EAST PASTURE
TEST WELL (TW-2) EVALUATION
AND
CS-13 CONSTRUCTION REPORT

Prepared for:

CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS

JULY 2012

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EXECUTIVE SUMMARY

In spring 2012, Parsons installed test well (TW-2) in the East Pasture of CSSA. The well was drilled to satisfy multiple Evaluation Criteria which included:

1. A US Environmental Protection Agency (USEPA) recommendation to determine of solvent contamination was present in the southeast corner of CSSA as a result of past waste management disposal practices;
2. Determine if groundwater availability in the East Pasture was suitable for the development of an emergency fire suppression system for the mission-critical Test Firing Range operations; and
3. Assess if groundwater produced from the East Pasture could augment the CSSA potable water distribution system.

The well was drilled through the entire thickness of the Middle Trinity Aquifer to a depth of 578 feet below ground surface (bgs). Groundwater samples were collected from the test well and submitted for chemical and microbial analysis to determine if the groundwater met regulatory requirements for safe drinking water. No organic, inorganic, radionuclide results exceeded any regulatory standard, thereby satisfying Evaluation Criteria 1.

A 36-hour pumping test showed that the well could continuously maintain 110 gallons per minute (gpm) with a net aquifer drawdown of 182 feet. The transmissivity of the well was determined to be 1,278 gallons per day per foot (gpd/ft), with a specific capacity of 0.60 gallons per minute per foot (gpm/ft). Four observation wells were monitored for influence from the pumping action. Only the nearest well, CS-1, at a distance of 1,830 feet from TW-2 resulted in any measurable drawdown (1.79 feet) from the pumping test. CSSA concluded that the well location met the expectations of a fire suppression system for the East Pasture (Evaluation Criteria 2).

CSSA opted to convert the test well into a fully constructed fire suppression supply well, now designated CS-13. The upper 300 feet of strata were reamed to 14 inches in diameter, and 10-inch diameter steel casing was cemented into the subsurface. The remainder of the well was reamed to a 10-inch diameter to a total depth of 579.5 feet bgs. A new, 30-hp submersible pump capable of producing 120 gpm was installed to a depth of 554 feet bgs. The well was developed, disinfected, and purged for a final round of sampling.

Three consecutive daily samples for microbial parameters all resulted in "NOT FOUND" for total coliform, fecal coliform, and *E. coli*. A final round of samples for organic and inorganic constituents did not exceed any regulatory requirement. In accordance with TCEQ Rules, this well meets the requirements for interim approval for public water supply, and could therefore be incorporated into the CSSA public water supply system upon approval by the TCEQ (Evaluation Criteria 3).

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
AWG	American Wire Gauge
AWWA	American Water Works Association
bgs	Below Ground Surface
BS	Bexar Shale
CFU	Colony Forming Unit
CC	Cow Creek Limestone
CSSA	Camp Stanley Storage Activity
DO	Dissolved Oxygen
gpd	Gallon Per Day
gpd/ft	Gallon Per Day Per Foot
GPI	GeoProjects International
gpm	Gallon Per Minute
gpm/ft	Gallons Per Minute Per Foot
hp	horsepower
LGR	Lower Glen Rose Limestone
MCL	Maximum Contaminant Level
µg/L	Microgram Per Liter
mg/L	Milligrams Per Liter
mS/sec	MilliSiemens Per Second
mV	MilliVolt
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential
ppm	Parts Per Million
psi	Pounds Per Square Inch
PVC	Polyvinylchloride
PWS	Public Water Supply
Q	Discharge
Rules	30 TAC Chapter §290 – Rules and Regulations for Public Water Systems
s	Drawdown
SATL	San Antonio Test Laboratory, Inc.
SC	Specific Capacity
SCADA	Supervisory Control And Data Acquisition
SCL	Secondary Contaminant Level
SDR	Standard Dimension Ratio
SDWA	Safe Drinking Water Act
SP	Spontaneous Potential

ACRONYMS AND ABBREVIATIONS *(continued)*

SPR	Single Point Resistivity
SVOC	Semivolatile Organic Compound
T	Transmissivity
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
TW-2	Test well #2
UGR	Upper Glen Rose Limestone
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
VOC	Volatile Organic Compound

SECTION 1
INTRODUCTION

1.1 Introduction

Parsons was under contract with the U.S. Army to drill a test well (TW-2) in the East Pasture of CSSA. The well was drilled to satisfy multiple Evaluation Criteria which included:

1. A US Environmental Protection Agency (USEPA) recommendation to determine of solvent contamination was present in the southeast corner of CSSA as a result of past waste management disposal practices;
2. Determine if groundwater availability in the East Pasture was suitable for the development of an emergency fire suppression system for the mission-critical Test Firing Range operations; and
3. Assess if groundwater produced from the East Pasture could augment the CSSA potable water distribution system.

The prime objective of this investigation was to determine if organic solvent contamination was present in groundwater due to past waste management practices at the facility. In 2011, the USEPA had recommended that CSSA investigate the southeast corner of facility to determine if known contaminants were migrating off-post towards Camp Bullis. If contamination above the MCLs were detected in groundwater at this location, an observation well would be installed and incorporated into the monitoring program.

A secondary goal of this investigation was to determine hydraulic capacity of the aquifer in this portion of post with respect to possible development as a fire suppression system for the East Pasture Test Firing Range facilities. Currently, CSSA has very limited fire suppression capacity in the East Pasture and therefore intends to construct infrastructure to supply fire suppression water to that portion of the post. This includes a fire suppression well in the East Pasture that may contain limited organic/inorganic contamination below applicable regulatory standards. A minimum well yield capacity of 50 gallons per minute (gpm) was established as the threshold for development of a fire protection well.

Finally, if the aquifer showed no evidence of chemical contamination and met the minimum well yield threshold, consideration would be given to incorporating the well location into the CSSA Public Water Supply (PWS) system. Because of the possibility that the resulting well could be incorporated as a water supply well, the installation methods and construction standards were were performed in accordance with Texas Commission on Environmental Quality (TCEQ) requirements and *30 TAC Chapter §290 – Rules and Regulations for Public Water Systems* (Rules) and American Water Works Association (AWWA) standards.

1.2 Scope of Work and Objectives

In March 2012, Parsons drilled and evaluated test well (TW-2) at CSSA. Depending on results of the aquifer and analytical testing, the activities would culminate in either constructing a fire suppression or water supply well (as CS-13), or the well would be converted into a standard observation well for incorporation into the CSSA groundwater monitoring network.

The objectives of the test well were as follows:

- Determine the stratigraphic and hydrologic properties of the drilling location in the East Pasture;
- Ascertain the potential yield of the well and its effect on the aquifer by performing a pumping test; and
- Collect groundwater samples for chemical, microbial, and natural water quality parameters to ensure the water source meets or exceeds all regulatory requirements for public water supply.

To meet the primary objectives, a test well was constructed in the East Pasture in Spring 2012. Based on findings of the test well program, recommendations would either be complete the well as functional public supply/fire suppression well, or convert it to a standard monitoring well for inclusion in the CSSA groundwater monitoring program.

This document describes the methods used to install the test well, results of the pumping test, and results of groundwater sampling analysis. Details regarding the final construction of the well, including materials and methods used, are presented in this report.

The appendices include supporting documentation relating to well construction (**Appendix A**), geophysical surveys (**Appendix B**), pumping test data (**Appendix C**), analytical results for chemical (**Appendix D**), and microbial (**Appendix E**) parameters, and manufacturer information on the installed pumping apparatus (**Appendix F**).

SECTION 2
TEST WELL INSTALLATION

2.1 Test Well Program

Beginning February 14, 2012, test well (TW-2) was drilled by GeoProjects International (GPI) of Austin, Texas. TW-2 was constructed in the East Pasture approximately 1,850 feet (0.35 mile) northeast of CS-1 (**Figure 2.1**). TW-2 was drilled 578 feet deep below ground surface (bgs), penetrating the full thickness of the Middle Trinity Aquifer. The Middle Trinity Aquifer comprises the Lower Glen Rose (LGR) Limestone, Bexar Shale (BS), and the Cow Creek (CC) Limestone members of the Trinity Group. At CSSA and throughout the surrounding area, the Middle Trinity Aquifer is used as a principal source of potable water supply.

The test well was advanced into the subsurface using air rotary drilling with water injection. The test well was drilled at a nominal diameter of 8 inches with a tri-cone rotary bit to facilitate a test pump that would be similar in size and capacity to production well pumps, which are typically 6 inches in diameter or greater. Quick-Foam® additive was utilized to assist in the removal of drill cuttings from the borehole. Chlorinated injection water was obtained from the CSSA potable water distribution system at Building 709 in the East Pasture. Containment pits were constructed to retain and settle out drill cuttings produced from the drilling activities.

A "TOTCO" single-shot declination tool was deployed every 50 feet of borehole advancement to check borehole plumbness. The requirement was to keep the borehole within 2 degrees of plumb, which was achieved. A summary of the declination surveys is included on the well completion diagram in **Appendix A**.

The final depth of 578 feet was determined by the on-site geologist based on geophysical logs of nearby existing wells and close scrutiny of drill cuttings to fully penetrate the full thickness of the Middle Trinity Aquifer.

2.2 Lower Glen Rose Segment

The test well was drilled in segments to determine if contaminants (chemical or biological) were present in the LGR groundwater before completing the test well throughout the entire thickness of the Middle Trinity Aquifer. The first phase of the work included drilling an 8-inch open borehole through the entire thickness of the LGR limestone. The contact with underlying BS strata was encountered at 441 feet below ground surface (bgs), and the segment was extended to 460 feet bgs to accommodate pumping equipment and geophysical logging tools. On March 1, 2012, a 4-inch submersible pump was installed to modestly develop the well and collect analytical samples for volatile organic compounds (VOC) and bacteriological analysis. Approximately 15,000 gallons of groundwater were pumped from the well during this development phase. The initial analytical sample was collected after 9,000 gallons had

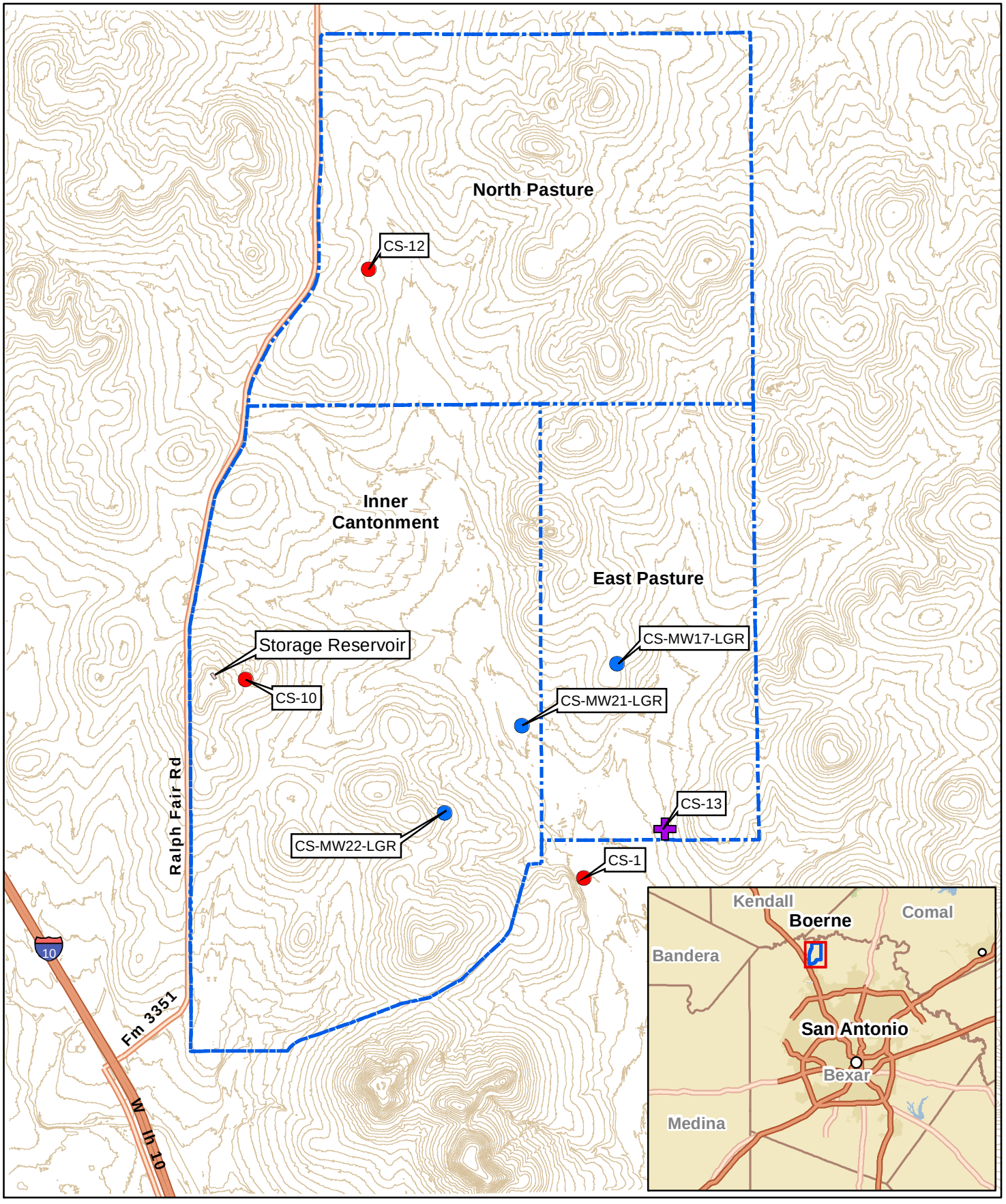

Figure 2.1

Location of CS-13
Camp Stanley Storage Activity

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been purged, and the last sample was collected after an additional 6,000 gallons had been evacuated from the borehole. The LGR segment of the test well sustained approximately 18 to 20 gpm during the development process.

Samples were submitted to San Antonio Testing Laboratory (SATL) for 24-hour results so driller stand-by time was minimized. Results of the interim LGR sampling are presented in **Table 2.1**. Only two VOCs were reported in the groundwater samples. Acetone is a by-product of the Quick-Foam additive, and toluene is a typical compound seen in groundwater after air rotary drilling. Both detections are well below established regulatory standards. All analytical laboratory reports are included as **Appendix D** (chemical) and **Appendix E** (microbial) of this document.

Table 2.1
Test Well Sampling (LGR Segment)

Analyte	3/1/2012 (1910)	3/1/2012 (2330)
VOCs (µg/L)		
Acetone	16	11
Toluene	26	5
Microbial Analysis		
Total Coliforms	**Found**	**Found**
Fecal Coliform	Not Found	Not Found
E. Coli	<1 CFU*/100 ml	<1 CFU*/100 ml

**CFU = Colony Forming Unit*

Geophysical and video surveys were conducted by Geo Cam, Inc. on March 2, 2012. Results of those surveys are included in **Appendix B** of this report. The geophysical survey indicated that the contact between Upper Glen Rose (UGR) and LGR occurred at approximately 117 feet bgs. It also confirmed visual observations that the LGR/BS contact occurred at 441 feet bgs.

2.3 Bexar Shale/Cow Creek Segment

Based on the analytical results from the LGR segment, CSSA directed Parsons to continue drilling the test well throughout the entire thickness of the Middle Trinity Aquifer. Drilling resumed on March 5, 2012 and continued until the total depth of 578 feet bgs was achieved on March 7, 2012. Drill cutting indicated that the CC limestone was encountered at approximately 500 feet bgs. The underlying Hammett Shale aquitard was subsequently encountered at 578 feet bgs. Groundwater production increased significantly while drilling the CC segment.

2.4 United States Geologic Survey Borehole Logging

Under direct contract with CSSA, the United States Geologic Survey (USGS) performed standard and advanced geophysical techniques to document the stratigraphic and hydrologic properties of the borehole. The USGS completed its borehole survey between March 8-12, 2012.

The USGS logging suite included:

- Natural Gamma, Spontaneous Potential (SP), Caliper, Conductivity,
- Resistivity (short [16N], long [64N], single-point [SPR], induction, and lateral),
- Neutron Density and Sonic Porosity,
- Conductivity (specific and fluid), Temperature,
- Optical Televiewer, Digital Video, and
- Electromagnetic Borehole Flowmeter

The standard geophysical tools confirmed the stratigraphy of the borehole. The generalized stratigraphy of the borehole is typical for the area, and is presented below in **Table 2.2**. A montage of the USGS logging effort is presented in **Appendix B**.

Table 2.2
Borehole Stratigraphy

Stratigraphy	Depth (ft bgs)	Interval Thickness (ft)
Upper Glen Rose Limestone	0 - 117	>117
Lower Glen Rose Limestone	117 – 441	324
Bexar Shale	441 – 502	61
Cow Creek Limestone	502 -578	76

The USGS also conducted a borehole flow analysis utilizing electromagnetic flowmeter measurements under both ambient and pumping conditions. The test identified two production intervals each in the LGR and CC members of the Middle Trinity Aquifer (**Table 2.3**). According to the USGS results, approximately 85 percent of the groundwater contribution to the borehole originates from the CC portion of the well.

Table 2.3
Groundwater Production Zones

Stratigraphy	Production Interval	Interval Thickness (ft)	Percent Contribution
Upper Glen Rose Limestone	None (Perched Zones Only)	0	0%
Lower Glen Rose Limestone	300 – 335 415 - 435	35 20	5.8% 9.6%
Bexar Shale	None	0	0%
Cow Creek Limestone	512 – 550 572 - 578	38 6	24.4% 60.1%

SECTION 3
PUMPING TESTS AND SAMPLE ANALYSIS

Production capacity testing of TW-2 occurred the week of March 13–15, 2012, which included both variable discharge step testing and constant discharge testing. The step test consisted of short duration pumping intervals at increasing discharge rates to help determine the correct pumping rate for the 36-hour constant discharge pumping test. At the time of testing, static groundwater level at TW-2 was approximately 200 feet bgs.

The well was equipped with a 30-hp pump capable of producing 125 gpm on 3-inch column pipe, and set at 564 feet bgs. After the pump was installed, the water column in the well was modestly disinfected by adding 3,000 gallons of 72 parts per million (ppm) solution of chlorinated water to the 1,500 gallons present in the wellbore. This effectively created a 48 ppm disinfection solution that remained in the borehole for approximately 18 hours before the start of the pumping test activities.

Prior to the start of pumping tests, datalogging pressure transducers were installed in the pumping well, as were four observation wells to determine lateral effects, if any, of pumping in existing wells (shown in **Figure 2.1**). The four nearest wells to TW-2 ranged in distance from 1,850 feet to 4,250 feet, and included CS-1, CS-MW17-LGR, CS-MW21-LGR, and CS-MW22-LGR. The pumping well transducer was programmed to collect data on a logarithmic schedule, with no more than a five-minute interval between measurements. The observation well transducers were programmed for a linear data collection schedule, with readings logged every 10 minutes. The transducer data collected during the pumping test is presented in **Appendix C**. In addition, Parsons geologists obtained manual confirmation measurements from both the pumping and observation wells every two hours. Chlorine readings and discharge measurements were also checked on TW-2 on the same time interval.

3.1 Step-Drawdown Test

Parsons geologists conducted a step-drawdown test on March 13, 2012. The purpose of this preliminary test was to determine an appropriate pumping rate for the 36-hour pumping test. Drawdown measurements versus elapsed-time were obtained using a pressure transducer and verified by occasional manual readings. Discharge rate and total flow measurements were monitored by an in-line flow meter.

Four pumping steps were undertaken. Each step ran for approximately 1 hour except Step 4, which ran for 22 minutes and was shortened due to sharply deteriorating water quality and excessive aquifer drawdown. There was a brief recovery period between the first two steps. The pumping rates and resultant drawdown (from static groundwater level) associated with the steps are presented in **Table 3.1**.

Table 3.1
TW-2 Step-Test Results

Step #	Discharge Rate	Duration	Water Level Drawdown	Sustainable Yield for 36-hour Test?
	(gpm)	*(minutes)*	*(feet below static level*)*	
1	30	60	20.25	Yes
2	50	60	41.44	Yes
3	90	60	90.33	Yes
4	120	30	132.57	Unlikely

**static groundwater level ~206.67 feet below top of casing (BTOC)*

The step test pumping produced between 20.25 feet (Step 1) and 132.57 feet (Step 4) of drawdown below the initial static groundwater level. The resulting drawdown of the step tests are illustrated in **Figure 3.1**. Based on the combination of step test analyses, the pumping rate selected for the 36-hour pumping test was 110 gpm.

3.2 36-Hour Pumping Test

Parsons conducted the TW-2 36-hour pumping test on March 14-15, 2012. The test served to evaluate the yield and overall suitability of the well as a potential water supply source. The pumping test consisted of recording water level drawdown over time during a period of constant rate pumping (110 gpm). Groundwater pumping rates and discharge totals were monitored via a flow totalizing meter installed on the discharge piping. Discharge rate was monitored throughout the pumping test and was adjusted as needed to maintain a discharge as close as possible to the prescribed 110 gpm flowrate. According to the wellhead flowmeter, total withdrawal was 236,128 gallons. The average pumping rate over the 36-hour (2,160 minutes) duration of the test was 109.32 gpm. Total drawdown was 182.29 feet. **Figure 3.2** presents water level drawdown and recovery with respect to elapsed time identified within TW-2 during the pumping test program.

Upon completion of the pumping test, the pressure transducer data from the observation wells were evaluated. The most obvious trend was that regional aquifer recharge was occurring, and that CS-MW17-LGR, CS-MW21-LGR, and CS-MW22-LGR groundwater increased in elevation by more than 8.6 feet over the duration of the pumping test (**Figure 3.3**). Recharge was also noted in well CS-1; however, that recharge was arrested with a net drawdown of 1.79 feet during the pumping phase of the test (**Table 3.2**). By subtracting the effects of recharge from the data, the net drawdown would likely have been more than 4 feet in a static system (**Figure 3.4**). **Figure 3.5** conceptualizes what the area of measurable pumping influence may look like in the East Pasture.

Figure 3.1
TW-2 Step-Drawdown Test
March 13, 2012

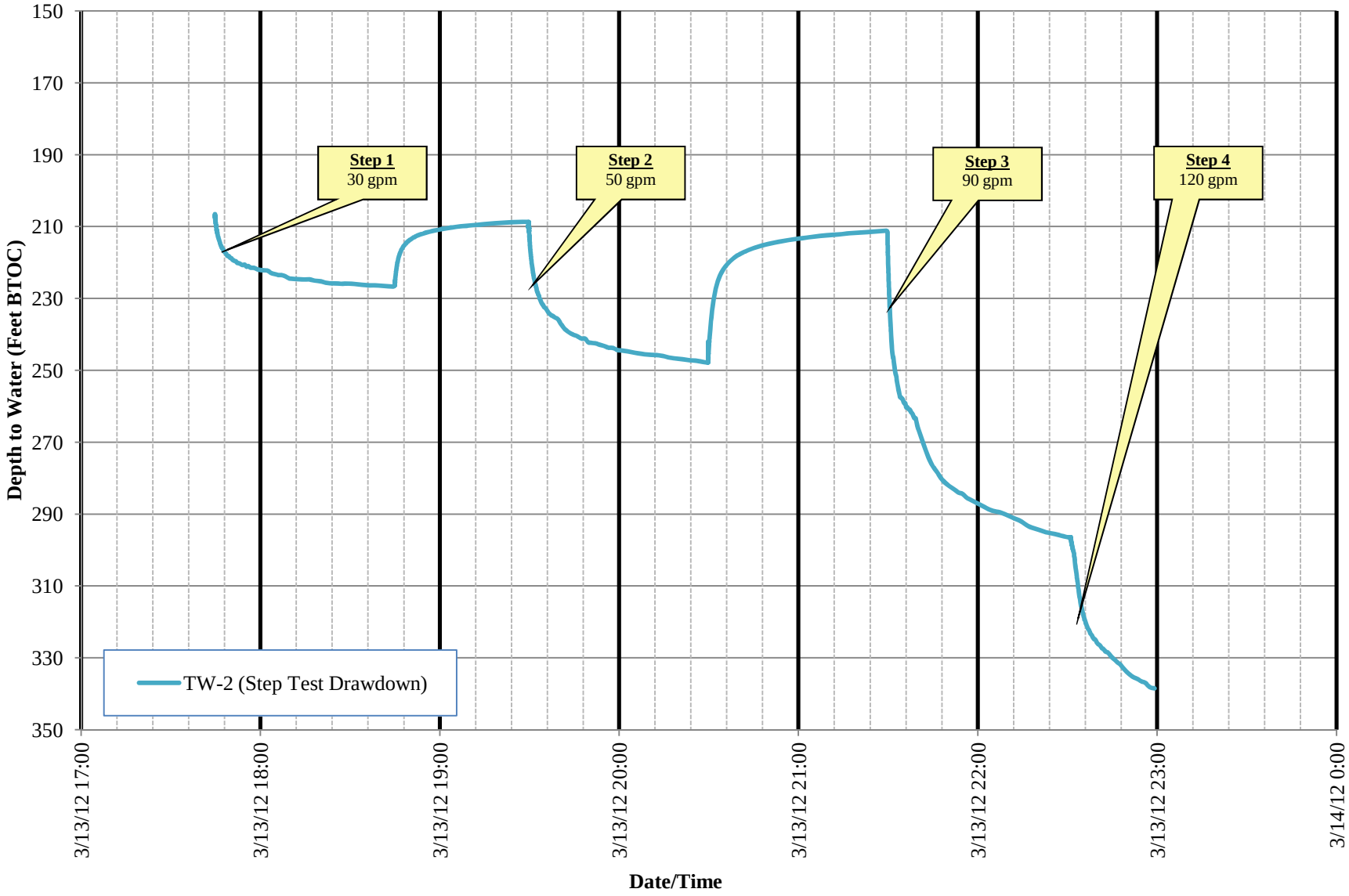


Figure 3.2
TW-2 Drawdown and Recovery Test (110 GPM)
March 14-15, 2012

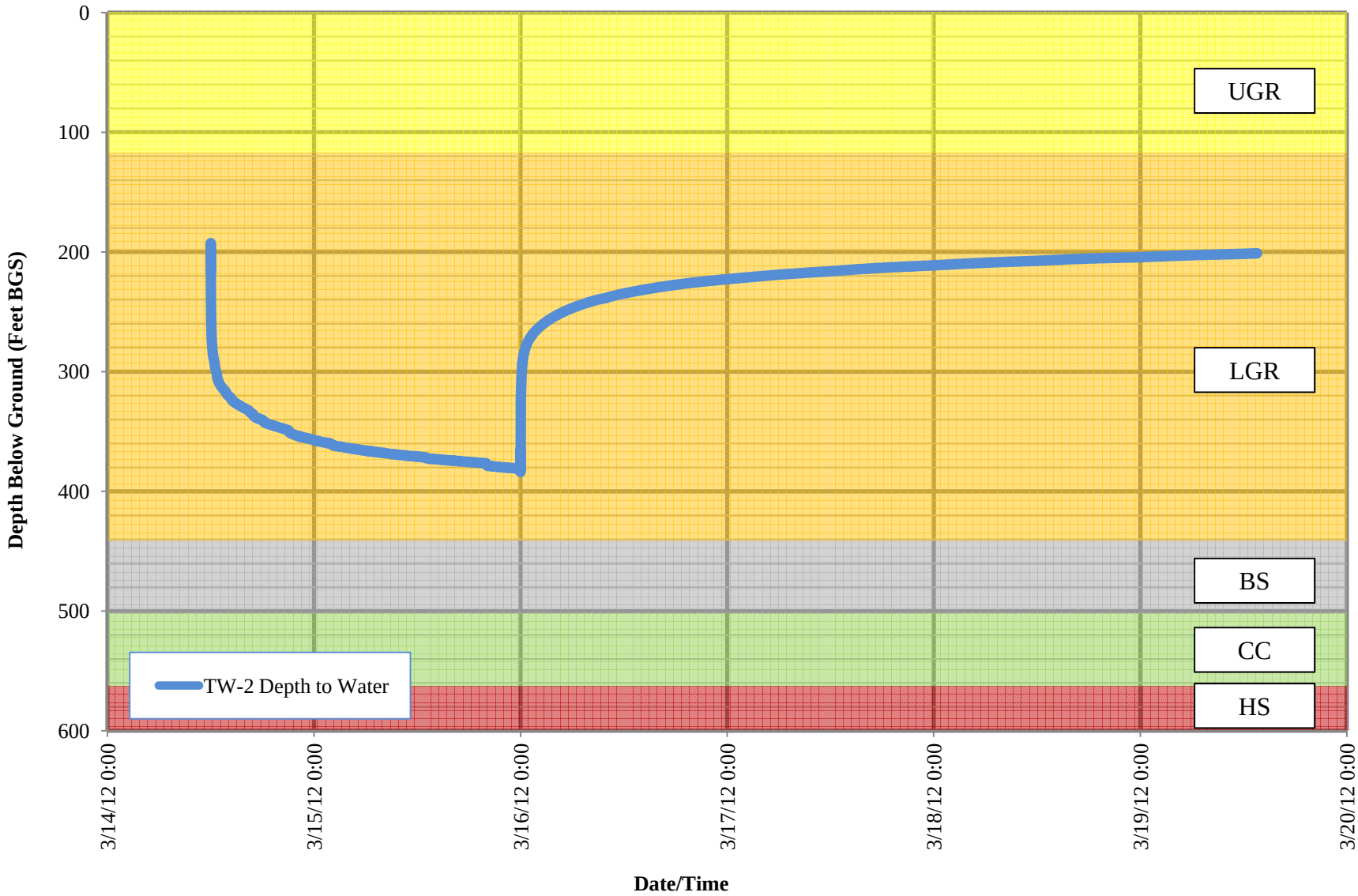


Figure 3.3
Recharge in Observation Wells During Pumping Test

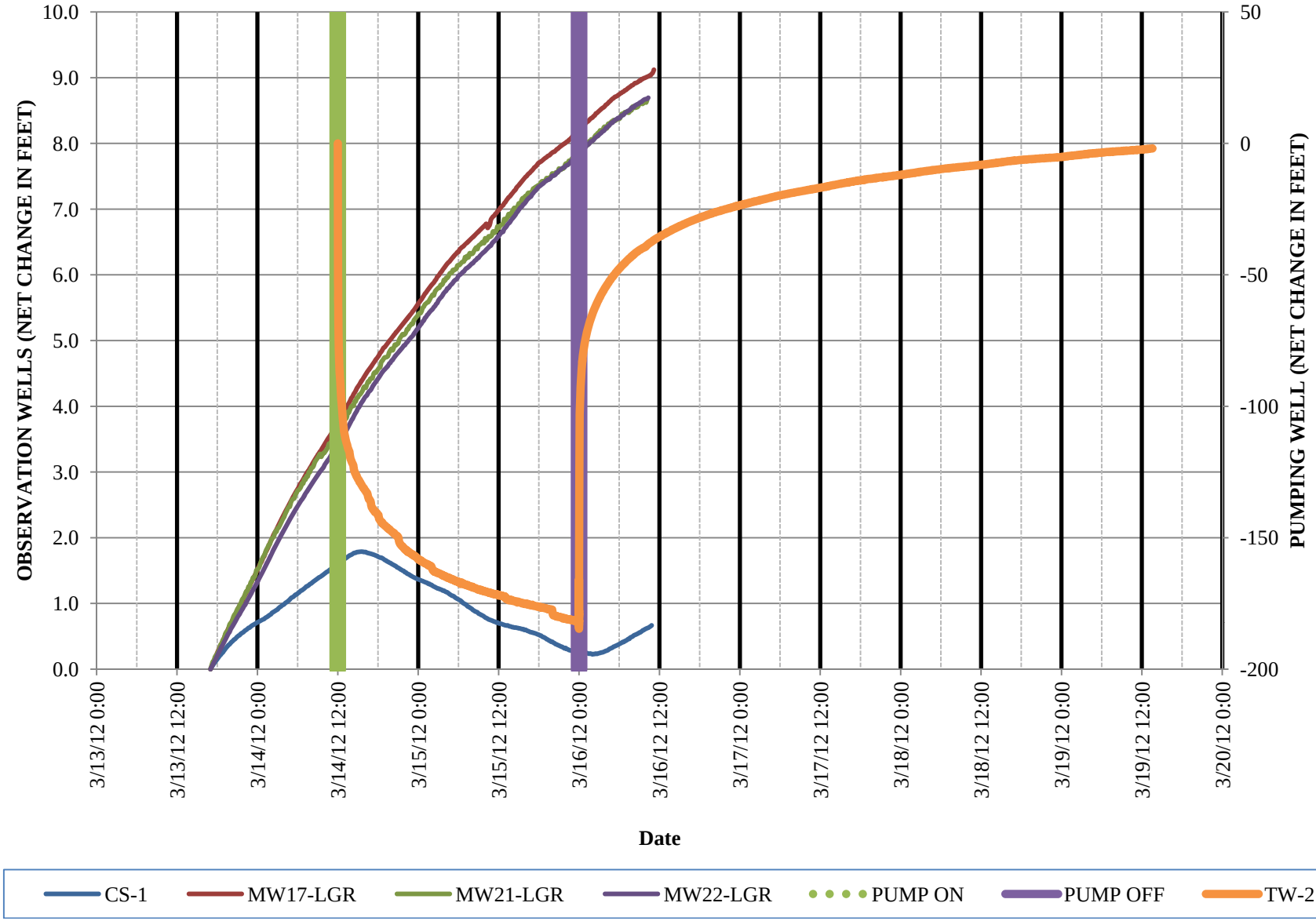
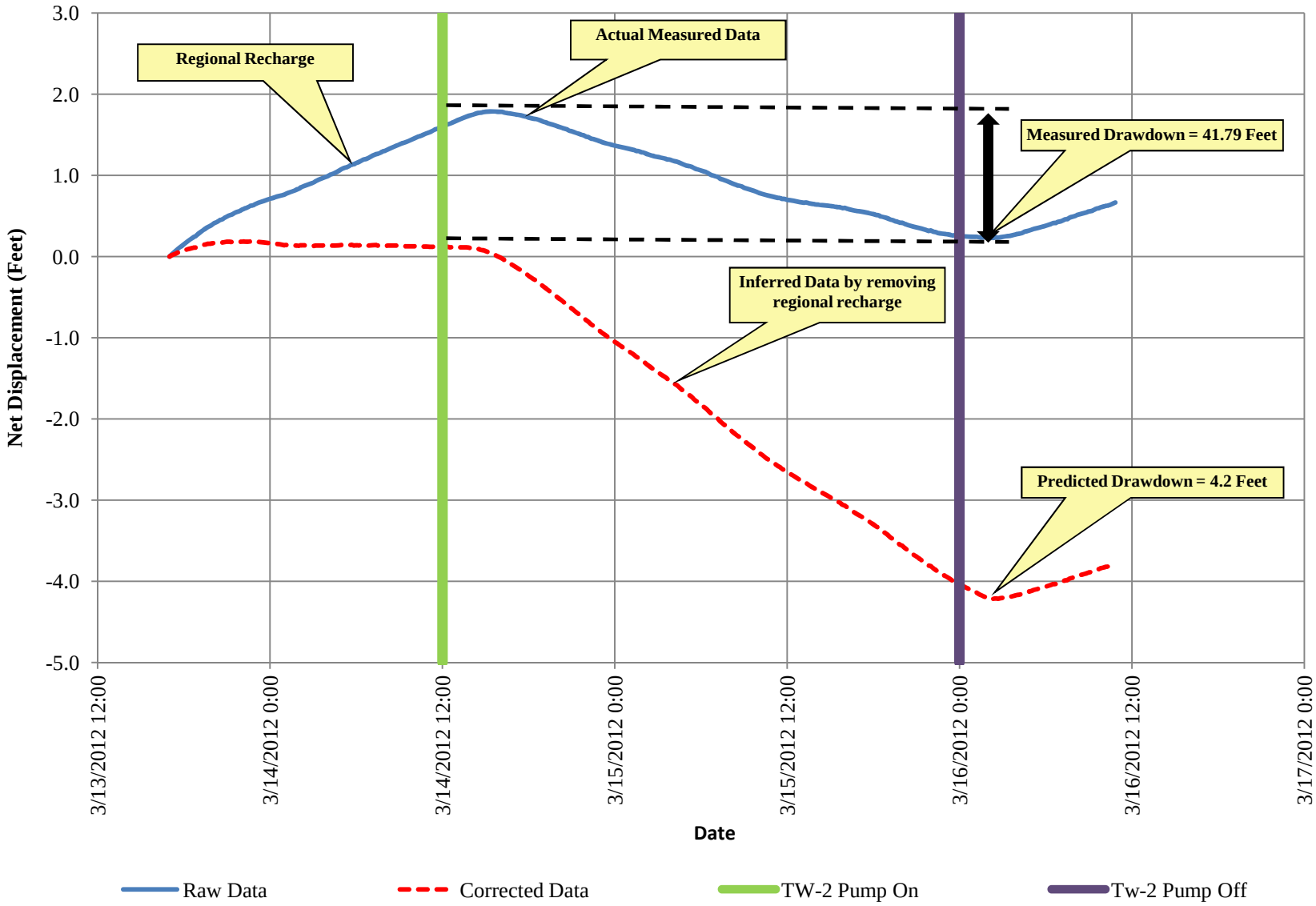
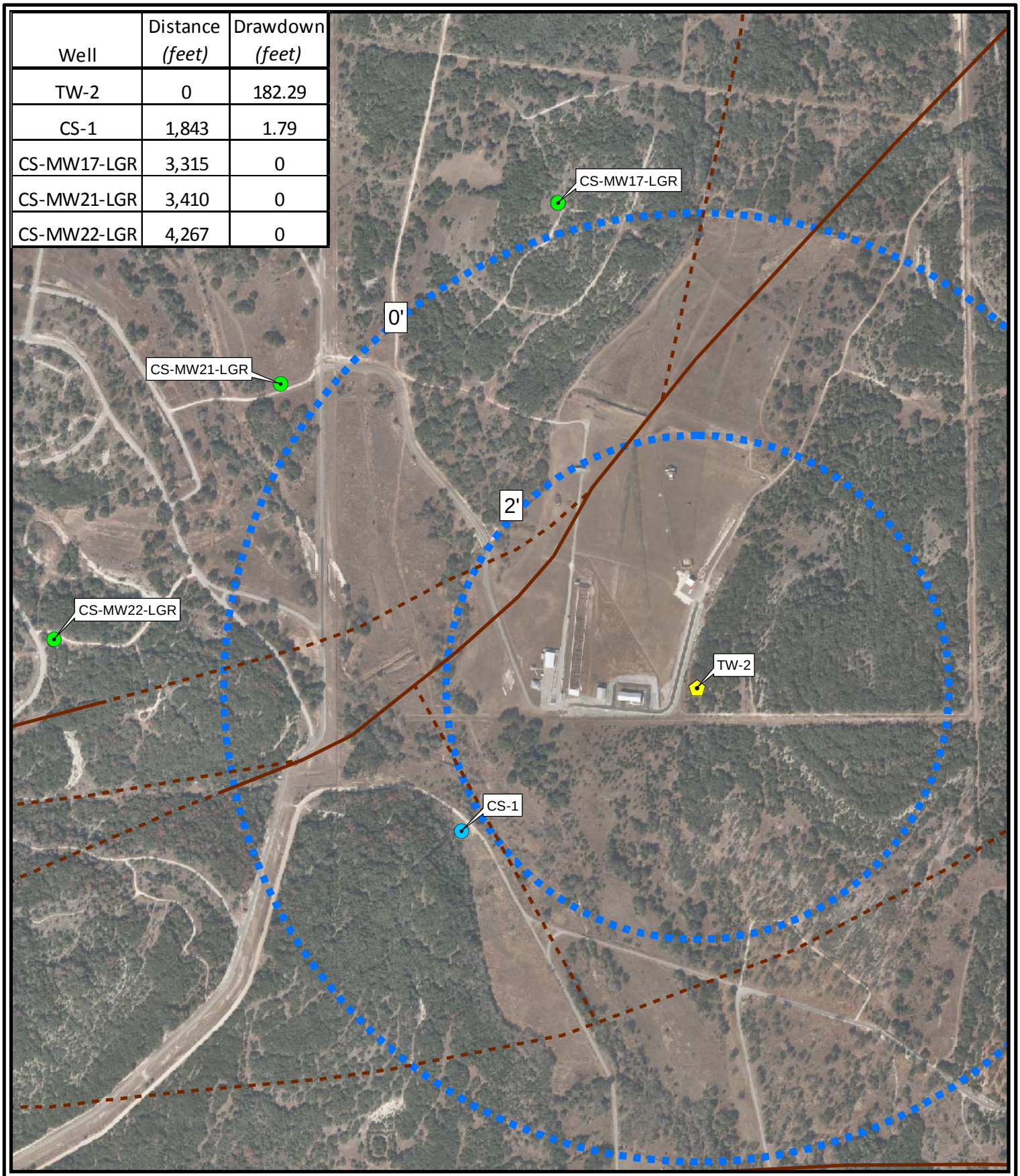


Figure 3.4
CS-1 Response to TW-2 Pumping



Well	Distance *(feet)*	Drawdown *(feet)*
TW-2	0	182.29
CS-1	1,843	1.79
CS-MW17-LGR	3,315	0
CS-MW21-LGR	3,410	0
CS-MW22-LGR	4,267	0



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0 425 850 1,700 Feet

- Pumping Test Well
- Monitoring Well
- Water Supply Well
- Mapped Fault
- Inferred Fault
- Cone of Depression

Figure 3.5

Conceptual Zone of Pumping Influence
Camp Stanley Storage Activity

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Table 3.2
Net Drawdown in Observation Wells

Well	Distance *(feet)*	Drawdown *(feet)*
CS-1	1,843	1.79
CS-MW17-LGR	3,315	0
CS-MW21-LGR	3,410	0
CS-MW22-LGR	4,267	0

A common term used to assess the hydraulic character of an aquifer is transmissivity (T), which is rate at which water transmitted through a unit width of an aquifer under a unit hydraulic gradient. Typical units to express this term are gallons per day per foot (gpd/ft). Using an empirical formula from the Jacob modified nonequilibrium equation (Driscoll, 1986), a value from T can be determined from the following equation:

$$T = \frac{Q \times 2000}{s}$$

Where: T = transmissivity (gpd/ft)
Q = Discharge (gpm)
s = 24-hour drawdown (ft)

Using data from TW-2, the following result for T is calculated:

$$T = \frac{110 \times 2000}{172.4} = 1{,}276 \text{ gpd/ft}$$

Another simple analysis to quantify performance of a well is to calculate the specific capacity (SC) of the well. Specific capacity is defined as the well yield (gpm) per unit of drawdown and is typically expressed in terms of gallons per minute per foot (gpm/ft) of drawdown. Specific capacity is a value used to estimate well characteristics such as maximum yield and overall performance. The higher a value for SC, the better the well's productivity is considered at that point in its operation. This occurs when more water can be pumped out with minimal lowering of the water level in the well. Generally, SC will decrease for any well as either discharge or drawdown increases.

$$SC = \frac{Q}{s}$$

Where: SC =Specific Capacity (gpm/ft)
Q = Discharge (gpm)
s = 36-hour drawdown (ft)

Using data from TW-2, the following result for SC is calculated:

$$SC = \frac{110}{182.3} = 0.603 \text{ gpm/ft}$$

As an example, a well that produced 100 gpm with only 20 feet of drawdown (SC = 5 gpm/ft) is much preferable over a well that produced 100 gpm with 100 feet of drawdown (SC = 1 gpm/ft). At the end of the 36-hour test, the resultant SC of TW-2 was 0.60 gpm/ft. Historical pumping tests at wells CS-10, CS-16, and CS-12 resulted in similar SC results of 1.13, 0.71, and 0.78 gpm/ft, respectively.

Specific capacity is a simplistic tool to predict what the yield of well would be at a certain pumping level, within reason. In the case of TW-2, the well will approximately produce 60 gpm for every 100 feet of drawdown. It is important to note that SC values can decay, up to 50 percent (Driscoll, 1986), with increased discharge and drawdown. In the case of CSSA, much of the water column in the well is not water-bearing, such as BS interval (60 feet). Overpumping this well can drop the water level below the BS strata while only negligibly increasing the yield. As a result, it is not valid to assume that TW-2 can produce 180 gpm at 300 feet of drawdown.

These analyses indicate that the transmissivity and specific capacity results for TW-2 is somewhat below average for what is typical for the area (**Table 3.3**). July 2001 pumping tests conducted at CS-16 (prior to re-completion) and CS-10 resulted with transmissivity values ranging between 1,600 and 2,400 gpd/ft, respectively. Likewise, a similar pumping test at CS-12 in 2008 resulted with transmissivity of 1,730 gpd/ft. Results for SC are generally in the same proportions as transmissivity.

Table 3.3
TW-2 Hydraulic Comparisons

	CSSA (2001)		**CSSA (2008)**	**CSSA (2012)**	
	CS-10	**CS-16**	**CS-12**	**TW-2**	**CS-1**
Transmissivity (gpd/ft)	2,400	1,600	1,730	1,276	2,640
Specific Capacity (gpm/ft)	1.13	0.71	0.78	0.60	N/A

This indicates that the transmissivity and SC results for TW-2 are somewhat below average for what is typical for the area. July 2001 pumping tests conducted at CS-16 (prior to re-completion) and CS-10 resulted with transmissivity values ranging between 1,600 and 2,400 gpd/ft, respectively. Likewise, a similar pumping test at CS-12 in 2008 resulted with transmissivity of 1,730 gpd/ft. Results for specific capacity are generally in the same proportions as the transmissivity.

Notwithstanding the calculated hydraulic parameters, qualitatively this well is a good water producer. The saturated interval of the aquifer is well-developed, upwards of twice the thickness of CS-10 and CS-12. The results of the pumping test showed the well location far surpassed the predetermined 50 gpm threshold set forth by CSSA for consideration as a future fire suppression well, or even a potable water supply well.

Two other notable facts were also ascertained during the pumping test. Measurable pumping influence was measured at CS-1, allowing an aquifer transmissivity of 2,600 gpd/ft to be calculated for that vicinity. That is the highest transmissivity determined at CSSA to date, and corresponds well to its ability to produce 60 to 80 gpm exclusively from the LGR segment of the aquifer. Secondly, as shown in **Figure 3.2**, it took 3.8 days for the water level to return to within 95 percent of the static pre-pumping level of the well. In comparison to other wells, this seemed to be a surprisingly long time considering the relatively high flowrate sustained during the test.

3.3 Analytical Results

Several rounds of analytical samples were obtained during the test well program. Initial samples were collected during the approximate midpoint (20.5 hours) and termination (35.5 hours) of the pumping test. These samples included the parameters that will be necessary to obtain TCEQ Interim Approval to operate the well as a public water supply, should that course of action be pursued.

Once residual chlorine from the disinfection process had been purged from the well, samples were collected after 20.5 hours of pumping on March 15, 2012 for Total Coliform, *E. coli*, Fecal Coliform, VOCs, Semivolatile Organic Compounds (SVOC), CSSA 9 Metals, Cations (Al, Fe, Mn, Ca, Mg, K, Na), Anions (nitrate, nitrite, fluoride, chloride, sulfate, bromide, total phosphorus and orthophosphate), pH, Total Dissolved Solids (TDS), Radionuclides (Gross Alpha/Beta, Radium 226, Radium 228, Isotopic Uranium), Alkalinity and Hardness. A second round of samples was collected after 35.5 hours of pumping, just before midnight on March 16, 2012. The results are included in **Table 3.4**. Samples were analyzed by Agriculture & Priority Pollutants Laboratories, Inc. (APPL), Clovis, CA. Analytical summary sheets are provided in **Appendix D** (chemical) **and Appendix E** (microbial).

All analytical results from groundwater samples collected from TW-2 show no contaminants of concern above Federal Safe Drinking Water Act (SDWA) maximum contaminant levels (MCL). Very low detections of the VOCs chloroform (0.37 µg/L), and toluene (2.34 µg/L) were reported by the laboratory in the initial sample (March 15, 2012). The reported detection of toluene is 400 times less than the compound-specific MCL of 1,000 µg/L.

The subsequent sample at the end of the 36-hour test (midnight, March 16, 2012) confirmed that no VOCs except chloroform (0.21 µg/L [less than the reporting limit]) and toluene (1.65 µg/L) were present.

Table 3.4
TW-2 Analytical Sampling Results
March 2012

PARAMETERS	SAMPLING EVENT						ANALYTICAL LIMITS		REGULATORY LIMITS		
	3/1/2012 (1910)	3/1/2012 (2330)	3/15/2012 (0830)		3/15/2012 (23:30)	3/15/2012 (23:30)	MDL or MDC	RL	MCL	Action Level	SCL
	Normal	Normal	Normal	Duplicate	Normal	Duplicate					
SVOCs (µg/L)											
All			<MDL	<MDL	<MDL		Varies	Varies			Varies
VOCs (µg/L) - Detections Only											
Acetone	16	11	NA	NA	NA			5			
Chloroform	<MDL	<MDL	0.37	0.35	0.21		0.06	0.3	80 (total THMs)		
Toluene	26	5	2.34	2.29	1.65		0.06	1.1	1,000		
METALS (mg/L)											
Aluminum			<MDL	<MDL	<MDL		0.02	0.2			0.2
Arsenic			0.00356F	<MDL	.00134F		0.00022	0.03	0.01		
Barium			0.0317	0.0316	0.0342		0.0003	0.005	2		
Cadmium			<MDL	<MDL	<MDL		0.0005	0.007	0.005		
Calcium			70.31	71.61	77.75		0.03	1.1			
Chromium			<MDL	<MDL	<MDL		0.001	0.01	0.1		
Copper			0.005F	0.005	0.005		0.003	0.01		1.3	1.0
Iron			<MDL	<MDL	<MDL		0.03	0.2			0.3
Lead			0.0102F	0.0100F	0.005F		0.0019	0.025		0.015	
Magnesium			43.62	44.38	48.76		0.01	0.1			
Manganese			<MDL	<MDL	<MDL		0.001	0.005			0.05
Mercury			<MDL	<MDL	<MDL		0.0001	0.001	0.002		
Nickel			0.011	0.01	0.008F		0.001	0.01			
Phosphorous			0.196B	0.162B	0.216		0.008	0.05			
Potassium			5.24	5.33	5.93		0.1	1			
Sodium			18.2	18.51	19.4		0.11	1			
Zinc			0.12	0.115	0.113		0.008	0.05			5
ANIONS & WATER QUALITY (mg/L)											
TDS			385	387	403		4.4	10			500
Hardness			355	362	395			1			
Bromide			0.38F	<MDL	0.29F		0.07	0.50			
Chloride			15.43	15.24	14.97		0.08	1.0			250
Fluoride			1.24	1.19	1.18		0.10	1.0	4		2
Nitrate			0.93	0.79F	0.87		0.03	1.0	10		
Nitrite			<MDL	<MDL	<MDL		0.04	0.6	1		
Phosphate-P			<MDL	<MDL	<MDL		0.07	1.0			
Sulfate			84.81J	84.33J	83.91J		0.26	1.0			250
Bicarbonate as $CaCO_3$			267.20	265.60	270.30		0.30	2.0			
Carbonate as $CaCO_3$			0.00	<MDL	<MDL						
Total Alkalinity as $CaCO_3$			267.19	265.57	270.25		0.85	2.0			
pH			7.50	7.70	7.80						6.5-8.5
RADIONUCLIDES (pCi/L)											
Gross Alpha			1.9 +/- 1.2		3.0 +/- 1.7	2.2 +/- 1.3	1.9 - 2.7		15		
Gross Beta			6.9 +/- 1.9		5.7 +/- 1.8	4.5 +/- 1.7	2.7 - 3.0		50		
Radium 228			0.23 +/- 0.35U		0.25 +/- 0.36U	0.18 +/- 0.35U	0.71 - 0.74		5		
Coliform											
Total Coliform	Found	Found	Found		Found			Found/Not Found	<5%/annually		
E-Coli	Not Found	Not Found	Not Found		Not Found			Found/Not Found	None		
Fecal Coliform	<1	<1	<1		1			1.0	None		

J - The analyte was positively identified; the quantitation is an estimation

U - Result is less than the sample specific Minimum Detectale Concentraiont (MDC)

F - The analyte was positively identified but the numerical value is below the Reporting Limit (RL)

MDL - Method Detection Limit

No SVOCs were reported in the test well. All inorganic analyses (cations, anions, natural water quality parameters, and radionuclides) were also within acceptable ranges. All the chemical summary reports are included in **Appendix D**.

Two microbial samples were also collected, one at the midpoint of the test and one prior to termination of pumping. In both samples, total coliforms were reported as "FOUND." *E. Coli* was reported as "NOT FOUND" in both samples. The second sample tested positive for fecal colifoms, with a single colony form unit (CFU) being reported by the laboratory. All microbial laboratory reports are included in **Appendix E**.

Chemical and microbiological analyses indicated the test well water quality met or exceeded all state and federal clean water standards required for interim approval under the test conditions at the time. Detection of a single fecal coliform colony at the test well stage was determined to be a manageable risk by CSSA since the well had not yet been constructed with surface casing, nor had the well been fully disinfected.

Testing and analyses indicated that this location was free from the target analytes of concern that is associated with VOC groundwater contamination elsewhere at CSSA. Therefore, this well would make a satisfactory source of water for either a fire suppression system, or introduction into the CSSA water supply system. Therefore, the well was recommended for conversion to a fully constructed well that would meet TCEQ standards for potable water supply.

SECTION 4
CS-13 WELL CONSTRUCTION

4.1 Well Construction

Between March 23, 2012 and April 9, 2012, TW-2 was reconstructed as a supply well (CS-13) that would meet either use as fire suppression or public water supply well. Construction followed typical well completions for the region, which are surfaced-cased, open borehole wells completed in the saturated zones of the bedrock aquifer. The existing borehole was first reamed at a 14-inch diameter to 300 feet bgs. Ten-inch diameter steel surface casing (0.25-inch wall thickness) was installed to 300 feet below grade with steel centralizers affixed on to the casing exterior every 50 feet. An additional 4 feet of casing was installed above grade to exceed the 18-inch minimum stick-up required above the finished grade of a future well house facility.

The casing was pressure grouted by positive displacement method in accordance with AWWA standards. A total of 161 sacks of Portland cement (94 pounds each) were mixed with 5 percent bentonite to grout the entire length of the casing. In addition, a 12-diameter steel sleeve was cemented around the casing to a depth of 2 feet bgs to meet the TCEQ requirement of a wellhead surface completion. It is expected that a full concrete foundation will surround the wellhead once a well house is constructed.

The remainder of the well was reamed with a 10-inch bit to 579.5 feet below grade, just above the Hammett Shale aquitard. CS-13 contains 279.5 feet of open borehole throughout the remaining intervals of the Middle Trinity Aquifer, from 300 to 579.5 feet bgs. **Appendix A** includes the drilling subcontractor's state well report, cementing affidavit, and a well construction diagram.

4.2 Pump Installation

Prior to installing a pump in the new well, Parsons and GPI performed total dynamic head (TDH) calculations to estimate the condition of service that the pump would be expected to meet. Since the infrastructure to deliver CS-13 groundwater to the reservoir does not yet exist, several assumptions had to be made. Ultimately, the following assumptions were calculated as shown in **Table 4.1**. The exercise showed that the TDH of the well is approximately 720 feet at 110 gpm. This accounts for head loss attributable to lifting the groundwater to the surface, entering into an 85 pounds per square inch (PSI) distribution system, and friction losses associated with more than 15,000 feet of pipe to the storage reservoir.

Based on these calculations, a new 30-hp submersible pump (Goulds model 120L30) was selected to meet this condition of service. On April 24, 2012, the pump and cooling shroud was installed on 26 joints of 3-inch galvanized steel column pipe, with a finished set depth of 553.6 feet bgs (bottom of pump). Check valves were installed just above the pump, and every nine pipe joints (~189 feet) above thereafter, for a total of three check valves (depths of 535, 355, and 165 ft bgs, respectively). The pump was wired with 1/0

AWG double-jacketed wire which is secured to the column pipe. GPI installed two, 1-inch diameter SDR21 PVC gauging tubes for water level and transducer access. Each gauging tube extends the entire length of the column pipe, and is perforated at the bottom 50 feet of the tubing length.

Table 4.1
Estimation of Total Dynamic Head at 110 GPM

Segment	Distance (Feet)	Pipe Diameter (Inches)	Status	Head Loss (Feet)
Well Column Pipe	550	3	Exists	16
3 Check Valves			Exists	64
Lift from Pumping Level	400		Exists	400
Pipe Tee at Wellhead			Exists	16
Well to Entry Point	675	4	Assumed	7.12
East Pasture Segment	3,020	6	Assumed	4.43
East Outer Segment	4,200	6	Exists	6.16
Motor Pool Segment	2,868	8	Exists	1.04
To 606 Segment	1,140	6	Exists	1.67
To Reservoir Segment	2,290	12	Exists	0.12
Totals	15,143			720

Table 4.2 lists the specific information on the pumping equipment installed in CS-13. Manufacturer information and specifications are included in **Appendix F**. The pump is operated using a 3-phase, 230-volt electrical motor. The pump size was determined by analyzing water level data, aquifer characteristics derived from pumping tests conducted in March 2012, and the TDH calculated for the system. The system has been designed to provide 110 gpm.

Table 4.2
CS-13 Pump/Motor Specifications

Equipment	Description
Motor Manufacturer	**Franklin Electric**
Model	2366068120
Serial Number	06E19-17-6086 336558930
Power Requirement	3P 26KW 230V 90.4A
Service Factor	1.15
KVA Code	H
Pump Manufacturer	**Goulds**
Model	120L30 (15 stages)
Code	102G06630
Operating Range	40 -170 gpm
Total Dynamic Head	962 – 390 feet
Wire Manufacturer	**Service Wire Co.**
Specification	1/0 AWG THW (Cu) Submersible Pump Cable THW Heavy Duty Flat Black Jacketed 3 Conductors w/Ground 600 volt (UL) E140260 2012

4.3 Well Development And Disinfection

Following pump installation, the reconstructed well was developed and disinfected in accordance with TCEQ regulations. The well development was initiated on April 24, 2012 using the newly installed submersible pump. The well development process continued through disinfection, and sampling events were completed on May 3, 2012. A total of 178,372 gallons of groundwater were purged from the well during the entire development, disinfection, and sampling process. Groundwater was purged at a flowrate of 110 gpm until the discharge was free of visible sedimentation and water quality parameters were stable. The final readings included pH of 7.13, temperature of 24.47° C, conductivity of 0.461 milliseimens per second (mS/sec), turbidity of 2.44 nephelometric turbidity units (NTU), dissolved oxygen (DO) of 2.64 milligrams per liter (mg/L), and oxidation-reduction potential (ORP) of 97.5 millivolts (mV).

The disinfection process was initiated after the first eight hours of well development, and the groundwater produced was generally sediment-free and clear to the naked eye. On April 25, 2012, a disinfection solution consisting of 14.4 pounds of granular calcium hypochlorite (72% available chlorine) dissolved in 1,200 gallons of water resulting in a 1,035 ppm free chlorine solution. When this solution was introduced into the 1,500-gallon water column of the borehole, it generated a shock concentration of 460 ppm within the wellbore. The solution was pumped into the well from the mixing vessel and recirculated for several hours within the well via the new well pump and piping.

Purging of chlorinated well water began 24 hours after initial chlorination on April 26, 2012. The well was pumped over the course of four days to remove the residual chlorine present in groundwater. More than 157,000 gallons of water were purged until the residual chlorine was no longer measured in groundwater.

4.4 Water Quality

Following removal of residual chlorine from the disinfection process, the well was sampled for microbial analysis on three consecutive days, per TCEQ Rules. Samples were collected over three successive days on April 30, May 1, and May 2, 2012 and submitted to SATL for total coliform, fecal coliform, and *E. coli* analysis. None of these parameters were detected in the three daily samples, thereby satisfying the TCEQ requirement for interim approval, if developed into potable water source for the facility. Results of analyses are presented in **Table 4.3**, and laboratory reports are included in **Appendix E**.

Likewise, a May 2, 2012 chemical analysis showed that water from the CS-13 well meets all regulated water quality standards that will be required by the TCEQ to permit the well as potable water source. Samples were analyzed by APPL. Low detections of the same VOCs detected during the pumping test included chloroform (3.53 µg/L), and toluene (3.64 µg/L). The reported detection of toluene is significantly less than the compound-specific MCL of 1,000 µg/L.

No SVOCs were reported in CS-13. All inorganic analyses (cations, anions, and natural water quality parameters) were also within acceptable ranges. All the chemical analytical summary reports are included in **Appendix D**.

Table 4.3
CS-13 Analytical Sampling Results
April-May 2012

PARAMETERS	SAMPLING EVENT				ANALYTICAL LIMITS		REGULATORY LIMITS		
	4/30/2012 (07:05) Normal	5/1/2012 (07:05) Normal	5/2/2012 (07:25) Normal	5/2/2012 (15:30) Normal	MDL	RL	MCL	Action Level	SCL
SVOCs (µg/L)									
All				<MDL	Varies	Varies			Varies
VOCs (µg/L) - Detections Only									
Chloroform				3.53	0.06	0.3	80 (total THMs)		
Toluene				3.64	0.06	1.1	1,000		
METALS (mg/L)									
Aluminum				0.19F	0.02	0.2			0.2
Arsenic				0.00824F	0.00022	0.03	0.01		
Barium				0.0316	0.0003	0.005	2		
Cadmium				<MDL	0.0005	0.007	0.005		
Calcium				62.70	0.03	1.1			
Chromium				<MDL	0.001	0.01	0.1		
Copper				<MDL	0.003	0.01		1.3	1.0
Iron				0.15	0.03	0.2			0.3
Lead				<MDL	0.0019	0.025		0.015	
Magnesium				42.97	0.01	0.1			
Manganese				0.006	0.001	0.005			0.05
Mercury				<MDL	0.0001	0.001	0.002		
Nickel				0.009F	0.001	0.01			
Phosphorous				0.173B	0.008	0.05			
Potassium				5.35	0.1	1			
Sodium				16.80	0.11	1			
Zinc				0.342	0.008	0.05			5
ANIONS & WATER QUALITY (mg/L)									
TDS				407	4.4	10			500
Hardness				334		1			
Bromide				<MDL	0.07	0.50			
Chloride				16.11	0.08	1.0			250
Fluoride				1.17	0.10	1.0	4		2
Nitrate				4.32	0.03	1.0	10		
Nitrite				<MDL	0.04	0.6	1		
Phosphate-P				<MDL	0.07	1.0			
Sulfate				80.87	0.26	1.0			250
Bicarbonate as $CaCO_3$				273.60	0.30	2.0			
Carbonate as $CaCO_3$				<MDL					
Total Alkalinity as $CaCO_3$				273.58	0.85	2.0			
pH				7.30					6.5-8.5
Coliform									
Total Coliform	Not Found	Not Found	Not Found			Found/Not Found	<5%/annually		
E-Coli	Not Found	Not Found	Not Found			Found/Not Found	None		
Fecal Coliform	<1	<1	<1			1.0	None		

J - The analyte was positively identified; the quantitation is an estimation

F - The analyte was positively identified but the numerical value is below the Reporting Limit (RL)

B - The analyte was found in an assoiated blank, as well as in the sample

MDL - Method Detection Limit

SECTION 5
CONCLUSIONS

5.1 Contamination Assessment

Multiple rounds of sampling indicate that VOC contamination present elsewhere in groundwater beneath CSSA is not present in the East Pasture at the CS-13 well location. Because the presence of target VOCs were not reported in multiple sampling events, the well was not recommended for conversion into a standard CSSA observation for inclusion in the groundwater monitoring program. Because the groundwater met all standards for a potable water supply source and the yield was in excess of the 50 gpm threshold established by CSSA, the well was recommended for completion as a fire suppression well or potential potable water supply well.

5.2 Potential as Fire Suppression Well

Long-term aquifer monitoring at surrounding wells showed that the aquifer level was below average during the drilling and testing of CS-13, indicating that the current aquifer condition is more aligned with the drought portion of the hydrologic cycle. The test well was able to readily maintain the continual 110 gpm flowrate given the current aquifer conditions.

However, it is likely that that the long-term production capacity will vary significantly with the overall health of the aquifer. Periods of elevated aquifer levels will make additional groundwater available to the well, temporally increasing its overall yield. Experience with CS-9 shows that severe and prolonged droughts can reduce that well's overall capacity by more than 50 percent. Therefore, a conservative estimate for the CS-13 capacity to supply groundwater may range between 60 and 120 gpm (86,400 to 172,800 gpd), depending on the current environmental conditions.

This range of production exceeds the predetermined minimum threshold of 50 gpm, and the lack of organic/inorganic constituents above regulatory limits ensures that contamination would not be distributed in the event of a fire suppression event. At a minimum, this well is recommended as a fire suppression well for the East Pasture Test Firing Range.

5.3 Potential as Potable Water Supply Well

In 2008 (peak use in past five years), CSSA utilized an average of 1.24 million gallons per month, equating to an average continual demand of 28 gpm (41,000 gallons per day [gpd]). In 2008, the peak monthly usage occurred in May with an average daily usage of 60,000 gpd (41 gpm). Meanwhile, the lowest monthly usage occurred in November with an average of 24,000 gpd (16 gpm). Water usage is not linear, and the demand is cyclic based on the typical operational schedule of the CSSA mission, typically Monday through Friday (8 am to 5 pm). During peak activity, more than

100 gpm of sustained usage has been observed. However, after-hour usage is quite low and generally limited to usage by the residential section of the facility.

CSSA rarely requires continual groundwater production to meet the demands of the facility. Unless controlled manually by the operator, the CSSA wells normally run under automated control by the Supervisory Control and Data Acquisition (SCADA) system. Under SCADA control, the total operation of the existing supply wells typically runs six and 10 hours per day to satisfy the daily demand and maintain the Reservoir level at 95 percent capacity or greater. Hypothetically, continual groundwater production would only occur during emergencies, such as a water main break, fire suppression activities, or even extreme drought when there is depressed well yield.

Accordingly, the potential yield from CS-13 under favorable environmental / aquifer conditions is anticipated to be more than adequate to satisfy the current daily average demand of potable water. The 110 gpm pumping test indicated that CS-13 is more than capable to provide current 28 gpm average consumption currently utilized at CSSA if ever called upon as the sole source of groundwater production. Even though the production capacity of CS-13 may not be able to match the peak usage during working hours, the buffering capacity of the Reservoir will meet the short-term demands, and the system could recover during off-peak hours solely by the operation of CS-13.

Permitting the well for potable water supply allows the well to serve both as a drinking water source in addition to augmenting to fire flow throughout the facility, including the East Pasture.

5.4 Future Activities

For CS-13 to become a fully operational potable water source, the well must be permitted by the TCEQ. Per TCEQ Rules, CSSA must submit a complete Engineering Plans and Specifications Report for review and approval. This report must be signed and sealed by registered professional engineer in the State of Texas. At a minimum, the plans must include a hazard assessment; proof of land ownership and financial responsibility; and complete design drawings and engineering specifications for faculties, plumbing, disinfection, distribution, and control of the well. To the extent practical, design elements from CS-12 (approved in 2010) can be used.

CSSA should be prepared to demonstrate that CS-13 will not be threatened by known groundwater contamination at CSSA (chemical or microbial), nor will its use adversely affect the plume migration such that it poses a threat to other consumers. The TCEQ may impose restrictions on use, require additional monitoring, or even mandate precautionary treatment technologies for organic, inorganic, or biological contaminants.

CSSA could consider utilizing CS-13 for non-potable activities such as irrigation and construction activities. Routine operation of the well helps alleviate any potential for stagnation, fouling, or biological growth. Periodic monitoring for contamination should also occur. If there are signs of detrimental microbial populations, the well should immediately be disinfected.

APPENDIX A

WELL CONSTRUCTION DATA

STATE OF TEXAS WELL FORM
CEMENTATION AFFIDAVIT
WELL COMPLETION DIAGRAM

STATE OF TEXAS WELL REPORT for Tracking #288851

Owner:	**U.S. Government**	Owner Well #:	**CS-13**
Address:	**25800 Ralph Fair Road Boerne , TX 78015**	Grid #:	**68-20-4**
Well Location:	**25800 Ralph Fair Road Boerne , TX 78015**	Latitude:	**29° 41' 19" N**
Well County:	**Bexar**	Longitude:	**098° 36' 09" W**
Elevation:	**1191 ft.**	GPS Brand Used:	**Garmin**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Date:
Started: **2/14/2012**
Completed: **4/10/2012**

Diameter of Hole:
Diameter: **14.75 in From Surface To 300 ft**
Diameter: **9.875 in From 300 ft To 579 ft**

Drilling Method: **Air Rotary**

Borehole Completion: **Open Hole**

Annular Seal Data:
1st Interval: **From 0 ft to 300 ft with 161-Portland (#sacks and material)**
2nd Interval: **No Data**
3rd Interval: **No Data**
Method Used: **Tremie**
Cemented By: **Lee Gebbert**
Distance to Septic Field or other Concentrated Contamination: **No Data**
Distance to Property Line: **No Data**
Method of Verification: **No Data**
Approved by Variance: **No Data**

Surface Completion: **Surface Sleeve Installed**

Water Level:
Static level: **No Data**
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **Submersible**
Depth to pump bowl: **550 ft**

Well Tests: **Pump**
Yield: **110 GPM with 182.29 ft drawdown after 36 hours**

Water Quality: Type of Water: **Fresh**
Depth of Strata: **No Data**
Chemical Analysis Made: **No**
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **Geoprojects International, Inc.**
8834 Circle Drive
Austin , TX 78736

Driller License Number: **2525**

Licensed Well Driller Signature: **Lee Gebbert**

Registered Driller Apprentice Signature: **No Data**

Apprentice Registration Number: **No Data**

Comments: **No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #**288851**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 to 120 Upper Glenrose Formation
120 to 443 Lower Glenrose Formation
443 to 502 Bexar Shale Formation
502 to 577 Cow Creek Formation
577 to 579 Hammett Shale Formation

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
10.75 New Steel Welded Casing set from +4 to 300 with 0.25-inch wall thickness

GEOPROJECTS INTERNATIONAL Inc.
8834 Circle Drive • Austin, Texas 78736
Telephone (512) 288-3777 • Facsimile (512) 288-0908

CEMENTING AFFIDAVIT

Well # CS-13 was cemented by Geoprojects International, Inc. as follows:

Well # CS-13 at Camp Stanley Storage Activity is completed open-hole with 10-3/4-inch outside diameter Steel Casing set to 300-feet inside a 14-3/4-inch Ø hole. The casing/borehole annulus was cemented by positive displacement method.

The casing/borehole annulus was cemented on 4/3/09 using 161 sacks of Type I Portland Cement mixed at a ratio of 6.5 gallons of water per sack of cement.

L. F. Gebbert

Lee F. Gebbert, Driller, TDLR License Number 2525

BOREHOLE LOG

BOREHOLE NO.: **CS-13**

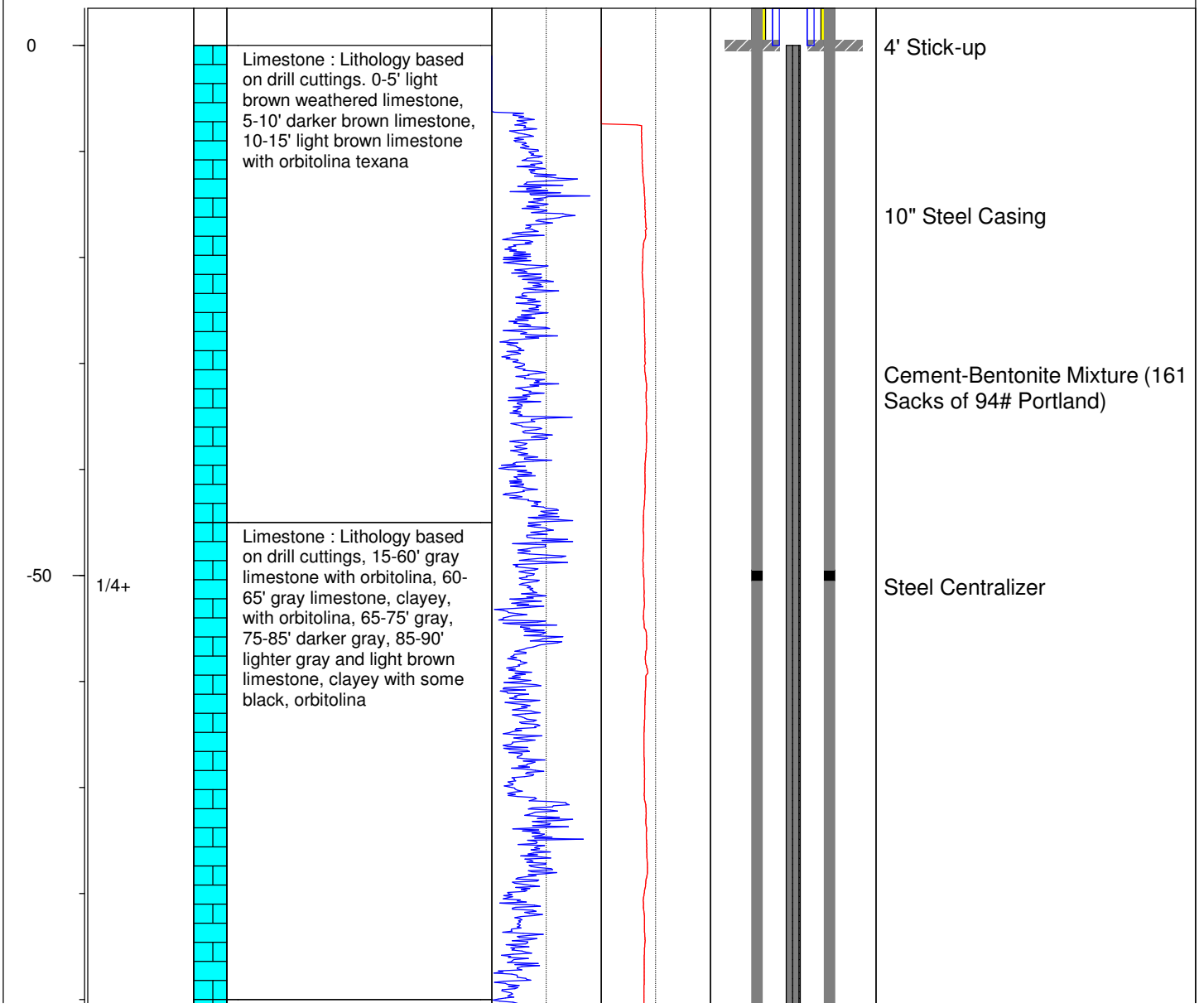
TOTAL DEPTH: **579.5 feet**

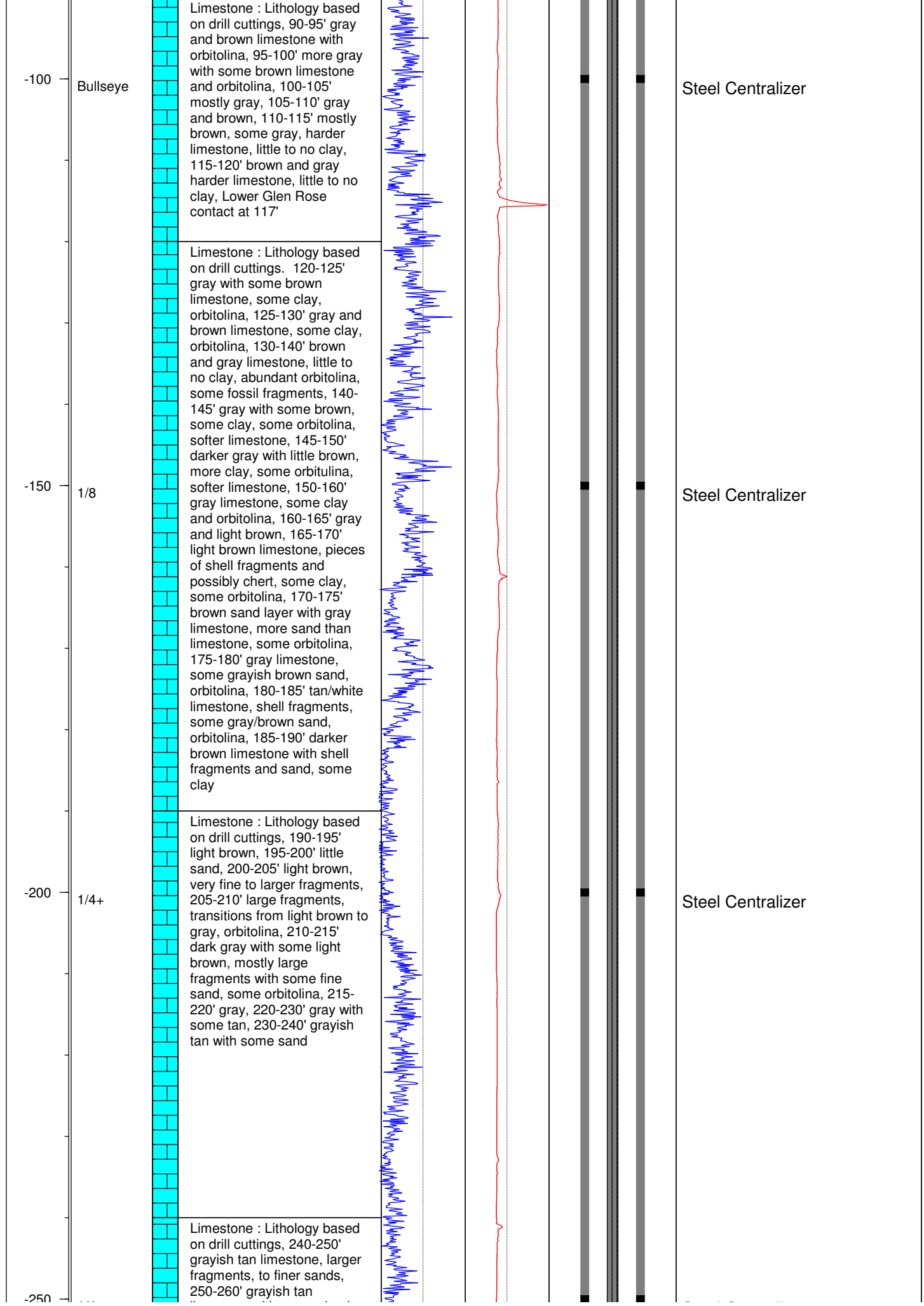
PARSONS

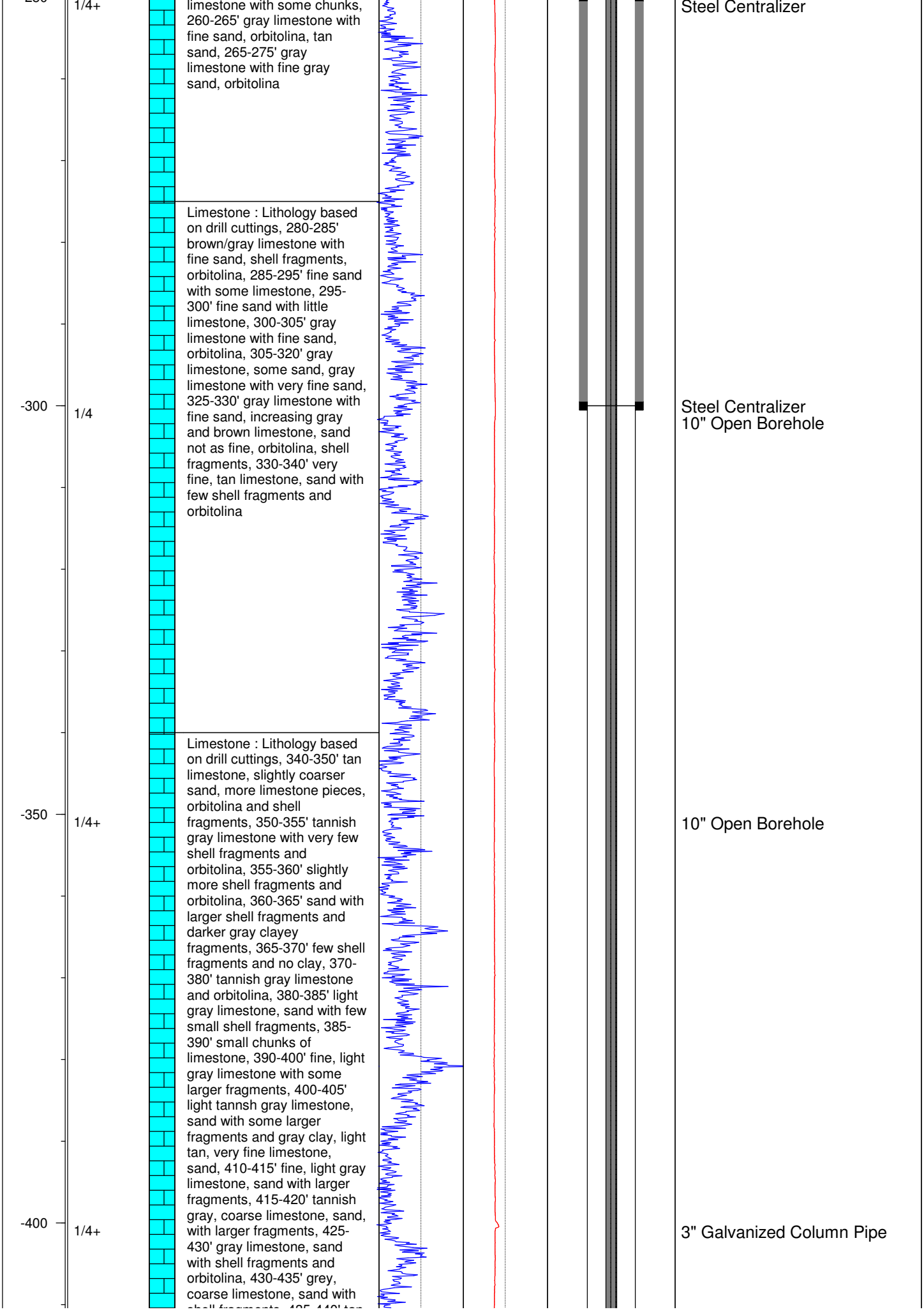
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**CSSA**	DRILLING COMPANY:	**GeoProjects Intl., Inc.**
SITE LOCATION:	**CSSA**	LEAD DRILLER:	**Lee Gebbert**
JOB NUMBER:	**748402.02000**	RIG TYPE:	**Gardner-Denver 1500**
LOGGING GEOLOGIST:	**Julie Bouch**	METHOD OF DRILLING:	**Air-Rotary**
PROJECT MANAGER:	**Scott Pearson**	SAMPLING METHOD:	**N/A**
DATES DRILLED:	**February-March 2012**	BORING DIAMETER	**14" to 300', 10" to 579.5'**

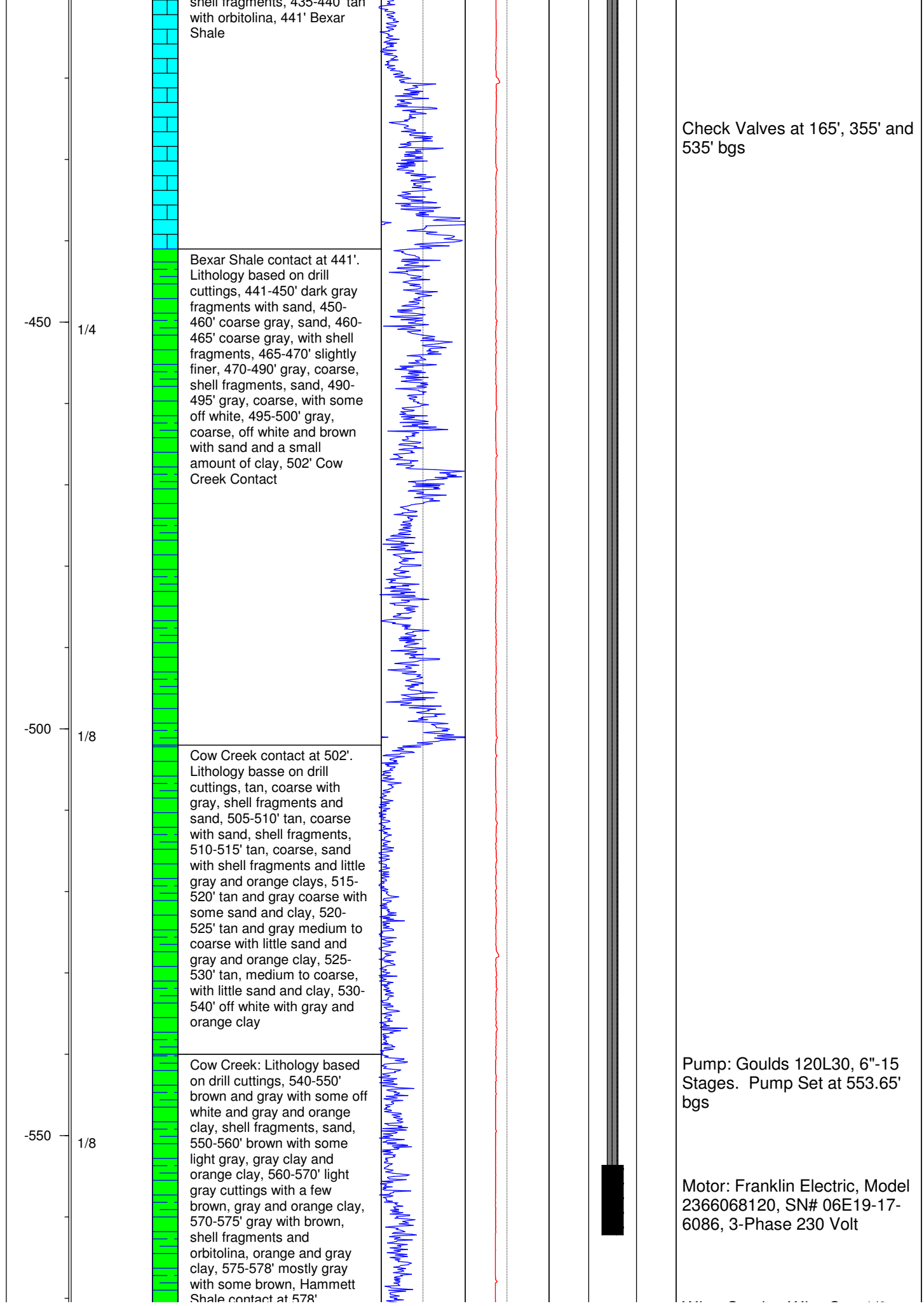
NOTES: Located in the East Pasture

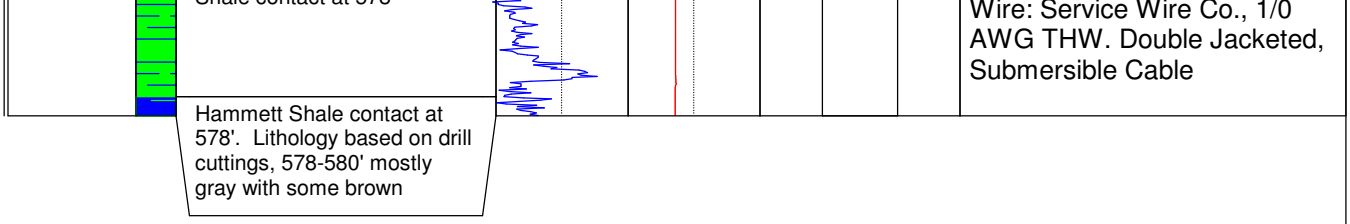
Depth (ft. bgs)	TOTCO Test (degrees)	Lithology	Description	Gamma	Caliper (Inches) 0 I--------I 22	Well Construction	Construction Material
0			Limestone : Lithology based on drill cuttings. 0-5' light brown weathered limestone, 5-10' darker brown limestone, 10-15' light brown limestone with orbitolina texana				4' Stick-up 10" Steel Casing Cement-Bentonite Mixture (161 Sacks of 94# Portland)
-50	1/4+		Limestone : Lithology based on drill cuttings, 15-60' gray limestone with orbitolina, 60-65' gray limestone, clayey, with orbitolina, 65-75' gray, 75-85' darker gray, 85-90' lighter gray and light brown limestone, clayey with some black, orbitolina				Steel Centralizer




-100
-150
-200
-250
Bullseye
1/8
1/4+
Limestone : Lithology based on drill cuttings, 90-95' gray and brown limestone with orbitolina, 95-100' more gray with some brown limestone and orbitolina, 100-105' mostly gray, 105-110' gray and brown, 110-115' mostly brown, some gray, harder limestone, little to no clay, 115-120' brown and gray harder limestone, little to no clay, Lower Glen Rose contact at 117'
Limestone : Lithology based on drill cuttings. 120-125' gray with some brown limestone, some clay, orbitolina, 125-130' gray and brown limestone, some clay, orbitolina, 130-140' brown and gray limestone, little to no clay, abundant orbitolina, some fossil fragments, 140-145' gray with some brown, some clay, some orbitolina, softer limestone, 145-150' darker gray with little brown, more clay, some orbitulina, softer limestone, 150-160' gray limestone, some clay and orbitolina, 160-165' gray and light brown, 165-170' light brown limestone, pieces of shell fragments and possibly chert, some clay, some orbitolina, 170-175' brown sand layer with gray limestone, more sand than limestone, some orbitolina, 175-180' gray limestone, some grayish brown sand, orbitolina, 180-185' tan/white limestone, shell fragments, some gray/brown sand, orbitolina, 185-190' darker brown limestone with shell fragments and sand, some clay
Limestone : Lithology based on drill cuttings, 190-195' light brown, 195-200' little sand, 200-205' light brown, very fine to larger fragments, 205-210' large fragments, transitions from light brown to gray, orbitolina, 210-215' dark gray with some light brown, mostly large fragments with some fine sand, some orbitolina, 215-220' gray, 220-230' gray with some tan, 230-240' grayish tan with some sand
Limestone : Lithology based on drill cuttings, 240-250' grayish tan limestone, larger fragments, to finer sands, 250-260' grayish tan
Steel Centralizer
Steel Centralizer
Steel Centralizer


-300
-350
-400
1/4+
1/4
1/4+
1/4+
limestone with some chunks, 260-265' gray limestone with fine sand, orbitolina, tan sand, 265-275' gray limestone with fine gray sand, orbitolina
Limestone : Lithology based on drill cuttings, 280-285' brown/gray limestone with fine sand, shell fragments, orbitolina, 285-295' fine sand with some limestone, 295-300' fine sand with little limestone, 300-305' gray limestone with fine sand, orbitolina, 305-320' gray limestone, some sand, gray limestone with very fine sand, 325-330' gray limestone with fine sand, increasing gray and brown limestone, sand not as fine, orbitolina, shell fragments, 330-340' very fine, tan limestone, sand with few shell fragments and orbitolina
Limestone : Lithology based on drill cuttings, 340-350' tan limestone, slightly coarser sand, more limestone pieces, orbitolina and shell fragments, 350-355' tannish gray limestone with very few shell fragments and orbitolina, 355-360' slightly more shell fragments and orbitolina, 360-365' sand with larger shell fragments and darker gray clayey fragments, 365-370' few shell fragments and no clay, 370-380' tannish gray limestone and orbitolina, 380-385' light gray limestone, sand with few small shell fragments, 385-390' small chunks of limestone, 390-400' fine, light gray limestone with some larger fragments, 400-405' light tannsh gray limestone, sand with some larger fragments and gray clay, light tan, very fine limestone, sand, 410-415' fine, light gray limestone, sand with larger fragments, 415-420' tannish gray, coarse limestone, sand, with larger fragments, 425-430' gray limestone, sand with shell fragments and orbitolina, 430-435' grey, coarse limestone, sand with
Steel Centralizer
Steel Centralizer
10" Open Borehole
10" Open Borehole
3" Galvanized Column Pipe


shell fragments, 435-440' tan with orbitolina, 441' Bexar Shale
Bexar Shale contact at 441'. Lithology based on drill cuttings, 441-450' dark gray fragments with sand, 450-460' coarse gray, sand, 460-465' coarse gray, with shell fragments, 465-470' slightly finer, 470-490' gray, coarse, shell fragments, sand, 490-495' gray, coarse, with some off white, 495-500' gray, coarse, off white and brown with sand and a small amount of clay, 502' Cow Creek Contact
Cow Creek contact at 502'. Lithology basse on drill cuttings, tan, coarse with gray, shell fragments and sand, 505-510' tan, coarse with sand, shell fragments, 510-515' tan, coarse, sand with shell fragments and little gray and orange clays, 515-520' tan and gray coarse with some sand and clay, 520-525' tan and gray medium to coarse with little sand and gray and orange clay, 525-530' tan, medium to coarse, with little sand and clay, 530-540' off white with gray and orange clay
Cow Creek: Lithology based on drill cuttings, 540-550' brown and gray with some off white and gray and orange clay, shell fragments, sand, 550-560' brown with some light gray, gray clay and orange clay, 560-570' light gray cuttings with a few brown, gray and orange clay, 570-575' gray with brown, shell fragments and orbitolina, orange and gray clay, 575-578' mostly gray with some brown, Hammett Shale contact at 578'
-450
1/4
-500
1/8
-550
1/8
Check Valves at 165', 355' and 535' bgs
Pump: Goulds 120L30, 6"-15 Stages. Pump Set at 553.65' bgs
Motor: Franklin Electric, Model 2366068120, SN# 06E19-17-6086, 3-Phase 230 Volt



Hammett Shale contact at 578'. Lithology based on drill cuttings, 578-580' mostly gray with some brown

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID CS-13
SHEET 1 of 1

PROJECT NAME: CS-13 PROJECT NO.: 748402.02000 DATE: 5.2.12

LOCATION: CSA / East Pasture DATE INSTALLED: April 2012

TOTAL DEPTH (FTOC) 578' CASING DIAMETER 14

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☒ Pumping ☐ Describe

Equipment decontaminated prior to development ☒ Yes ☐ NO

Describe Alconox / H2O

EQUIPMENT NUMBERS:

pH Meter YSI 556 EC Meter YSI 556 Turbidity Meter HACH 2100Q Thermometer YSI 556

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0	10.0	14.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6	4.08	8.0

PURGING INFORMATION:

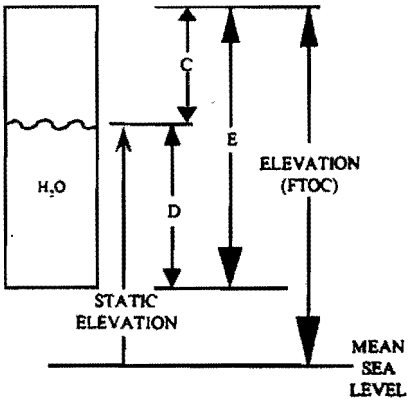
Measured Well Depth (B) 578 ft.

Measured Water Level Depth (C) 206.67 ft.

Length of Static Water Column (D) 578 (B) - 206.67 (C) = 371.33 ft.

Casing Water Volume (E) = 4.08 (A) x 371.33 (D) = 1,515 gal

Total Purge Volume = 157,000 (gal)
(6,185)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	Specific Cond. ~~EC~~	Temperature F or C	Turbidity/ Sand (ppm)	Comments
5.2.12	1454	263.50		7.18	0.476	25.38	1.21	DO: 1.72 ORP: 99.3
5.2.12	1510	304.06		7.18	0.466	24.80	3.70	DO: 2.91 ORP: 98.9
5.2.12	1521	304.68		7.11	0.462	24.63	2.49	DO: 1.98 ORP: 96.6
5.2.12	1530	348.50		7.13	0.461	24.47	2.44	DO: 2.64 ORP: 97.5
			*6,185					

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID CS-13
SHEET 1 of 1

PROJECT NAME: CS-13 PROJECT NO.: 748402.02000 DATE: 5.2.12

LOCATION: CSSA | East Pasture DATE INSTALLED: April 2012

TOTAL DEPTH (FTOC) 578' CASING DIAMETER 4"

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☒ Pumping ☐ Describe

Equipment decontaminated prior to development ☒ Yes ☐ NO

Describe Alconox / H2O

EQUIPMENT NUMBERS:

pH Meter YSI 556 Specific Cond (EC) Meter YSI 556 Turbidity Meter HACH 2100Q Thermometer YSI 556

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0	10.0	14.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6	4.08	8.01

PURGING INFORMATION:

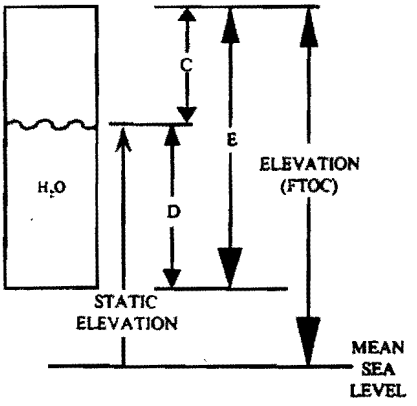
Measured Well Depth (B) 578 ft.

Measured Water Level Depth (C) 217.34 ft.

Length of Static Water Column (D) 578 (B) - 217.34 (C) = 360.66 ft.

Casing Water Volume (E) = 4.08 (A) x 360.66 (D) = 1,471 gal

Total Purge Volume = 7,845 (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	Specific Cond (EC)	Temperature F or (C)	Turbidity/ Sand (ppm)	Comments
5.2.12	0619	295.47		7.06	6.69	21.9	2.89	
5.2.12	631	302.79		6.90	647	22.0	8.12	
5.2.12	641	312.11		6.93	642	22.0	9.05	
5.2.12	650	315.37		6.95	640	22.3	6.18	
5.2.12	0700	318.32		6.87	654	22.3	3.28	
5.2.12	0710	321.00		6.72	644	22.2	1.84	
5.2.12	0722	322.04		6.83	655	22.1	1.55	
			*7845					

AFCEE FORM WD.11

APPENDIX B

GEOPHYSICAL LOGGING

GEO CAM GEOPHYSICAL LOG AND DVD
USGS GEOPHYSICAL MONTAGE AND DVD

GEO CAM

Water Well Logging & Video Recording Services

Geo Cam, Inc. 126 Palo Duro, San Antonio, TX 210-495-9121

Borehole: C-13

Logs: GAMMA, SP, RESISTIVITY, CALIPER

Project: CAMP STANLEY
Client: **GEOPROJECTS INT.**
Location: N 29* 41' 18.7", W 98* 36' 09.1"

Date: 03-02-12
County: BEXAR
State: TX

BOREHOLE DATA

Drilling Contractor: GPI
Elevation: 1,158FT GPS
Depth Ref: G.L.

Driller T.D. (ft) : 458'
Logger T.D. (ft) : 457.5'
Date Drilled: 02-29-12

BIT RECORD				CASING RECORD		
RUN	BIT SIZE (in)	FROM (ft)	TO (ft)	SIZE/WGT/THK	FROM (ft)	TO (ft)
1	7 7/8"	0'	458'	OPEN		
2						
3						

Drill Method:
Hole Medium:
Viscosity:

Weight:
Mud Type:
Rm: at: Deg C

Fluid Level (ft) : 189'
Time Since Circ: NA

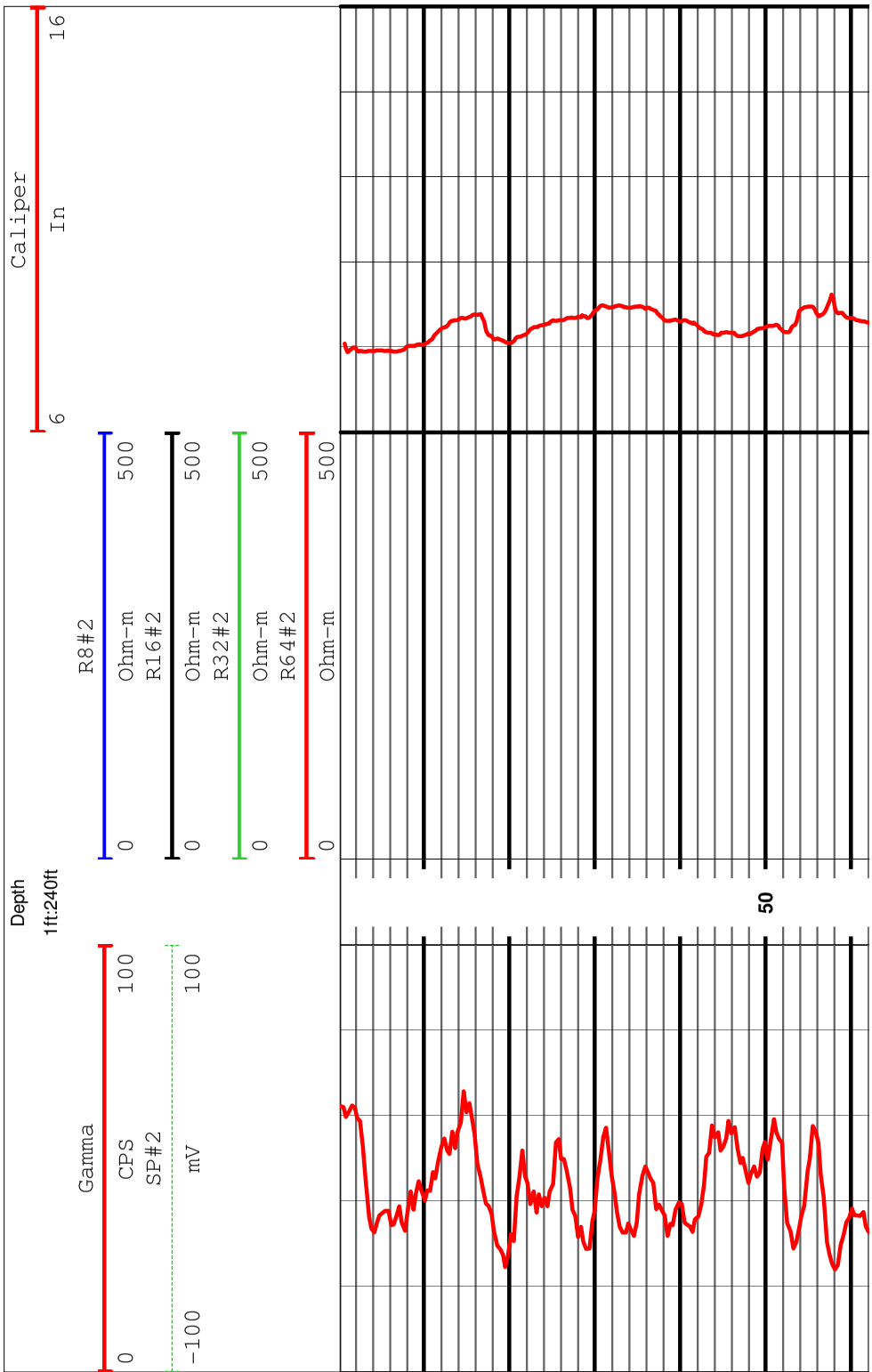
GENERAL DATA

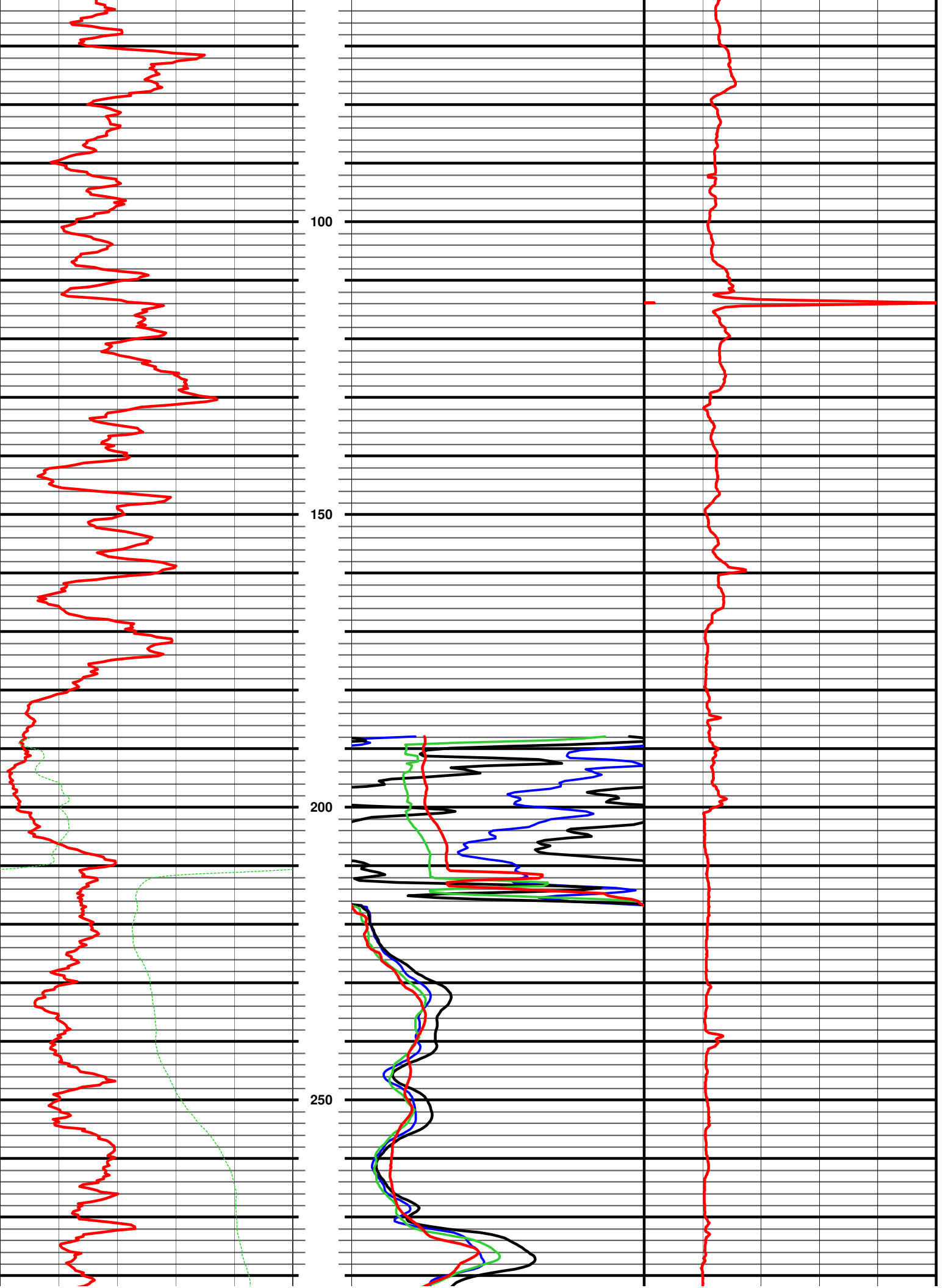
Logged by: Michael G. Miller
Witness: LEE GABARD

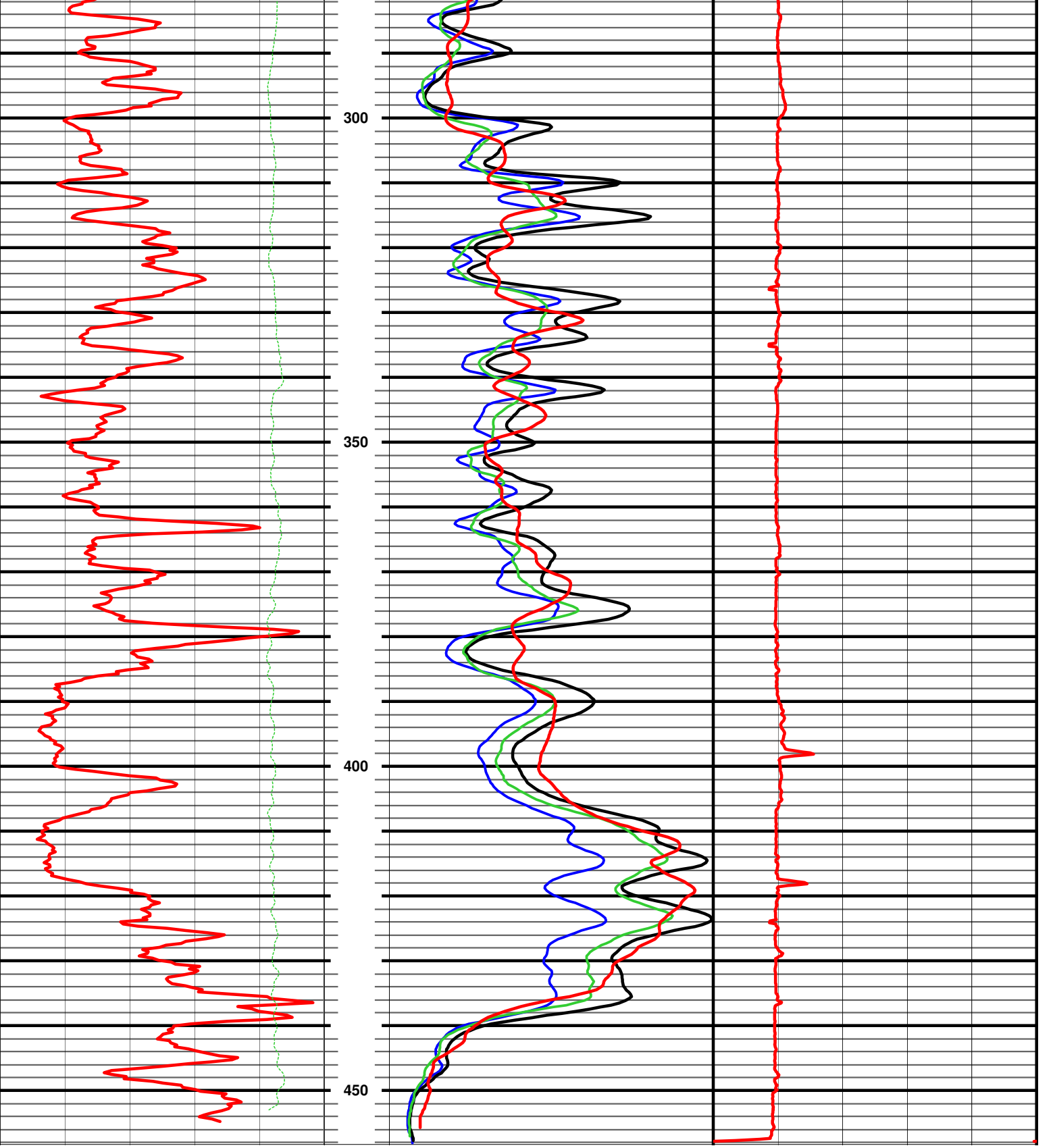
Unit/Truck: 03

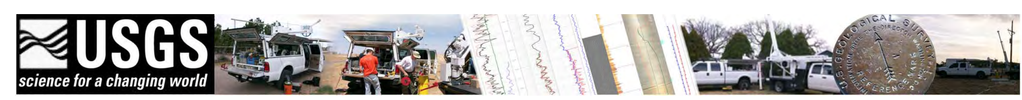
LOG TYPE	RUN NO	SPEED (ft/min)	FROM (ft)	TO (ft)	FT./ IN.
GAMMA	2	25'	453'	188'	20
SP, RESISTIVITY	2	25'	458'	2'	20
CALIPER	1	30'	457'	8'	20

Comments:

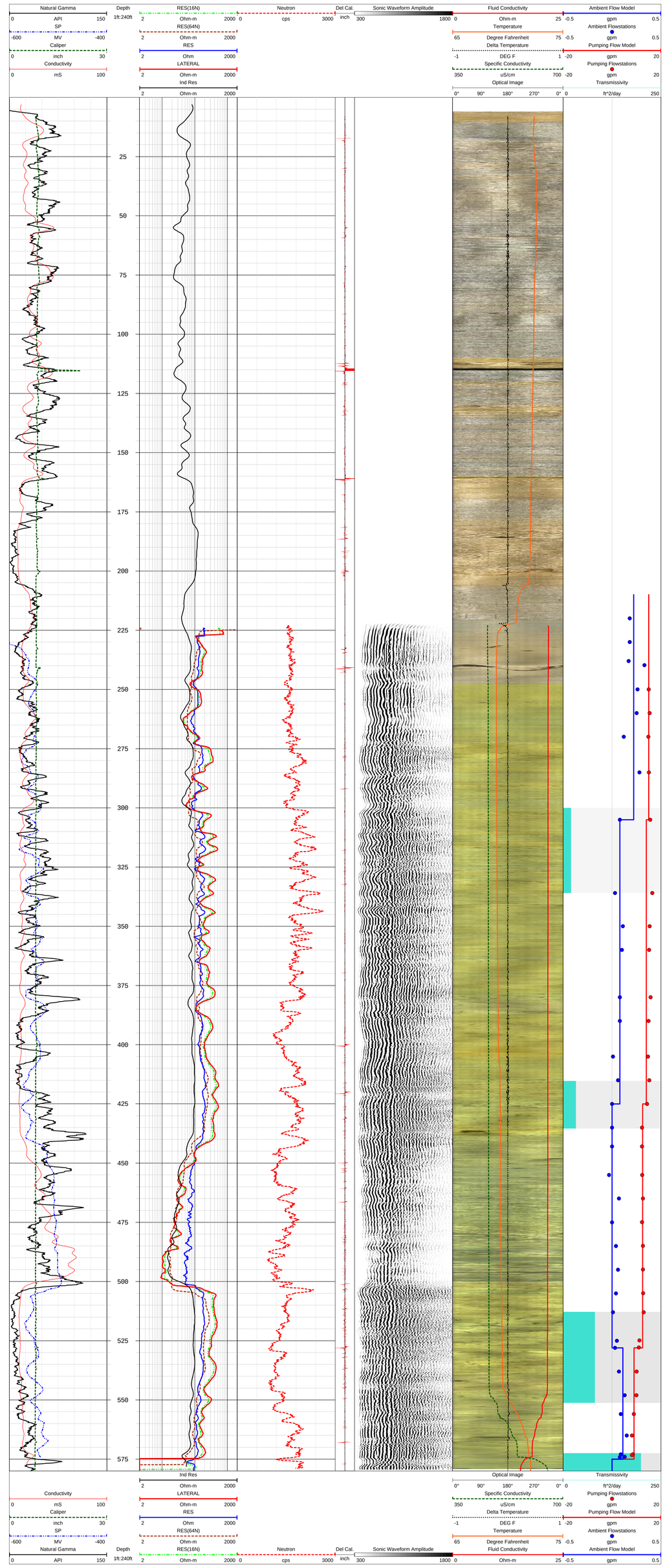



100
150
200
250


300
350
400
450



Well Name CS-13 Date of Logging 03-08-2012 County Bexar State TX Cooperator Camp Stanley - CSSA



FLASH - Flow Log Analysis of Single Holes

USGS science for a changing world

REQUIRED INPUT:

Wellname: **Camp Stanley - CSSA - CS-11**

Elevation of measuring point [FT]	1214
Number of flow zones [-]	4
Well diameter [IN]	8
Drawdown [FT]	9.08
Depth to ambient water level [FT]	204.6
Depth at bottom of casing [FT]	0.8
Depth at bottom of well [FT]	580
Radius of influence (R_0) [FT]	255.6
Total transmissivity (T_{total}) [FT²/day]	331.26

Run Solver

- ○ Estimate Transmissivity
- ◉ Estimate ROI

- ○ Solve without Regularization
- ◉ Solve with Regularization

ABS(Δh) maximum	5.00E-08
Regularization weight	1.00E-06
Tfactor minimum [-]	1.00E-09

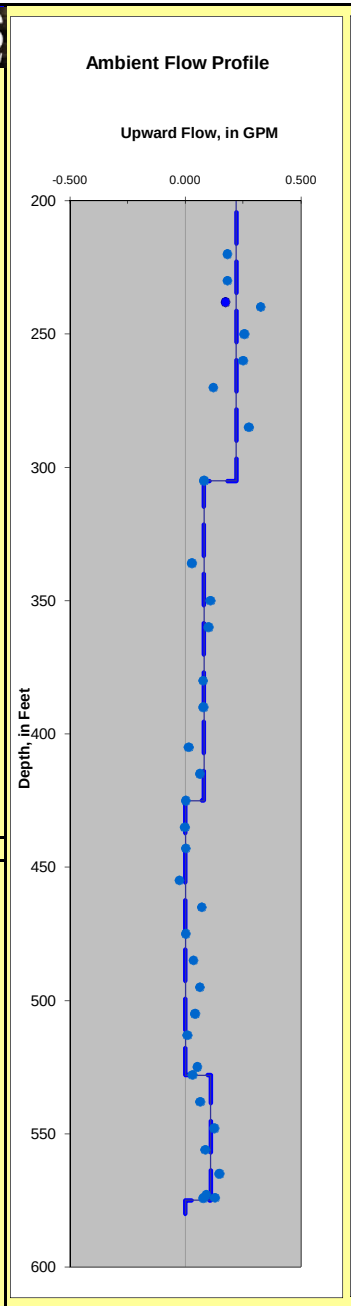
Flow above layer bottom depths

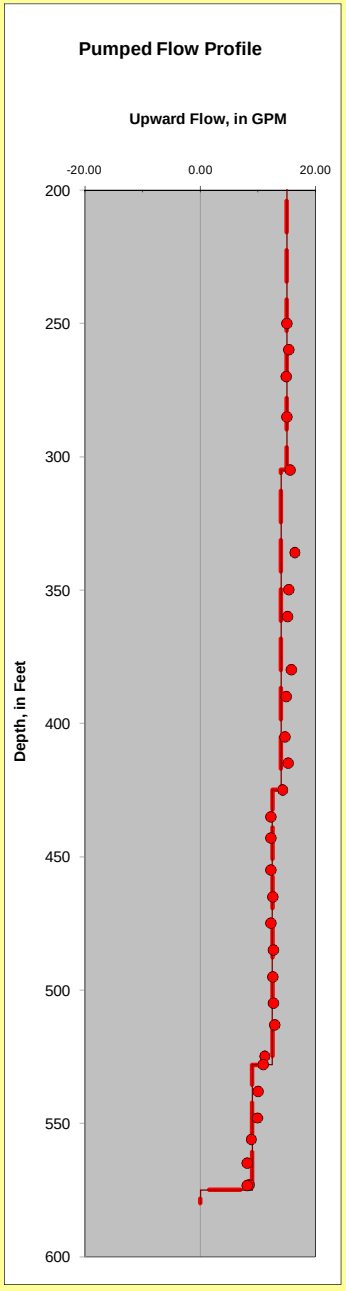
FRACTURES	Bottom Depth [FT]	Ambient [GPM]	Stressed [GPM]	Tfactor [FT²/D]	Δh [FT]	Farfield head [FT]
4	305.00	0.22	15.00	0.06	1.47	1010.87
3	425.00	0.08	14.00	0.10	0.51	1009.91
2	528.00	0.00	12.50	0.24	-0.28	1009.12
1	575.00	0.11	9.00	0.60	0.11	1009.51

SIMULATED PROFILES (DO NOT EDIT)

MSE [GPM²]	0.000	Sum T_{factor}	1.000	Sum Δh^2	2.53
Ambient WL [FT]	1009.40	Estimated Ttotal [FT²/day]	331.257	Regularized Misfit	0.00
Pumped WL [FT]	1000.32				

FRACTURES:	Depth [FT]	Ambient Flow above [GPM]	Stressed Flow above [GPM]	Ambient Error [GPM]	Stressed Error [GPM]	Zone T [FT²/day]	Fraction of total transmissivity
4	305.00	0.220	15.000	0.000	0.000	19.282	0.058
3	425.00	0.080	14.000	0.000	0.000	31.823	0.096
2	528.00	0.000	12.500	0.000	0.000	80.908	0.244
1	575.00	0.110	9.000	0.000	0.000	199.244	0.601



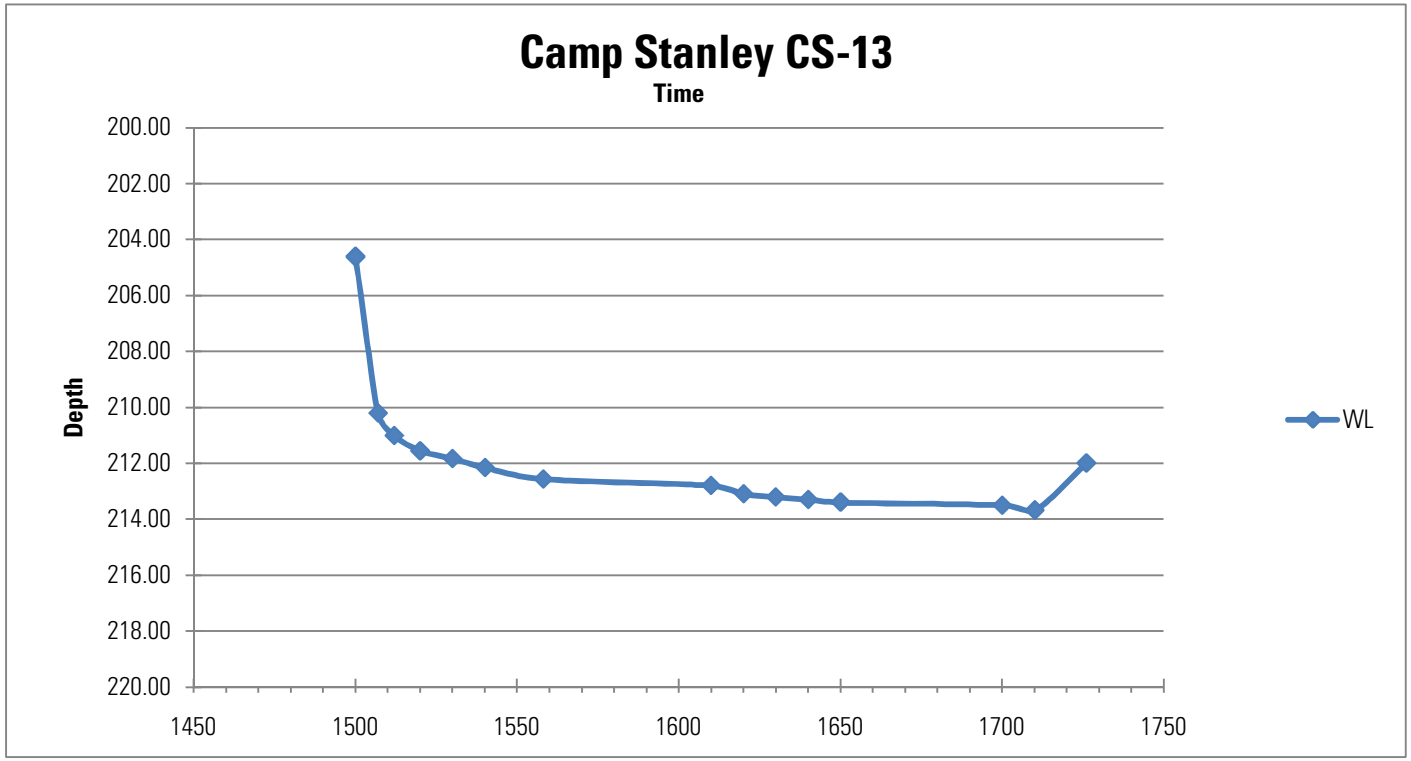


Dashed lines indicate interpretations of measured data. Solid lines indicate simulated profiles.

Notes:

Time (hhmm)	Pump Rate (gpm	WL (feet below LSD)
1500	0	204.60
1507	15	210.20
1512	15	211.00
1520	15	211.55
1530	15	211.83
1540	15	212.15
1558	15	212.56
1610	15	212.80
1620	15	213.10
1630	15	213.20
1640	15	213.30
1650	15	213.40
1700	15	213.50
1710	15	213.68
1726	0	212.00

MP	=	1.20	feet above LSD
Ambient WL	=	204.60	feet below LSD
Drawdown	=	9.08	feet
Pump Rate	=	15.00	gpm
SP Capacity	=	1.65	gpm / ft
Transmissivity	=	2,477.97	gallon / day / ft
Transmissivity	=	331.26	ft^2 / day



APPENDIX C

PUMPING TEST DATA

TW-1
CS-1
CS-MW17-LGR
CS-MW21-LGR
CS-MW22-LGR

Stick up Above G.L. = 6.6'

Pump Depth 571' -

STEP TEST

TW-2 (CS-13 Test Well) Pumping Test

WELL TW2(CS-13) **Groundwater Level Measurements**

Date	Time	E-Line DTW (ft BTOC)	Level Troll DTW (ft BTOC)	Pumping Well Flow Rate (GPM)	Free Cl⁻ (PPM)	Initials	Notes
3-13-12	1720	206.67	206.67			SP	135265 gall totalizer @ EZ O
	1745	206.67	206.67	29.5			
	1750	218.88		29.7			
	1755	221.06		28.5			
	1800	222.22		28.0			
	1805	223.48		30.0			
	1810	224.43		30.5			
	1815	225.04		30.0			
	1825	225.85		30.0			
	1835	226.40		30.0			
	1845	226.92		30.0			1353830 gall totalizer
	1850	214.04		Ø			
	1855	212.01		Ø			
	1905	210.37		Ø			
	1915	209.51		Ø			
	1925	208.95		Ø			
	1930	208.78		50Ø			
	1935	232.50		49.0			
	1940	236.35		48.5			
	1945	240.52		51.5			
	1950	242.34		52.0			
	1955	243.63		52.0			
	2000	244.65		52.0			

Step1 D.D. 1353830 gals. Q=30 gpm

Step 1 Recovery

Step2 D.D

TW-2 (CS-13 Test Well) Pumping Test

WELL TW-2(CS-13) **Groundwater Level Measurements**

	Date	Time	E-Line DTW (ft BTOC)	Level Troll DTW (ft BTOC)	Pumping Well Flow Rate (GPM)	Free Cl (PPM)	Initials	Notes
	3-13-12	2010	245.94		52.0			
Step 2 DD cont.		2020	247.16		51.5			
		2030	248.11		51.5			1357990 gal. totalizer
Step2 Recovery		2035	222.34		0			
		2040	218.26		0			
		2045	215.32		0			
		2050	215.12		0			
		2100	213.62		0			
		2110	212.61		0			
		2120	211.97		0			
		2130	211.48	211.43	103.0			
		2135	258.50		80.0			
Step 3 DD		2140	265.90		86.0			
		2145	276.90		90.0			
		2150	281.24		92.0			
		2155	285.04		90.0			
		2200	287.57		90.0			
		2210	290.77		90.0			
		2220	294.94		91.0			
		2230	297.0		91			1362470 gall total
Step 4 DD		2231			117.0			
		2235	316.82		121.0			
		2240	326.16		119.0			

TW-2 (CS-13 Test Well) Pumping Test

WELL TW2 (CS-13) **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl⁻ *(PPM)*	Initials	Notes
3-13-12	2245	330.50		120.0			
↓	2250	334.47		121.0			
↓	2255	337.19		120.0			
↓	2300	339.24		121.0			totalizer = 1365959

Report Date: 5/16/2012 5:55:53 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:
File Name: TW2 STEP TEST 2012-03-13 23.01.04.wsl
Create Date: 3/13/2012 11:00:40 PM

Device Properties:
Device: Level TROLL 700
Site: TW2
Device Name:
Serial Number: 170526
Firmware Version: 2.08
Hardware Version:
Device Address:
Device Comm Cfg:
Used Memory(%):
Used Battery(%):

Log Configuration
Log Name: TW2 STEP TEST
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.4.2.0
Create Date: 3/13/2012 5:26:05 PM Central Standard Time (Ignore DST)
Log Setup Time Zone: Unknown
Notes Size(bytes): 4096
Overwrite when full: Disabled
Scheduled Start Time: Manual Start
Scheduled Stop Time: No Stop Time
Type: True Logarithmic
Max Interval: Days: 0 hrs: 00 mins: 05 secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 206.67 (ft)
Level Reference Head Pressure: 150.45 (PSI)

Other Log Settings
Depth of Probe: 347.39 (ft)
Head Pressure: 150.453 (PSI)
Temperature: 22.8171 (C)

Log Notes:

Date and Time	Note
3/13/2012 5:26:11 PM	User Note: "Level reference initialized to: 206.67"
3/13/2012 5:44:46 PM	Manual Start Command
3/13/2012 6:44:56 PM	Restart Command
3/13/2012 7:29:37 PM	Restart Command
3/13/2012 7:29:51 PM	Restart Command
3/13/2012 8:29:46 PM	Restart Command
3/13/2012 9:29:49 PM	Restart Command
3/13/2012 10:30:47 PM	Restart Command
3/13/2012 10:30:59 PM	Restart Command
3/13/2012 11:00:28 PM	Manual Stop Command

Log Data:

Record Count: 872

Sensors: 1 170526 Pressure/Temp 300 PSIG (211m/692ft)

1 - 170526: Pressure/Temp 300 PSIG (211m/692ft)

Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 692ft SN#: 170526 Pressure (PSI)	Sensor: Pres(G) 692ft SN#: 170526 Temperature (C)	Sensor: Pres(G) 692ft SN#: 170526 Level Depth To Water (ft)
3/13/2012 17:44	0	150.678	22.649	206.145
3/13/2012 17:44	0.251	146.29	22.66	216.275
3/13/2012 17:44	0.5	148.033	22.684	212.252
3/13/2012 17:44	0.751	144.517	22.694	220.369
3/13/2012 17:44	1.001	153.129	22.7	200.485
3/13/2012 17:44	1.251	154.848	22.71	196.516
3/13/2012 17:44	1.501	151.642	22.71	203.919
3/13/2012 17:44	1.751	151.243	22.716	204.84
3/13/2012 17:44	2.001	151.175	22.721	204.996
3/13/2012 17:44	2.251	150.884	22.725	205.669
3/13/2012 17:44	2.501	150.496	22.728	206.563
3/13/2012 17:44	2.751	150.49	22.73	206.579
3/13/2012 17:44	3.001	150.394	22.73	206.8
3/13/2012 17:44	3.251	150.421	22.734	206.737
3/13/2012 17:44	3.501	150.265	22.736	207.097
3/13/2012 17:44	3.751	150.268	22.736	207.089
3/13/2012 17:44	4.001	150.252	22.74	207.126
3/13/2012 17:44	4.251	150.301	22.738	207.014
3/13/2012 17:44	4.501	150.223	22.743	207.195
3/13/2012 17:44	4.751	150.23	22.741	207.179
3/13/2012 17:44	5.001	150.116	22.743	207.442
3/13/2012 17:44	5.251	150.186	22.744	207.28
3/13/2012 17:44	5.501	150.189	22.743	207.272
3/13/2012 17:44	5.751	150.231	22.743	207.176
3/13/2012 17:44	6.001	150.245	22.748	207.143
3/13/2012 17:44	6.361	150.126	22.739	207.417
3/13/2012 17:44	6.721	150.067	22.734	207.554

3/13/2012 17:44	7.141	149.975	22.729	207.766
3/13/2012 17:44	7.561	150.085	22.723	207.512
3/13/2012 17:44	7.981	149.984	22.724	207.745
3/13/2012 17:44	8.461	149.933	22.717	207.864
3/13/2012 17:44	9.001	149.912	22.712	207.911
3/13/2012 17:44	9.481	149.943	22.713	207.84
3/13/2012 17:44	10.08	149.863	22.708	208.025
3/13/2012 17:44	10.68	149.849	22.705	208.058
3/13/2012 17:44	11.28	149.801	22.704	208.17
3/13/2012 17:44	11.94	149.786	22.7	208.203
3/13/2012 17:44	12.66	149.695	22.7	208.412
3/13/2012 17:45	13.44	149.697	22.695	208.409
3/13/2012 17:45	14.22	149.603	22.698	208.626
3/13/2012 17:45	15.061	149.61	22.693	208.609
3/13/2012 17:45	15.961	149.448	22.693	208.983
3/13/2012 17:45	16.92	149.414	22.693	209.062
3/13/2012 17:45	17.88	149.431	22.69	209.023
3/13/2012 17:45	18.961	149.327	22.689	209.263
3/13/2012 17:45	20.101	149.305	22.685	209.313
3/13/2012 17:45	21.301	149.253	22.682	209.434
3/13/2012 17:45	22.561	149.137	22.685	209.701
3/13/2012 17:45	23.88	149.154	22.684	209.662
3/13/2012 17:45	25.321	149.022	22.68	209.968
3/13/2012 17:45	26.821	149.025	22.678	209.96
3/13/2012 17:45	28.38	148.974	22.675	210.078
3/13/2012 17:45	30.061	148.882	22.676	210.29
3/13/2012 17:45	31.86	148.669	22.674	210.781
3/13/2012 17:45	33.721	148.676	22.671	210.765
3/13/2012 17:45	35.761	148.565	22.67	211.022
3/13/2012 17:45	37.86	148.585	22.671	210.975
3/13/2012 17:45	40.08	148.46	22.666	211.265
3/13/2012 17:45	42.481	148.366	22.666	211.482
3/13/2012 17:45	45	148.468	22.663	211.246
3/13/2012 17:45	47.64	148.241	22.658	211.771
3/13/2012 17:45	50.461	148.248	22.656	211.754
3/13/2012 17:45	53.461	148.036	22.654	212.244
3/13/2012 17:45	56.64	147.957	22.652	212.426
3/13/2012 17:45	60	147.929	22.649	212.49
3/13/2012 17:45	63.6	147.752	22.641	212.9
3/13/2012 17:45	67.2	147.704	22.638	213.01
3/13/2012 17:45	71.4	147.684	22.632	213.058
3/13/2012 17:46	75.6	147.569	22.629	213.322
3/13/2012 17:46	79.8	147.444	22.627	213.61
3/13/2012 17:46	84.6	147.382	22.62	213.755
3/13/2012 17:46	90	147.275	22.612	214
3/13/2012 17:46	94.8	147.211	22.605	214.148
3/13/2012 17:46	100.8	147.108	22.602	214.386
3/13/2012 17:46	106.8	146.914	22.594	214.834
3/13/2012 17:46	112.8	146.802	22.583	215.094
3/13/2012 17:46	119.4	146.76	22.578	215.19
3/13/2012 17:46	126.6	146.652	22.569	215.44
3/13/2012 17:47	134.4	146.502	22.56	215.785
3/13/2012 17:47	142.2	146.48	22.549	215.837
3/13/2012 17:47	150.6	146.374	22.54	216.082

3/13/2012 17:47	159.6	146.294	22.529	216.266
3/13/2012 17:47	169.2	146.236	22.519	216.401
3/13/2012 17:47	178.8	146.062	22.506	216.802
3/13/2012 17:47	189.6	145.976	22.493	217
3/13/2012 17:48	201	145.913	22.483	217.145
3/13/2012 17:48	213	145.803	22.467	217.4
3/13/2012 17:48	225.6	145.748	22.458	217.527
3/13/2012 17:48	238.8	145.57	22.443	217.938
3/13/2012 17:48	253.2	145.462	22.436	218.188
3/13/2012 17:49	268.2	145.464	22.425	218.183
3/13/2012 17:49	283.8	145.425	22.417	218.273
3/13/2012 17:49	300.6	145.274	22.412	218.622
3/13/2012 17:50	318.6	145.192	22.407	218.81
3/13/2012 17:50	337.2	145.166	22.404	218.871
3/13/2012 17:50	357.6	144.983	22.41	219.293
3/13/2012 17:51	378.6	144.9	22.413	219.484
3/13/2012 17:51	400.8	144.863	22.417	219.57
3/13/2012 17:51	424.8	144.802	22.426	219.711
3/13/2012 17:52	450	144.625	22.431	220.121
3/13/2012 17:52	476.4	144.588	22.442	220.206
3/13/2012 17:53	504.6	144.522	22.454	220.357
3/13/2012 17:53	534.6	144.414	22.47	220.606
3/13/2012 17:54	566.4	144.358	22.486	220.737
3/13/2012 17:54	600	144.409	22.501	220.618
3/13/2012 17:55	636	144.166	22.523	221.18
3/13/2012 17:55	672	144.236	22.537	221.017
3/13/2012 17:56	714	144.05	22.561	221.447
3/13/2012 17:57	756	144.029	22.578	221.496
3/13/2012 17:58	798	144.006	22.6	221.55
3/13/2012 17:58	846	143.861	22.618	221.884
3/13/2012 17:59	900	143.783	22.641	222.064
3/13/2012 18:00	948	143.737	22.66	222.17
3/13/2012 18:01	1008	143.733	22.682	222.179
3/13/2012 18:02	1068	143.667	22.701	222.331
3/13/2012 18:03	1128	143.407	22.721	222.931
3/13/2012 18:04	1194	143.289	22.744	223.204
3/13/2012 18:05	1266	143.169	22.761	223.481
3/13/2012 18:07	1344	143.15	22.774	223.527
3/13/2012 18:08	1422	142.988	22.789	223.9
3/13/2012 18:09	1506	142.725	22.804	224.507
3/13/2012 18:11	1596	142.696	22.821	224.574
3/13/2012 18:12	1692	142.638	22.839	224.708
3/13/2012 18:14	1788	142.62	22.853	224.749
3/13/2012 18:16	1896	142.652	22.865	224.676
3/13/2012 18:18	2010	142.47	22.88	225.095
3/13/2012 18:20	2130	142.41	22.89	225.233
3/13/2012 18:22	2256	142.193	22.907	225.736
3/13/2012 18:24	2388	142.166	22.92	225.798
3/13/2012 18:26	2532	142.108	22.937	225.932
3/13/2012 18:29	2682	142.132	22.954	225.877
3/13/2012 18:32	2838	142.075	22.967	226.008
3/13/2012 18:34	3006	141.958	22.979	226.278
3/13/2012 18:37	3186	141.911	22.992	226.387
3/13/2012 18:40	3372	141.857	23.003	226.51

TW-2 Step Test Data

3/13/2012 18:44	3576	141.766	23.026	226.722
3/13/2012 18:44	3609.785	141.887	23.034	226.442
3/13/2012 18:44	3610.035	142.012	23.052	226.153
3/13/2012 18:44	3610.286	141.897	23.065	226.419
3/13/2012 18:44	3610.536	141.949	23.077	226.298
3/13/2012 18:44	3610.786	141.964	23.084	226.265
3/13/2012 18:44	3611.036	142.003	23.091	226.173
3/13/2012 18:44	3611.286	142.065	23.099	226.031
3/13/2012 18:44	3611.536	142.045	23.101	226.077
3/13/2012 18:44	3611.786	142.072	23.103	226.016
3/13/2012 18:44	3612.036	142.131	23.108	225.877
3/13/2012 18:44	3612.286	142.11	23.113	225.926
3/13/2012 18:44	3612.536	142.174	23.111	225.778
3/13/2012 18:44	3612.786	142.147	23.113	225.842
3/13/2012 18:44	3613.036	142.21	23.119	225.695
3/13/2012 18:44	3613.286	142.18	23.118	225.766
3/13/2012 18:45	3613.536	142.245	23.12	225.615
3/13/2012 18:45	3613.786	142.223	23.121	225.666
3/13/2012 18:45	3614.036	142.252	23.124	225.599
3/13/2012 18:45	3614.286	142.251	23.125	225.6
3/13/2012 18:45	3614.536	142.307	23.126	225.472
3/13/2012 18:45	3614.786	142.278	23.129	225.54
3/13/2012 18:45	3615.036	142.329	23.128	225.422
3/13/2012 18:45	3615.286	142.324	23.128	225.434
3/13/2012 18:45	3615.536	142.367	23.131	225.334
3/13/2012 18:45	3615.786	142.361	23.13	225.347
3/13/2012 18:45	3616.146	142.423	23.125	225.204
3/13/2012 18:45	3616.506	142.418	23.116	225.217
3/13/2012 18:45	3616.926	142.434	23.114	225.179
3/13/2012 18:45	3617.346	142.456	23.109	225.129
3/13/2012 18:45	3617.766	142.473	23.107	225.089
3/13/2012 18:45	3618.246	142.522	23.103	224.975
3/13/2012 18:45	3618.786	142.54	23.099	224.935
3/13/2012 18:45	3619.266	142.579	23.099	224.844
3/13/2012 18:45	3619.866	142.609	23.096	224.774
3/13/2012 18:45	3620.466	142.661	23.089	224.655
3/13/2012 18:45	3621.066	142.705	23.087	224.553
3/13/2012 18:45	3621.726	142.724	23.089	224.508
3/13/2012 18:45	3622.446	142.79	23.086	224.358
3/13/2012 18:45	3623.226	142.835	23.089	224.253
3/13/2012 18:45	3624.006	142.877	23.085	224.156
3/13/2012 18:45	3624.846	142.914	23.085	224.07
3/13/2012 18:45	3625.746	142.982	23.082	223.914
3/13/2012 18:45	3626.9	143.036	23.098	223.789
3/13/2012 18:45	3627.666	143.068	23.09	223.714
3/13/2012 18:45	3628.746	143.131	23.085	223.569
3/13/2012 18:45	3629.886	143.206	23.079	223.396
3/13/2012 18:45	3631.086	143.27	23.081	223.248
3/13/2012 18:45	3632.346	143.334	23.078	223.1
3/13/2012 18:45	3633.666	143.391	23.081	222.97
3/13/2012 18:45	3635.106	143.462	23.078	222.805
3/13/2012 18:45	3636.606	143.546	23.08	222.612
3/13/2012 18:45	3638.166	143.599	23.095	222.488
3/13/2012 18:45	3639.846	143.686	23.085	222.288

3/13/2012 18:45	3641.646	143.75	23.082	222.141
3/13/2012 18:45	3643.506	143.847	23.081	221.915
3/13/2012 18:45	3645.546	143.907	23.082	221.778
3/13/2012 18:45	3647.646	143.995	23.08	221.575
3/13/2012 18:45	3649.866	144.114	23.08	221.299
3/13/2012 18:45	3652.266	144.207	23.082	221.085
3/13/2012 18:45	3654.786	144.308	23.078	220.851
3/13/2012 18:45	3657.426	144.367	23.082	220.716
3/13/2012 18:45	3660.246	144.503	23.084	220.402
3/13/2012 18:45	3663.246	144.594	23.084	220.191
3/13/2012 18:45	3666.426	144.694	23.086	219.961
3/13/2012 18:45	3669.786	144.785	23.088	219.75
3/13/2012 18:46	3673.386	144.89	23.09	219.509
3/13/2012 18:46	3676.986	144.983	23.092	219.292
3/13/2012 18:46	3681.186	145.098	23.095	219.028
3/13/2012 18:46	3685.386	145.188	23.097	218.819
3/13/2012 18:46	3689.586	145.288	23.098	218.588
3/13/2012 18:46	3694.386	145.395	23.104	218.343
3/13/2012 18:46	3699.786	145.504	23.104	218.09
3/13/2012 18:46	3704.586	145.589	23.108	217.893
3/13/2012 18:46	3710.586	145.688	23.111	217.664
3/13/2012 18:46	3716.586	145.8	23.115	217.406
3/13/2012 18:46	3722.586	145.891	23.12	217.196
3/13/2012 18:46	3729.186	145.967	23.122	217.022
3/13/2012 18:47	3736.386	146.085	23.127	216.749
3/13/2012 18:47	3744.186	146.208	23.132	216.464
3/13/2012 18:47	3751.986	146.275	23.134	216.311
3/13/2012 18:47	3760.386	146.345	23.141	216.149
3/13/2012 18:47	3769.386	146.443	23.148	215.922
3/13/2012 18:47	3778.986	146.558	23.152	215.656
3/13/2012 18:47	3788.586	146.654	23.157	215.436
3/13/2012 18:48	3799.386	146.716	23.162	215.293
3/13/2012 18:48	3810.786	146.792	23.164	215.117
3/13/2012 18:48	3822.786	146.881	23.169	214.91
3/13/2012 18:48	3835.386	146.968	23.173	214.709
3/13/2012 18:48	3848.586	147.089	23.178	214.432
3/13/2012 18:49	3862.986	147.133	23.183	214.33
3/13/2012 18:49	3877.986	147.246	23.186	214.068
3/13/2012 18:49	3893.586	147.281	23.189	213.987
3/13/2012 18:49	3910.386	147.397	23.187	213.72
3/13/2012 18:50	3928.386	147.441	23.188	213.617
3/13/2012 18:50	3946.986	147.513	23.192	213.452
3/13/2012 18:50	3967.386	147.602	23.2	213.245
3/13/2012 18:51	3988.386	147.694	23.21	213.034
3/13/2012 18:51	4010.586	147.738	23.231	212.932
3/13/2012 18:52	4034.586	147.843	23.256	212.689
3/13/2012 18:52	4059.786	147.898	23.29	212.563
3/13/2012 18:52	4086.186	147.973	23.331	212.39
3/13/2012 18:53	4114.386	148.039	23.376	212.238
3/13/2012 18:53	4144.386	148.085	23.424	212.13
3/13/2012 18:54	4176.186	148.134	23.478	212.018
3/13/2012 18:54	4209.785	148.214	23.528	211.833
3/13/2012 18:55	4245.785	148.296	23.595	211.644
3/13/2012 18:56	4281.785	148.34	23.663	211.542

3/13/2012 18:56	4323.785	148.397	23.741	211.411
3/13/2012 18:57	4365.785	148.473	23.824	211.236
3/13/2012 18:58	4407.785	148.516	23.881	211.135
3/13/2012 18:59	4455.785	148.569	23.921	211.013
3/13/2012 18:59	4509.785	148.637	23.965	210.856
3/13/2012 19:00	4557.785	148.716	24.007	210.675
3/13/2012 19:01	4617.785	148.76	24.044	210.571
3/13/2012 19:02	4677.785	148.808	24.041	210.461
3/13/2012 19:03	4737.785	148.891	24.022	210.27
3/13/2012 19:04	4803.785	148.922	24.001	210.199
3/13/2012 19:06	4875.785	149	24.013	210.017
3/13/2012 19:07	4953.785	149.052	24.02	209.899
3/13/2012 19:08	5031.785	149.067	24.003	209.864
3/13/2012 19:10	5115.785	149.151	23.969	209.67
3/13/2012 19:11	5205.785	149.174	23.896	209.616
3/13/2012 19:13	5301.785	149.229	23.846	209.488
3/13/2012 19:14	5397.785	149.288	23.82	209.353
3/13/2012 19:16	5505.785	149.337	23.815	209.241
3/13/2012 19:18	5619.785	149.407	23.778	209.079
3/13/2012 19:20	5739.785	149.451	23.772	208.977
3/13/2012 19:22	5865.785	149.495	23.768	208.875
3/13/2012 19:24	5997.785	149.534	23.783	208.785
3/13/2012 19:27	6141.785	149.568	23.802	208.706
3/13/2012 19:29	6290.759	151.879	23.783	203.372
3/13/2012 19:29	6291.01	150.086	23.803	207.51
3/13/2012 19:29	6291.26	149.514	23.818	208.831
3/13/2012 19:29	6291.51	150.951	23.829	205.513
3/13/2012 19:29	6291.76	150.52	23.837	206.509
3/13/2012 19:29	6292.01	150.08	23.842	207.525
3/13/2012 19:29	6292.26	149.981	23.847	207.752
3/13/2012 19:29	6292.51	149.519	23.85	208.819
3/13/2012 19:29	6292.76	148.95	23.856	210.134
3/13/2012 19:29	6293.01	149.191	23.857	209.577
3/13/2012 19:29	6293.26	148.916	23.859	210.212
3/13/2012 19:29	6293.51	149.001	23.862	210.016
3/13/2012 19:29	6293.76	148.909	23.869	210.227
3/13/2012 19:29	6294.01	148.977	23.87	210.071
3/13/2012 19:29	6294.26	148.909	23.866	210.229
3/13/2012 19:29	6294.548	148.994	23.866	210.031
3/13/2012 19:29	6294.771	148.942	23.872	210.153
3/13/2012 19:29	6295.01	148.985	23.873	210.052
3/13/2012 19:29	6295.26	148.962	23.872	210.105
3/13/2012 19:29	6295.51	149.01	23.873	209.995
3/13/2012 19:29	6295.76	148.989	23.878	210.044
3/13/2012 19:29	6296.01	149.007	23.879	210.002
3/13/2012 19:29	6296.26	149.021	23.876	209.97
3/13/2012 19:29	6296.51	149.027	23.88	209.956
3/13/2012 19:29	6296.76	149.052	23.881	209.897
3/13/2012 19:29	6297.12	149.098	23.874	209.792
3/13/2012 19:29	6297.48	149.049	23.866	209.905
3/13/2012 19:29	6297.9	149.069	23.86	209.858
3/13/2012 19:29	6298.32	149.072	23.854	209.852
3/13/2012 19:29	6298.74	149.074	23.854	209.848
3/13/2012 19:29	6299.22	149.102	23.848	209.783

3/13/2012 19:29	6299.76	149.119	23.844	209.744
3/13/2012 19:29	6300.24	149.134	23.845	209.708
3/13/2012 19:29	6300.84	149.124	23.836	209.733
3/13/2012 19:29	6301.44	149.135	23.836	209.707
3/13/2012 19:29	6302.04	149.142	23.835	209.69
3/13/2012 19:29	6302.7	149.153	23.833	209.664
3/13/2012 19:29	6303.42	149.18	23.829	209.602
3/13/2012 19:29	6304.2	143.62	23.827	222.441
3/13/2012 19:29	6304.441	148.43	23.843	211.335
3/13/2012 19:29	6304.691	149.549	23.853	208.75
3/13/2012 19:29	6304.942	149.391	23.862	209.114
3/13/2012 19:29	6305.192	149.443	23.865	208.996
3/13/2012 19:29	6305.442	149.362	23.87	209.182
3/13/2012 19:29	6305.692	148.996	23.875	210.028
3/13/2012 19:29	6305.942	149.015	23.877	209.983
3/13/2012 19:29	6306.192	148.869	23.88	210.32
3/13/2012 19:29	6306.442	148.838	23.88	210.393
3/13/2012 19:29	6306.692	148.888	23.884	210.277
3/13/2012 19:29	6306.942	148.8	23.883	210.479
3/13/2012 19:29	6307.192	148.702	23.887	210.705
3/13/2012 19:29	6307.442	148.81	23.888	210.457
3/13/2012 19:29	6307.692	148.723	23.887	210.658
3/13/2012 19:29	6307.942	148.602	23.889	210.937
3/13/2012 19:29	6308.192	148.563	23.892	211.028
3/13/2012 19:29	6308.442	148.449	23.893	211.291
3/13/2012 19:29	6308.692	148.504	23.89	211.163
3/13/2012 19:29	6308.942	148.481	23.892	211.216
3/13/2012 19:29	6309.192	148.482	23.896	211.215
3/13/2012 19:29	6309.442	148.475	23.894	211.229
3/13/2012 19:29	6309.692	148.385	23.895	211.437
3/13/2012 19:29	6309.942	148.375	23.896	211.462
3/13/2012 19:29	6310.192	148.319	23.9	211.591
3/13/2012 19:29	6310.442	148.22	23.899	211.819
3/13/2012 19:29	6310.802	148.184	23.887	211.902
3/13/2012 19:29	6311.162	148.158	23.882	211.962
3/13/2012 19:29	6311.582	148.104	23.874	212.086
3/13/2012 19:29	6312.002	148.087	23.872	212.126
3/13/2012 19:29	6312.422	148.013	23.866	212.296
3/13/2012 19:29	6312.902	148.001	23.865	212.325
3/13/2012 19:30	6313.442	147.861	23.86	212.647
3/13/2012 19:30	6313.922	147.871	23.858	212.624
3/13/2012 19:30	6314.522	147.764	23.849	212.873
3/13/2012 19:30	6315.122	147.689	23.85	213.046
3/13/2012 19:30	6315.722	147.722	23.849	212.969
3/13/2012 19:30	6316.382	147.594	23.842	213.264
3/13/2012 19:30	6317.102	147.507	23.842	213.465
3/13/2012 19:30	6317.882	147.522	23.839	213.431
3/13/2012 19:30	6318.662	147.415	23.836	213.678
3/13/2012 19:30	6319.502	147.352	23.833	213.823
3/13/2012 19:30	6320.402	147.153	23.831	214.282
3/13/2012 19:30	6321.362	147.139	23.832	214.315
3/13/2012 19:30	6322.322	147.089	23.83	214.431
3/13/2012 19:30	6323.402	146.955	23.824	214.74
3/13/2012 19:30	6324.542	146.86	23.827	214.959

3/13/2012 19:30	6325.742	146.724	23.82	215.274
3/13/2012 19:30	6327.002	146.703	23.818	215.321
3/13/2012 19:30	6328.322	146.493	23.817	215.806
3/13/2012 19:30	6329.762	146.462	23.814	215.878
3/13/2012 19:30	6331.262	146.373	23.81	216.084
3/13/2012 19:30	6332.822	146.254	23.808	216.359
3/13/2012 19:30	6334.502	146.098	23.804	216.718
3/13/2012 19:30	6336.302	146.001	23.806	216.942
3/13/2012 19:30	6338.162	145.861	23.8	217.266
3/13/2012 19:30	6340.202	145.758	23.795	217.503
3/13/2012 19:30	6342.302	145.624	23.793	217.812
3/13/2012 19:30	6344.522	145.464	23.791	218.182
3/13/2012 19:30	6346.922	145.377	23.786	218.384
3/13/2012 19:30	6349.441	145.25	23.78	218.678
3/13/2012 19:30	6352.082	145.037	23.774	219.168
3/13/2012 19:30	6354.902	144.926	23.77	219.426
3/13/2012 19:30	6357.902	144.785	23.763	219.751
3/13/2012 19:30	6361.097	144.569	23.758	220.248
3/13/2012 19:30	6364.441	144.417	23.752	220.599
3/13/2012 19:30	6368.042	144.249	23.743	220.987
3/13/2012 19:30	6371.642	144.122	23.738	221.281
3/13/2012 19:31	6375.842	143.988	23.731	221.591
3/13/2012 19:31	6380.042	143.833	23.722	221.948
3/13/2012 19:31	6384.242	143.514	23.717	222.684
3/13/2012 19:31	6389.042	143.418	23.705	222.907
3/13/2012 19:31	6394.442	143.155	23.694	223.514
3/13/2012 19:31	6399.242	143.081	23.685	223.685
3/13/2012 19:31	6405.242	142.799	23.672	224.335
3/13/2012 19:31	6411.242	142.643	23.662	224.697
3/13/2012 19:31	6417.242	142.476	23.649	225.082
3/13/2012 19:31	6423.841	142.306	23.637	225.473
3/13/2012 19:31	6431.042	142.064	23.624	226.033
3/13/2012 19:32	6438.842	142.021	23.612	226.133
3/13/2012 19:32	6446.641	141.706	23.6	226.859
3/13/2012 19:32	6455.042	141.63	23.59	227.034
3/13/2012 19:32	6464.042	141.306	23.578	227.783
3/13/2012 19:32	6473.641	141.091	23.565	228.28
3/13/2012 19:32	6483.242	141.033	23.553	228.413
3/13/2012 19:33	6494.041	140.771	23.539	229.019
3/13/2012 19:33	6505.441	140.678	23.526	229.233
3/13/2012 19:33	6517.441	140.351	23.516	229.987
3/13/2012 19:33	6530.041	140.209	23.503	230.316
3/13/2012 19:33	6543.242	140.013	23.49	230.769
3/13/2012 19:34	6557.641	139.82	23.475	231.215
3/13/2012 19:34	6572.642	139.628	23.462	231.658
3/13/2012 19:34	6588.242	139.575	23.447	231.781
3/13/2012 19:34	6605.041	139.332	23.429	232.34
3/13/2012 19:35	6623.042	139.243	23.409	232.546
3/13/2012 19:35	6641.641	139.14	23.393	232.785
3/13/2012 19:35	6662.041	138.96	23.367	233.201
3/13/2012 19:36	6683.042	138.754	23.347	233.676
3/13/2012 19:36	6705.242	138.569	23.323	234.103
3/13/2012 19:36	6729.242	138.445	23.292	234.39
3/13/2012 19:37	6754.442	138.291	23.264	234.744

3/13/2012 19:37	6780.842	138.246	23.235	234.849
3/13/2012 19:38	6809.041	138.12	23.204	235.139
3/13/2012 19:38	6839.042	138.007	23.173	235.4
3/13/2012 19:39	6870.842	137.911	23.141	235.623
3/13/2012 19:39	6904.441	137.701	23.103	236.108
3/13/2012 19:40	6940.441	137.304	23.067	237.023
3/13/2012 19:41	6976.441	137.034	23.037	237.648
3/13/2012 19:41	7018.441	136.684	23.006	238.455
3/13/2012 19:42	7060.441	136.468	22.978	238.955
3/13/2012 19:43	7102.441	136.273	22.951	239.404
3/13/2012 19:43	7150.441	136.103	22.92	239.796
3/13/2012 19:44	7204.441	135.937	22.886	240.179
3/13/2012 19:45	7252.441	135.847	22.859	240.387
3/13/2012 19:46	7312.441	135.652	22.827	240.838
3/13/2012 19:47	7372.441	135.484	22.798	241.227
3/13/2012 19:48	7432.441	135.492	22.774	241.207
3/13/2012 19:49	7498.441	135.046	22.747	242.237
3/13/2012 19:50	7570.441	134.982	22.724	242.385
3/13/2012 19:52	7648.441	134.919	22.701	242.53
3/13/2012 19:53	7726.441	134.755	22.68	242.91
3/13/2012 19:54	7810.441	134.623	22.663	243.214
3/13/2012 19:56	7900.441	134.404	22.644	243.72
3/13/2012 19:58	7996.441	134.361	22.632	243.82
3/13/2012 19:59	8092.441	134.102	22.622	244.418
3/13/2012 20:01	8200.441	134.047	22.611	244.544
3/13/2012 20:03	8314.441	133.939	22.602	244.794
3/13/2012 20:05	8434.441	133.781	22.595	245.158
3/13/2012 20:07	8560.441	133.681	22.586	245.389
3/13/2012 20:09	8692.441	133.564	22.586	245.66
3/13/2012 20:12	8836.441	133.526	22.582	245.746
3/13/2012 20:14	8986.441	133.415	22.58	246.003
3/13/2012 20:17	9142.441	133.176	22.578	246.556
3/13/2012 20:19	9310.441	133.08	22.577	246.777
3/13/2012 20:22	9491.441	132.904	22.574	247.183
3/13/2012 20:26	9676.441	132.826	22.579	247.364
3/13/2012 20:29	9880.441	132.605	22.584	247.873
3/13/2012 20:29	9900.249	132.8	22.584	247.422
3/13/2012 20:29	9900.499	132.66	22.601	247.747
3/13/2012 20:29	9900.75	132.656	22.616	247.755
3/13/2012 20:29	9901	132.69	22.628	247.676
3/13/2012 20:29	9901.25	132.664	22.635	247.737
3/13/2012 20:29	9901.5	132.662	22.64	247.741
3/13/2012 20:29	9901.75	132.733	22.647	247.577
3/13/2012 20:29	9902	132.644	22.652	247.784
3/13/2012 20:29	9902.25	133.768	22.659	245.189
3/13/2012 20:29	9902.5	135.103	22.658	242.105
3/13/2012 20:29	9902.75	134.186	22.661	244.223
3/13/2012 20:29	9903	132.792	22.662	247.443
3/13/2012 20:29	9903.25	132.789	22.667	247.45
3/13/2012 20:29	9903.5	132.629	22.668	247.819
3/13/2012 20:29	9903.75	132.759	22.67	247.519
3/13/2012 20:29	9904	132.912	22.671	247.164
3/13/2012 20:29	9904.25	132.978	22.674	247.013
3/13/2012 20:29	9904.5	132.96	22.676	247.055

3/13/2012 20:29	9904.75	133.018	22.677	246.92
3/13/2012 20:29	9905	133.084	22.678	246.767
3/13/2012 20:29	9905.25	133.094	22.675	246.744
3/13/2012 20:29	9905.5	133.119	22.68	246.688
3/13/2012 20:29	9905.75	133.142	22.683	246.635
3/13/2012 20:29	9906	133.183	22.682	246.54
3/13/2012 20:29	9906.25	133.216	22.681	246.462
3/13/2012 20:29	9906.61	133.25	22.674	246.385
3/13/2012 20:29	9906.97	133.288	22.669	246.297
3/13/2012 20:29	9907.389	133.362	22.663	246.126
3/13/2012 20:29	9907.809	133.426	22.659	245.979
3/13/2012 20:29	9908.229	133.453	22.658	245.915
3/13/2012 20:29	9908.71	133.521	22.651	245.758
3/13/2012 20:29	9909.249	133.567	22.647	245.653
3/13/2012 20:29	9909.729	133.63	22.645	245.506
3/13/2012 20:29	9910.329	133.703	22.644	245.339
3/13/2012 20:29	9910.93	133.736	22.643	245.263
3/13/2012 20:29	9911.53	133.776	22.638	245.169
3/13/2012 20:29	9912.19	133.846	22.638	245.008
3/13/2012 20:29	9912.909	133.907	22.638	244.868
3/13/2012 20:30	9913.69	134.009	22.631	244.632
3/13/2012 20:30	9914.47	134.1	22.629	244.422
3/13/2012 20:30	9915.31	134.195	22.63	244.203
3/13/2012 20:30	9916.21	134.258	22.627	244.058
3/13/2012 20:30	9917.17	134.363	22.629	243.815
3/13/2012 20:30	9918.129	134.451	22.626	243.611
3/13/2012 20:30	9919.21	134.546	22.623	243.392
3/13/2012 20:30	9920.35	134.665	22.624	243.116
3/13/2012 20:30	9921.55	134.788	22.624	242.834
3/13/2012 20:30	9922.81	134.924	22.622	242.518
3/13/2012 20:30	9924.129	135.002	22.622	242.339
3/13/2012 20:30	9925.57	135.131	22.623	242.042
3/13/2012 20:30	9927.07	135.261	22.621	241.74
3/13/2012 20:30	9928.629	135.369	22.619	241.492
3/13/2012 20:30	9930.31	135.524	22.62	241.133
3/13/2012 20:30	9932.109	135.651	22.616	240.841
3/13/2012 20:30	9933.97	135.798	22.62	240.5
3/13/2012 20:30	9936.01	135.954	22.618	240.14
3/13/2012 20:30	9938.109	136.115	22.615	239.769
3/13/2012 20:30	9940.329	136.278	22.617	239.393
3/13/2012 20:30	9942.73	136.423	22.615	239.059
3/13/2012 20:30	9945.249	136.602	22.614	238.645
3/13/2012 20:30	9947.889	136.792	22.614	238.205
3/13/2012 20:30	9950.71	136.974	22.61	237.786
3/13/2012 20:30	9953.71	137.158	22.614	237.361
3/13/2012 20:30	9956.889	137.36	22.61	236.893
3/13/2012 20:30	9960.249	137.581	22.612	236.384
3/13/2012 20:30	9963.849	137.802	22.61	235.875
3/13/2012 20:30	9967.449	138.023	22.609	235.362
3/13/2012 20:30	9971.649	138.268	22.609	234.797
3/13/2012 20:31	9975.849	138.501	22.61	234.26
3/13/2012 20:31	9980.049	138.735	22.607	233.719
3/13/2012 20:31	9984.849	138.964	22.607	233.19
3/13/2012 20:31	9990.249	139.226	22.607	232.585

TW-2 Step Test Data

3/13/2012 20:31	9995.049	139.441	22.61	232.088
3/13/2012 20:31	10001.049	139.697	22.609	231.497
3/13/2012 20:31	10007.049	139.953	22.61	230.906
3/13/2012 20:31	10013.049	140.177	22.611	230.39
3/13/2012 20:31	10019.649	140.418	22.611	229.833
3/13/2012 20:31	10026.849	140.664	22.612	229.265
3/13/2012 20:32	10034.649	140.908	22.611	228.702
3/13/2012 20:32	10042.449	141.176	22.613	228.083
3/13/2012 20:32	10050.849	141.405	22.615	227.554
3/13/2012 20:32	10059.849	141.595	22.618	227.116
3/13/2012 20:32	10069.449	141.828	22.62	226.579
3/13/2012 20:32	10079.049	142.067	22.62	226.027
3/13/2012 20:32	10089.849	142.285	22.623	225.523
3/13/2012 20:33	10101.249	142.485	22.624	225.061
3/13/2012 20:33	10113.249	142.685	22.63	224.599
3/13/2012 20:33	10125.849	142.888	22.63	224.131
3/13/2012 20:33	10139.049	143.07	22.632	223.711
3/13/2012 20:34	10153.449	143.245	22.635	223.306
3/13/2012 20:34	10168.449	143.444	22.643	222.846
3/13/2012 20:34	10184.049	143.604	22.646	222.477
3/13/2012 20:34	10200.849	143.776	22.651	222.079
3/13/2012 20:35	10218.849	143.934	22.655	221.715
3/13/2012 20:35	10237.449	144.09	22.661	221.356
3/13/2012 20:35	10257.849	144.28	22.668	220.916
3/13/2012 20:36	10278.849	144.44	22.675	220.547
3/13/2012 20:36	10301.049	144.567	22.68	220.254
3/13/2012 20:36	10325.049	144.71	22.687	219.923
3/13/2012 20:37	10350.249	144.863	22.697	219.57
3/13/2012 20:37	10376.649	144.999	22.706	219.256
3/13/2012 20:38	10404.849	145.121	22.715	218.974
3/13/2012 20:38	10434.849	145.271	22.723	218.627
3/13/2012 20:39	10466.649	145.4	22.73	218.331
3/13/2012 20:39	10500.249	145.557	22.737	217.968
3/13/2012 20:40	10536.249	145.666	22.741	217.716
3/13/2012 20:40	10572.249	145.781	22.743	217.452
3/13/2012 20:41	10614.249	145.92	22.74	217.13
3/13/2012 20:42	10656.249	146.012	22.744	216.916
3/13/2012 20:43	10698.249	146.149	22.745	216.601
3/13/2012 20:43	10746.249	146.26	22.745	216.344
3/13/2012 20:44	10800.249	146.373	22.739	216.084
3/13/2012 20:45	10848.249	146.479	22.741	215.839
3/13/2012 20:46	10908.249	146.595	22.838	215.572
3/13/2012 20:47	10968.249	146.679	22.977	215.377
3/13/2012 20:48	11028.249	146.791	23.088	215.118
3/13/2012 20:49	11094.249	146.861	23.18	214.958
3/13/2012 20:50	11166.249	146.982	23.228	214.677
3/13/2012 20:52	11244.249	147.08	23.251	214.452
3/13/2012 20:53	11322.249	147.18	23.268	214.221
3/13/2012 20:54	11406.249	147.274	23.283	214.003
3/13/2012 20:56	11496.249	147.355	23.31	213.817
3/13/2012 20:57	11592.249	147.447	23.326	213.604
3/13/2012 20:59	11688.249	147.534	23.333	213.403
3/13/2012 21:01	11796.249	147.604	23.341	213.242
3/13/2012 21:03	11910.249	147.696	23.347	213.029

3/13/2012 21:05	12030.249	147.785	23.328	212.824
3/13/2012 21:07	12156.249	147.88	23.321	212.604
3/13/2012 21:09	12288.249	147.95	23.328	212.443
3/13/2012 21:11	12432.249	148.026	23.367	212.268
3/13/2012 21:14	12582.249	148.069	23.369	212.169
3/13/2012 21:17	12738.249	148.21	23.371	211.842
3/13/2012 21:19	12906.249	148.263	23.356	211.719
3/13/2012 21:22	13086.249	148.317	23.365	211.594
3/13/2012 21:25	13272.249	148.4	23.337	211.403
3/13/2012 21:29	13476.249	148.503	23.301	211.166
3/13/2012 21:29	13502.569	148.548	23.305	211.062
3/13/2012 21:29	13502.819	146.754	23.319	215.205
3/13/2012 21:29	13503.07	142.739	23.337	224.474
3/13/2012 21:29	13503.32	139.809	23.347	231.239
3/13/2012 21:29	13503.57	140.549	23.353	229.531
3/13/2012 21:29	13503.82	146.939	23.363	214.778
3/13/2012 21:29	13504.07	150.841	23.366	205.766
3/13/2012 21:29	13504.32	151.521	23.37	204.196
3/13/2012 21:29	13504.57	150.019	23.375	207.666
3/13/2012 21:29	13504.82	148.919	23.376	210.205
3/13/2012 21:29	13505.07	148.285	23.377	211.669
3/13/2012 21:29	13505.32	147.847	23.383	212.681
3/13/2012 21:29	13505.57	147.686	23.383	213.053
3/13/2012 21:29	13505.82	147.452	23.384	213.593
3/13/2012 21:29	13506.07	147.344	23.388	213.841
3/13/2012 21:29	13506.32	147.158	23.386	214.27
3/13/2012 21:29	13506.566	147.053	23.392	214.513
3/13/2012 21:29	13506.82	146.951	23.391	214.75
3/13/2012 21:29	13507.07	146.883	23.391	214.907
3/13/2012 21:29	13507.32	146.873	23.393	214.928
3/13/2012 21:29	13507.57	146.745	23.395	215.226
3/13/2012 21:29	13507.824	146.701	23.396	215.326
3/13/2012 21:29	13508.07	146.687	23.395	215.358
3/13/2012 21:29	13508.32	146.54	23.396	215.699
3/13/2012 21:29	13508.57	146.461	23.399	215.881
3/13/2012 21:29	13508.93	146.379	23.389	216.07
3/13/2012 21:29	13509.29	146.347	23.381	216.143
3/13/2012 21:29	13509.71	146.191	23.378	216.503
3/13/2012 21:29	13510.129	145.986	23.375	216.976
3/13/2012 21:29	13510.549	145.982	23.374	216.986
3/13/2012 21:29	13511.03	145.811	23.368	217.382
3/13/2012 21:29	13511.569	145.647	23.36	217.761
3/13/2012 21:29	13512.049	145.549	23.361	217.986
3/13/2012 21:29	13512.649	145.464	23.356	218.182
3/13/2012 21:29	13513.25	145.284	23.354	218.597
3/13/2012 21:30	13513.85	145.1	23.352	219.022
3/13/2012 21:30	13514.51	144.986	23.349	219.287
3/13/2012 21:30	13515.23	144.848	23.348	219.604
3/13/2012 21:30	13516.01	144.641	23.343	220.083
3/13/2012 21:30	13516.79	144.481	23.341	220.452
3/13/2012 21:30	13517.63	144.263	23.342	220.955
3/13/2012 21:30	13518.53	144.064	23.339	221.415
3/13/2012 21:30	13519.49	143.906	23.332	221.78
3/13/2012 21:30	13520.45	143.724	23.335	222.201

3/13/2012 21:30	13521.53	143.492	23.331	222.735
3/13/2012 21:30	13522.67	143.335	23.328	223.099
3/13/2012 21:30	13523.87	143.129	23.328	223.573
3/13/2012 21:30	13525.13	142.821	23.322	224.286
3/13/2012 21:30	13526.45	142.663	23.316	224.651
3/13/2012 21:30	13527.89	142.352	23.314	225.368
3/13/2012 21:30	13529.39	142.096	23.312	225.958
3/13/2012 21:30	13530.95	141.777	23.309	226.695
3/13/2012 21:30	13532.63	141.659	23.307	226.968
3/13/2012 21:30	13534.43	141.372	23.304	227.632
3/13/2012 21:30	13536.29	141.049	23.301	228.377
3/13/2012 21:30	13538.33	140.734	23.292	229.103
3/13/2012 21:30	13540.43	140.458	23.287	229.742
3/13/2012 21:30	13542.649	140.13	23.285	230.498
3/13/2012 21:30	13545.05	139.735	23.274	231.41
3/13/2012 21:30	13547.569	139.336	23.268	232.331
3/13/2012 21:30	13550.21	139.125	23.262	232.819
3/13/2012 21:30	13553.03	138.713	23.256	233.77
3/13/2012 21:30	13556.03	138.331	23.25	234.652
3/13/2012 21:30	13559.21	137.892	23.241	235.667
3/13/2012 21:30	13562.569	137.605	23.235	236.328
3/13/2012 21:30	13566.17	137.085	23.227	237.53
3/13/2012 21:30	13569.769	136.763	23.219	238.274
3/13/2012 21:31	13573.97	136.264	23.211	239.426
3/13/2012 21:31	13578.17	135.807	23.204	240.48
3/13/2012 21:31	13582.369	135.388	23.196	241.448
3/13/2012 21:31	13587.17	134.903	23.188	242.567
3/13/2012 21:31	13592.569	134.335	23.176	243.88
3/13/2012 21:31	13597.369	133.986	23.172	244.686
3/13/2012 21:31	13603.369	133.624	23.157	245.52
3/13/2012 21:31	13609.369	133.46	23.151	245.901
3/13/2012 21:31	13615.369	133.164	23.141	246.583
3/13/2012 21:31	13621.969	133.19	23.128	246.522
3/13/2012 21:31	13629.17	132.782	23.118	247.464
3/13/2012 21:32	13636.969	132.398	23.11	248.352
3/13/2012 21:32	13644.769	132.028	23.101	249.206
3/13/2012 21:32	13653.17	131.686	23.083	249.995
3/13/2012 21:32	13662.17	131.382	23.073	250.698
3/13/2012 21:32	13671.769	131.121	23.057	251.3
3/13/2012 21:32	13681.369	130.914	23.045	251.778
3/13/2012 21:32	13692.169	130.364	23.029	253.048
3/13/2012 21:33	13703.569	129.98	23.016	253.934
3/13/2012 21:33	13715.569	129.623	23.002	254.76
3/13/2012 21:33	13728.169	129.23	22.987	255.667
3/13/2012 21:33	13741.369	128.844	22.969	256.557
3/13/2012 21:34	13755.769	128.446	22.949	257.476
3/13/2012 21:34	13770.769	128.438	22.931	257.494
3/13/2012 21:34	13786.369	128.287	22.914	257.843
3/13/2012 21:34	13803.169	128.243	22.893	257.945
3/13/2012 21:35	13821.169	127.977	22.87	258.56
3/13/2012 21:35	13839.769	127.703	22.843	259.193
3/13/2012 21:35	13860.169	127.718	22.816	259.157
3/13/2012 21:36	13881.169	127.206	22.792	260.339
3/13/2012 21:36	13903.369	127.216	22.765	260.317

3/13/2012 21:36	13927.369	126.995	22.739	260.828
3/13/2012 21:37	13952.569	126.929	22.713	260.98
3/13/2012 21:37	13978.969	126.619	22.69	261.695
3/13/2012 21:38	14007.169	126.412	22.667	262.173
3/13/2012 21:38	14037.169	125.95	22.644	263.24
3/13/2012 21:39	14068.969	125.889	22.623	263.381
3/13/2012 21:39	14102.569	124.963	22.601	265.519
3/13/2012 21:40	14138.569	124.312	22.587	267.021
3/13/2012 21:41	14174.569	123.666	22.576	268.513
3/13/2012 21:41	14216.569	122.952	22.562	270.163
3/13/2012 21:42	14258.569	122.245	22.551	271.795
3/13/2012 21:43	14300.569	121.552	22.536	273.394
3/13/2012 21:43	14348.569	120.871	22.525	274.967
3/13/2012 21:44	14402.569	120.221	22.506	276.468
3/13/2012 21:45	14450.569	119.806	22.49	277.426
3/13/2012 21:46	14510.569	119.306	22.472	278.58
3/13/2012 21:47	14570.569	118.713	22.452	279.95
3/13/2012 21:48	14630.569	118.313	22.436	280.872
3/13/2012 21:49	14696.569	117.949	22.414	281.714
3/13/2012 21:50	14768.569	117.602	22.401	282.515
3/13/2012 21:52	14846.569	117.328	22.384	283.148
3/13/2012 21:53	14924.569	116.961	22.375	283.994
3/13/2012 21:54	15008.569	116.787	22.361	284.396
3/13/2012 21:56	15098.569	116.307	22.356	285.506
3/13/2012 21:58	15194.569	115.996	22.351	286.224
3/13/2012 21:59	15290.569	115.71	22.349	286.885
3/13/2012 22:01	15398.569	115.372	22.346	287.663
3/13/2012 22:03	15512.569	114.993	22.342	288.539
3/13/2012 22:05	15632.569	114.716	22.342	289.178
3/13/2012 22:07	15758.569	114.576	22.347	289.501
3/13/2012 22:09	15890.569	114.251	22.351	290.253
3/13/2012 22:12	16034.569	113.868	22.35	291.136
3/13/2012 22:14	16184.569	113.48	22.355	292.033
3/13/2012 22:17	16340.569	112.864	22.358	293.455
3/13/2012 22:19	16508.569	112.526	22.362	294.234
3/13/2012 22:22	16688.569	112.152	22.361	295.098
3/13/2012 22:26	16874.569	111.936	22.369	295.599
3/13/2012 22:29	17078.569	111.615	22.375	296.339
3/13/2012 22:30	17160.559	111.525	22.383	296.546
3/13/2012 22:30	17160.81	111.536	22.403	296.521
3/13/2012 22:30	17161.06	111.567	22.415	296.45
3/13/2012 22:30	17161.31	111.545	22.427	296.501
3/13/2012 22:30	17161.56	111.527	22.434	296.543
3/13/2012 22:30	17161.81	111.491	22.442	296.625
3/13/2012 22:30	17162.06	111.52	22.447	296.559
3/13/2012 22:30	17162.31	111.537	22.449	296.518
3/13/2012 22:30	17162.56	111.498	22.455	296.608
3/13/2012 22:30	17162.81	111.474	22.458	296.665
3/13/2012 22:30	17163.06	111.44	22.459	296.742
3/13/2012 22:30	17163.31	111.529	22.465	296.538
3/13/2012 22:30	17163.56	111.525	22.466	296.547
3/13/2012 22:30	17163.81	111.537	22.469	296.518
3/13/2012 22:30	17164.06	111.535	22.469	296.524
3/13/2012 22:30	17164.31	111.509	22.47	296.584

3/13/2012 22:30	17164.56	111.541	22.47	296.51
3/13/2012 22:30	17164.81	111.501	22.474	296.603
3/13/2012 22:30	17165.06	111.57	22.476	296.442
3/13/2012 22:30	17165.31	111.534	22.473	296.527
3/13/2012 22:30	17165.56	111.54	22.475	296.512
3/13/2012 22:30	17165.811	111.467	22.478	296.68
3/13/2012 22:30	17166.061	111.476	22.482	296.659
3/13/2012 22:30	17166.311	111.569	22.478	296.445
3/13/2012 22:30	17166.561	111.525	22.482	296.547
3/13/2012 22:30	17166.92	111.481	22.471	296.647
3/13/2012 22:30	17167.281	111.473	22.467	296.666
3/13/2012 22:30	17167.701	111.493	22.459	296.621
3/13/2012 22:30	17168.12	111.464	22.456	296.687
3/13/2012 22:30	17168.54	111.504	22.459	296.594
3/13/2012 22:30	17169.021	111.509	22.453	296.583
3/13/2012 22:30	17169.56	111.447	22.449	296.728
3/13/2012 22:30	17170.04	111.513	22.445	296.574
3/13/2012 22:30	17170.64	111.498	22.443	296.608
3/13/2012 22:30	17171.24	111.483	22.438	296.644
3/13/2012 22:30	17171.84	111.466	22.437	296.683
3/13/2012 22:30	17172.331	111.527	22.441	296.543
3/13/2012 22:30	17172.582	111.554	22.457	296.481
3/13/2012 22:30	17172.832	111.57	22.462	296.443
3/13/2012 22:30	17173.082	111.519	22.471	296.561
3/13/2012 22:31	17173.332	111.572	22.472	296.439
3/13/2012 22:31	17173.582	111.54	22.479	296.511
3/13/2012 22:31	17173.832	111.511	22.483	296.578
3/13/2012 22:31	17174.082	111.485	22.484	296.64
3/13/2012 22:31	17174.332	111.542	22.485	296.508
3/13/2012 22:31	17174.582	111.485	22.485	296.64
3/13/2012 22:31	17174.832	111.442	22.492	296.739
3/13/2012 22:31	17175.082	111.454	22.492	296.712
3/13/2012 22:31	17175.332	111.489	22.493	296.63
3/13/2012 22:31	17175.582	111.491	22.491	296.624
3/13/2012 22:31	17175.832	111.476	22.496	296.66
3/13/2012 22:31	17176.12	111.54	22.493	296.512
3/13/2012 22:31	17176.344	111.503	22.498	296.598
3/13/2012 22:31	17176.582	111.49	22.501	296.627
3/13/2012 22:31	17176.832	111.43	22.499	296.766
3/13/2012 22:31	17177.082	111.475	22.5	296.663
3/13/2012 22:31	17177.332	111.543	22.502	296.505
3/13/2012 22:31	17177.582	111.555	22.499	296.476
3/13/2012 22:31	17177.832	111.531	22.502	296.532
3/13/2012 22:31	17178.082	111.487	22.505	296.634
3/13/2012 22:31	17178.332	111.439	22.503	296.745
3/13/2012 22:31	17178.692	111.43	22.493	296.766
3/13/2012 22:31	17179.052	111.491	22.49	296.626
3/13/2012 22:31	17179.472	111.443	22.483	296.735
3/13/2012 22:31	17179.892	111.474	22.478	296.664
3/13/2012 22:31	17180.312	111.447	22.479	296.726
3/13/2012 22:31	17180.792	111.422	22.47	296.785
3/13/2012 22:31	17181.332	111.565	22.469	296.455
3/13/2012 22:31	17181.812	111.293	22.466	297.082
3/13/2012 22:31	17182.412	111.27	22.463	297.135

3/13/2012 22:31	17183.012	111.319	22.462	297.022
3/13/2012 22:31	17183.612	111.332	22.46	296.992
3/13/2012 22:31	17184.272	111.424	22.453	296.779
3/13/2012 22:31	17184.992	111.365	22.451	296.917
3/13/2012 22:31	17185.772	111.267	22.446	297.142
3/13/2012 22:31	17186.552	111.269	22.449	297.138
3/13/2012 22:31	17187.392	111.256	22.449	297.168
3/13/2012 22:31	17188.292	111.186	22.443	297.329
3/13/2012 22:31	17189.252	111.195	22.443	297.308
3/13/2012 22:31	17190.212	111.123	22.446	297.474
3/13/2012 22:31	17191.292	111.077	22.444	297.58
3/13/2012 22:31	17192.432	111.03	22.438	297.689
3/13/2012 22:31	17193.632	111.052	22.439	297.639
3/13/2012 22:31	17194.892	110.918	22.439	297.949
3/13/2012 22:31	17196.212	110.877	22.436	298.044
3/13/2012 22:31	17197.652	110.881	22.433	298.034
3/13/2012 22:31	17199.152	110.834	22.433	298.141
3/13/2012 22:31	17200.712	110.729	22.432	298.384
3/13/2012 22:31	17202.392	110.685	22.432	298.486
3/13/2012 22:31	17204.192	110.715	22.427	298.417
3/13/2012 22:31	17206.052	110.6	22.429	298.684
3/13/2012 22:31	17208.092	110.551	22.428	298.796
3/13/2012 22:31	17210.192	110.55	22.423	298.798
3/13/2012 22:31	17212.412	110.398	22.426	299.149
3/13/2012 22:31	17214.812	110.418	22.424	299.103
3/13/2012 22:31	17217.332	110.261	22.422	299.464
3/13/2012 22:31	17219.972	110.157	22.422	299.705
3/13/2012 22:31	17222.792	110.177	22.419	299.658
3/13/2012 22:31	17225.792	110.097	22.416	299.843
3/13/2012 22:31	17228.972	110.023	22.415	300.014
3/13/2012 22:31	17232.332	109.979	22.416	300.116
3/13/2012 22:32	17235.932	109.831	22.412	300.457
3/13/2012 22:32	17239.532	109.746	22.412	300.655
3/13/2012 22:32	17243.732	109.715	22.411	300.727
3/13/2012 22:32	17247.932	109.577	22.41	301.044
3/13/2012 22:32	17252.132	109.221	22.408	301.866
3/13/2012 22:32	17256.932	109.179	22.406	301.964
3/13/2012 22:32	17262.332	108.871	22.403	302.676
3/13/2012 22:32	17267.132	108.52	22.407	303.485
3/13/2012 22:32	17273.132	108.214	22.401	304.191
3/13/2012 22:32	17279.132	107.952	22.4	304.798
3/13/2012 22:32	17285.132	107.707	22.403	305.362
3/13/2012 22:32	17291.732	107.426	22.403	306.012
3/13/2012 22:33	17298.932	107.12	22.403	306.718
3/13/2012 22:33	17306.732	106.669	22.403	307.758
3/13/2012 22:33	17314.532	106.373	22.403	308.442
3/13/2012 22:33	17322.932	105.953	22.405	309.411
3/13/2012 22:33	17331.932	105.508	22.411	310.44
3/13/2012 22:33	17341.532	105.139	22.414	311.292
3/13/2012 22:33	17351.132	104.693	22.413	312.321
3/13/2012 22:34	17361.932	104.301	22.416	313.227
3/13/2012 22:34	17373.332	103.841	22.42	314.289
3/13/2012 22:34	17385.332	103.454	22.422	315.183
3/13/2012 22:34	17397.932	103.14	22.424	315.908

TW-2 Step Test Data

3/13/2012 22:34	17411.132	102.846	22.431	316.587
3/13/2012 22:35	17425.532	102.404	22.429	317.606
3/13/2012 22:35	17440.532	102.066	22.431	318.387
3/13/2012 22:35	17456.132	101.676	22.434	319.287
3/13/2012 22:35	17472.932	101.452	22.434	319.805
3/13/2012 22:36	17490.932	101.082	22.435	320.659
3/13/2012 22:36	17509.532	100.87	22.434	321.15
3/13/2012 22:36	17529.932	100.528	22.43	321.938
3/13/2012 22:37	17550.932	100.339	22.429	322.374
3/13/2012 22:37	17573.132	99.997	22.426	323.165
3/13/2012 22:38	17597.132	99.818	22.421	323.578
3/13/2012 22:38	17622.332	99.534	22.419	324.234
3/13/2012 22:38	17648.732	99.295	22.416	324.785
3/13/2012 22:39	17676.932	99.203	22.411	324.997
3/13/2012 22:39	17706.932	98.876	22.406	325.753
3/13/2012 22:40	17738.732	98.65	22.401	326.274
3/13/2012 22:40	17772.332	98.488	22.396	326.649
3/13/2012 22:41	17808.332	98.184	22.392	327.351
3/13/2012 22:42	17844.332	98.045	22.39	327.672
3/13/2012 22:42	17886.332	97.752	22.392	328.348
3/13/2012 22:43	17928.332	97.669	22.385	328.54
3/13/2012 22:44	17970.332	97.357	22.385	329.259
3/13/2012 22:45	18018.332	97.024	22.38	330.03
3/13/2012 22:45	18072.332	96.761	22.384	330.637
3/13/2012 22:46	18120.332	96.469	22.379	331.31
3/13/2012 22:47	18180.332	96.205	22.38	331.92
3/13/2012 22:48	18240.332	95.744	22.383	332.984
3/13/2012 22:49	18300.332	95.366	22.381	333.858
3/13/2012 22:50	18366.332	95.026	22.384	334.641
3/13/2012 22:52	18438.332	94.701	22.384	335.392
3/13/2012 22:53	18516.332	94.495	22.383	335.868
3/13/2012 22:54	18594.332	94.209	22.384	336.529
3/13/2012 22:56	18678.332	94.012	22.387	336.984
3/13/2012 22:57	18768.332	93.495	22.386	338.178
3/13/2012 22:59	18864.332	93.349	22.39	338.515

1367660 - initial flow meter

Pump Test @ 110 gpm

Pump set at 571' bgs

TW-2 (CS-13 Test Well) Pumping Test

WELL TW-2 **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl^- *(PPM)*	Initials	Notes
3-14-2012	12:00	205.95	206.66	119.0	—	EN	1367660 initial flow meter
	1205	274.29	273.44	111.5	—		WL meter sticking
	1210	287.12	285.56	110.0	—		"
	1215	292.49	291.88	109.0	—		"
	1220	295.95	295.86	107.0	—		"
	1225	298.45	298.10	107.0	—		"
	1230	303.50	303.02	110.0	0.09		1235 0.09 ppm Cl^-
	1240	307.49	307.17	108.5	—		—
	1250	313.90	313.63	111.0	—		light rain
	1300	316.78	316.49	110.0	—		"
	1400	326.89	326.60	112.0	0.08	SP	—
	1500	334.05	333.86	105.0	—	EN	SP, JB head out
	1600	337.90	337.56	110.0	—	EN	—
	1700	344.48	344.04	110.0	0.09	EN	—
	1800	347.63	347.23	114.0	—	EN	—
	1900	351.72	351.25	110.0	0.04	EN	—
	2000	352.97	353.37	110.0	0.01	EN	—
	2100	356.10	355.67	109.0	0.00	EN	—
	2200	—	—	—	—	EN	—
	2300	362.63	362.10	107.0	—	EN	—
3/15/2012	0000	364.68	364.21	112.0	0.01	EN	1445825 flow meter
	0200	367.30	366.77	107.5	0.02	SP	
	0400	371.13	370.70	110.0	0.00	SP	Cond = 651 µS/cm; pH = 7.07

Temp = 20.6°C

TW-2 (CS-13 Test Well) Pumping Test

WELL TW-2 (CS-13) **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl *(PPM)*	Initials	Notes
3-15-12	0600	373.39	372.88	110.0	0.00	SP	BACT Samples 540 mph Wind
	0800	375.20	374.80	110.0	0.00	JDB	SP offsite @ 0730
	0930	376.58	376.0	110.0	0.00	JDB	collected samples @ 0830
	1200	378.35	—	110.0	0.01	EN	TOTALIZER: 1509680 (after sampling) slightly cloudy
	1300	379.00	—	110.0	—	EN	
	1400	380.40	—	110.0	—	EN	
	1443	—	380.22	110.0	—	EN	
	1500	381.05	—	110.0	—	EN	
	1600	381.67	—	110.0	—	EN	
	1700	382.30	—	110.0	—	EN	
	1800	383.80	—	110.0	—	EN	
	1811	—	382.23	100.0	0.00	EN	
	2106	386.74	386.13	111.0	0.00	EN	
	2354	—	—	110.5	0.00	EN	Sample @ 1130
3-16-12	2359	388.24	387.67	110.5	0.00	EN	1603788 gall Totalizer

TW-2 (CS-13 Test Well) Pumping Test

WELL TW-2 Recovery Test **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl⁻ *(PPM)*	Initials	Notes
3.16.12	0000	388.24	387.67	~~40.5~~	0.00	SP	
	0005	313.70	313.74	—	—	EN	
	0010	303.00	302.84	—	—	EN	
	0015	—	297.20	—	—	EN	
	0020	299.62	293.46	—	—	EN	
	0025	290.81	290.66	—	—	EN	
	0030	288.60	288.37	—	—	EN	
	0040	284.98	284.81	—	—	EN	
	0050	282.09	282.05	—	—	EN	
	0100	280.06	279.80	—	—	EN	
	0110	277.98	277.89	—	—	EN	
	0120	276.37	276.17	—	—	EN	
↓	0130	274.85	274.63	—	—	EN	
3-17-12	1000	245.19	245.13	—	—	SP	~~End Test~~ SP
	1131	242.19	242.17	—	—	SP	

Report Date: 5/16/2012 6:02:56 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:

File Name:	TW2 PUMP TEST 2012-03-19 13.45.26.wsl
Create Date:	3/19/2012 1:44:50 PM

Device Properties:

Device:	Level TROLL 700
Site:	TW2
Device Name:	
Serial Number:	170526
Firmware Version:	2.08
Hardware Version:	
Device Address:	
Device Comm Cfg:	
Used Memory(%):	
Used Battery(%):	

Log Configuration

Log Name:	TW2 PUMP TEST
Created By:	Unknown
Computer Name:	Pocket PC
Application:	WinSituMobile.exe
Application Version:	5.4.2.0
Create Date:	3/14/2012 11:49:53 AM Central Standard Time (Ignore DST)
Log Setup Time Zone:	Unknown
Notes Size(bytes):	4096
Overwrite when full:	Disabled
Scheduled Start Time:	Manual Start
Scheduled Stop Time:	No Stop Time
Type:	True Logarithmic
Max Interval:	Days: 0 hrs: 00 mins: 05 secs: 00

Level Reference Settings At Log Creation

Level Measurement Mode:	Level Depth To Water
Specific Gravity:	0.999
Level Reference Mode:	Set new reference
Level Reference Value:	205.97 (ft)
Level Reference Head Pressure:	150.329 (PSI)

Other Log Settings

Depth of Probe:	347.101 (ft)
Head Pressure:	150.327 (PSI)
Temperature:	21.7749 (C)

Log Notes:

Date and Time	Note
3/14/2012 11:49:22 AM	User Note: "Level reference initialized to: 205.97"
3/14/2012 11:59:51 AM	Manual Start Command
3/15/2012 11:59:49 PM	Restart Command
3/16/2012 11:32:10 AM	User Note: "Downloading log - Used Batt: 11% Memory: 3% User: Unkn
3/19/2012 1:37:33 PM	Manual Stop Command

Log Data:

Record Count: 1709

Sensors: 1 170526 Pressure/Temp 300 PSIG (211m/692ft)

1 - 170526: Pressure/Temp 300 PSIG (211m/692ft)

Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 692ft SN#: 170526 Pressure (PSI)	Sensor: Pres(G) 692ft SN#: 170526 Temperature (C)	Sensor: Pres(G) 692ft SN#: 170526 Level Depth To Water (ft)
3/14/2012 11:59	0	150.415	21.677	205.771
3/14/2012 11:59	0.25	150.461	21.697	205.666
3/14/2012 11:59	0.556	150.409	21.714	205.787
3/14/2012 11:59	0.776	150.386	21.727	205.84
3/14/2012 11:59	0.996	150.431	21.736	205.735
3/14/2012 11:59	1.25	150.396	21.741	205.816
3/14/2012 11:59	1.5	150.365	21.743	205.887
3/14/2012 11:59	1.75	150.418	21.746	205.764
3/14/2012 11:59	2	150.395	21.75	205.819
3/14/2012 11:59	2.25	150.415	21.756	205.773
3/14/2012 11:59	2.5	150.41	21.757	205.784
3/14/2012 11:59	2.75	150.396	21.756	205.816
3/14/2012 11:59	3	149.576	21.759	207.709
3/14/2012 11:59	3.25	147.241	21.763	213.1
3/14/2012 11:59	3.5	143.714	21.763	221.244
3/14/2012 11:59	3.75	142.609	21.766	223.795
3/14/2012 11:59	4	144.652	21.768	219.078
3/14/2012 11:59	4.25	151.576	21.769	203.092
3/14/2012 11:59	4.5	153.246	21.769	199.236
3/14/2012 11:59	4.75	152.601	21.771	200.724
3/14/2012 11:59	5	151.305	21.771	203.716
3/14/2012 11:59	5.25	150.534	21.772	205.497
3/14/2012 11:59	5.5	150.061	21.772	206.589
3/14/2012 11:59	5.75	149.662	21.774	207.511
3/14/2012 11:59	6	149.534	21.776	207.806
3/14/2012 11:59	6.36	149.318	21.77	208.305
3/14/2012 11:59	6.72	149.097	21.764	208.814
3/14/2012 11:59	7.14	148.91	21.756	209.248
3/14/2012 11:59	7.56	148.736	21.75	209.649
3/14/2012 11:59	7.98	148.489	21.749	210.219
3/14/2012 11:59	8.46	148.35	21.747	210.541
3/14/2012 12:00	9	148.187	21.744	210.917

3/14/2012 12:00	9.48	148.074	21.742	211.177
3/14/2012 12:00	10.08	147.813	21.735	211.781
3/14/2012 12:00	10.68	147.688	21.733	212.068
3/14/2012 12:00	11.28	147.483	21.732	212.542
3/14/2012 12:00	11.94	147.268	21.731	213.039
3/14/2012 12:00	12.66	147.124	21.727	213.371
3/14/2012 12:00	13.44	146.88	21.727	213.933
3/14/2012 12:00	14.22	146.707	21.721	214.335
3/14/2012 12:00	15.06	146.443	21.721	214.943
3/14/2012 12:00	15.96	146.171	21.72	215.57
3/14/2012 12:00	16.92	145.957	21.716	216.066
3/14/2012 12:00	17.88	145.729	21.716	216.592
3/14/2012 12:00	18.96	145.484	21.712	217.158
3/14/2012 12:00	20.1	145.222	21.71	217.763
3/14/2012 12:00	21.3	144.957	21.708	218.374
3/14/2012 12:00	22.56	144.653	21.704	219.077
3/14/2012 12:00	23.88	144.327	21.704	219.829
3/14/2012 12:00	25.32	144.029	21.698	220.517
3/14/2012 12:00	26.82	143.799	21.696	221.049
3/14/2012 12:00	28.38	143.463	21.694	221.824
3/14/2012 12:00	30.06	143.127	21.693	222.599
3/14/2012 12:00	31.86	142.831	21.689	223.283
3/14/2012 12:00	33.72	142.474	21.685	224.107
3/14/2012 12:00	35.76	142.106	21.684	224.958
3/14/2012 12:00	37.86	141.647	21.681	226.018
3/14/2012 12:00	40.08	141.381	21.677	226.632
3/14/2012 12:00	42.48	140.899	21.674	227.745
3/14/2012 12:00	45	140.435	21.667	228.816
3/14/2012 12:00	47.64	139.987	21.665	229.851
3/14/2012 12:00	50.46	139.538	21.66	230.886
3/14/2012 12:00	53.46	138.981	21.659	232.174
3/14/2012 12:00	56.64	138.574	21.652	233.111
3/14/2012 12:00	60	137.95	21.651	234.553
3/14/2012 12:00	63.6	137.446	21.642	235.716
3/14/2012 12:00	67.199	136.913	21.64	236.947
3/14/2012 12:01	71.4	136.242	21.631	238.498
3/14/2012 12:01	75.6	135.79	21.629	239.541
3/14/2012 12:01	79.8	135.13	21.624	241.064
3/14/2012 12:01	84.6	134.608	21.617	242.269
3/14/2012 12:01	90	133.878	21.612	243.957
3/14/2012 12:01	94.8	133.374	21.606	245.12
3/14/2012 12:01	100.8	132.936	21.602	246.131
3/14/2012 12:01	106.8	132.392	21.597	247.387
3/14/2012 12:01	112.8	131.722	21.588	248.933
3/14/2012 12:01	119.4	131.14	21.586	250.278
3/14/2012 12:01	126.6	130.435	21.58	251.905
3/14/2012 12:02	134.4	129.871	21.571	253.207
3/14/2012 12:02	142.2	129.2	21.567	254.757
3/14/2012 12:02	150.6	128.459	21.556	256.469
3/14/2012 12:02	159.6	127.855	21.556	257.862
3/14/2012 12:02	169.2	127.223	21.55	259.321
3/14/2012 12:02	178.8	126.696	21.545	260.538
3/14/2012 12:03	189.6	126.053	21.542	262.023
3/14/2012 12:03	201	125.463	21.536	263.387

3/14/2012 12:03	213	124.842	21.538	264.82
3/14/2012 12:03	225.6	124.143	21.533	266.433
3/14/2012 12:03	238.8	123.745	21.532	267.351
3/14/2012 12:04	253.2	123.119	21.531	268.797
3/14/2012 12:04	268.199	122.576	21.531	270.051
3/14/2012 12:04	283.799	121.999	21.532	271.383
3/14/2012 12:04	300.6	121.454	21.533	272.642
3/14/2012 12:05	318.599	120.932	21.538	273.847
3/14/2012 12:05	337.2	120.36	21.544	275.169
3/14/2012 12:05	357.6	119.856	21.551	276.333
3/14/2012 12:06	378.599	119.329	21.56	277.548
3/14/2012 12:06	400.799	118.862	21.578	278.627
3/14/2012 12:06	424.799	118.425	21.583	279.635
3/14/2012 12:07	450.019	117.936	21.626	280.765
3/14/2012 12:07	476.4	117.58	21.602	281.587
3/14/2012 12:08	504.599	116.98	21.617	282.973
3/14/2012 12:08	534.599	116.621	21.632	283.801
3/14/2012 12:09	566.4	116.174	21.644	284.833
3/14/2012 12:09	600.024	115.787	21.663	285.726
3/14/2012 12:10	636	115.403	21.677	286.615
3/14/2012 12:11	671.999	115.043	21.699	287.444
3/14/2012 12:11	713.999	114.607	21.718	288.452
3/14/2012 12:12	756	114.192	21.731	289.41
3/14/2012 12:13	797.999	113.842	21.747	290.217
3/14/2012 12:13	845.999	113.572	21.767	290.842
3/14/2012 12:14	900.018	113.23	21.791	291.63
3/14/2012 12:15	948	112.847	21.805	292.515
3/14/2012 12:16	1008	112.461	21.827	293.407
3/14/2012 12:17	1068	112.239	21.848	293.92
3/14/2012 12:18	1128	111.934	21.864	294.624
3/14/2012 12:19	1194	111.605	21.888	295.383
3/14/2012 12:20	1265.999	111.344	21.904	295.986
3/14/2012 12:22	1343.999	110.914	21.925	296.979
3/14/2012 12:23	1421.999	110.691	21.948	297.494
3/14/2012 12:24	1505.999	110.363	21.963	298.251
3/14/2012 12:26	1596	109.822	21.984	299.501
3/14/2012 12:28	1691.999	109.089	22.004	301.192
3/14/2012 12:29	1788	108.457	22.015	302.651
3/14/2012 12:31	1896	107.942	22.035	303.84
3/14/2012 12:33	2010.124	107.516	22.086	304.825
3/14/2012 12:35	2130.121	107.168	22.107	305.628
3/14/2012 12:37	2256	106.881	22.095	306.29
3/14/2012 12:39	2388	106.517	22.114	307.131
3/14/2012 12:42	2531.999	105.833	22.137	308.711
3/14/2012 12:44	2681.999	104.903	22.153	310.858
3/14/2012 12:47	2837.999	104.271	22.166	312.318
3/14/2012 12:49	3005.999	103.784	22.189	313.441
3/14/2012 12:52	3185.999	103.325	22.209	314.502
3/14/2012 12:56	3371.999	102.907	22.244	315.465
3/14/2012 12:59	3575.999	102.621	22.249	316.126
3/14/2012 13:02	3785.999	102.28	22.267	316.915
3/14/2012 13:06	4008	101.885	22.286	317.826
3/14/2012 13:10	4248	101.554	22.296	318.591
3/14/2012 13:14	4500	101.292	22.31	319.195

3/14/2012 13:19	4764	100.919	22.33	320.057
3/14/2012 13:23	5046	100.725	22.347	320.505
3/14/2012 13:28	5346	100.295	22.367	321.497
3/14/2012 13:33	5646	100.063	22.387	322.032
3/14/2012 13:38	5946	99.806	22.4	322.626
3/14/2012 13:43	6246	99.555	22.415	323.206
3/14/2012 13:48	6546	98.88	22.427	324.766
3/14/2012 13:53	6846	98.451	22.443	325.756
3/14/2012 13:58	7146.012	98.236	22.484	326.253
3/14/2012 14:03	7446	97.97	22.472	326.866
3/14/2012 14:08	7746	97.761	22.483	327.349
3/14/2012 14:13	8046	97.58	22.491	327.767
3/14/2012 14:18	8346	97.328	22.503	328.349
3/14/2012 14:23	8646	96.702	22.516	329.795
3/14/2012 14:28	8946	96.384	22.523	330.528
3/14/2012 14:33	9246	96.128	22.534	331.12
3/14/2012 14:38	9546	95.955	22.545	331.519
3/14/2012 14:43	9846	95.697	22.553	332.113
3/14/2012 14:48	10146	95.629	22.562	332.271
3/14/2012 14:53	10446	95.372	22.573	332.864
3/14/2012 14:58	10746	95.176	22.581	333.318
3/14/2012 15:03	11046	95.049	22.594	333.611
3/14/2012 15:08	11346	94.926	22.596	333.895
3/14/2012 15:13	11646	94.643	22.61	334.549
3/14/2012 15:18	11946	94.569	22.613	334.718
3/14/2012 15:23	12246	94.458	22.622	334.974
3/14/2012 15:28	12546	94.253	22.627	335.448
3/14/2012 15:33	12846	94.115	22.638	335.768
3/14/2012 15:38	13146	93.919	22.647	336.219
3/14/2012 15:43	13446	93.797	22.653	336.502
3/14/2012 15:48	13746	93.65	22.66	336.841
3/14/2012 15:53	14046	93.59	22.667	336.979
3/14/2012 15:58	14345.999	93.397	22.689	337.424
3/14/2012 16:03	14646	93.264	22.677	337.731
3/14/2012 16:08	14946	93.152	22.682	337.99
3/14/2012 16:13	15246	92.972	22.691	338.407
3/14/2012 16:18	15546	92.896	22.696	338.583
3/14/2012 16:23	15846	92.751	22.698	338.917
3/14/2012 16:28	16146	92.363	22.704	339.813
3/14/2012 16:33	16446	92.043	22.712	340.55
3/14/2012 16:38	16746	91.783	22.714	341.151
3/14/2012 16:43	17046	91.735	22.72	341.261
3/14/2012 16:48	17346	91.584	22.724	341.61
3/14/2012 16:53	17646	91.397	22.729	342.043
3/14/2012 16:58	17946	90.805	22.736	343.41
3/14/2012 17:03	18246	90.467	22.741	344.19
3/14/2012 17:08	18546	90.344	22.741	344.473
3/14/2012 17:13	18846	90.149	22.745	344.924
3/14/2012 17:18	19146	90.051	22.754	345.151
3/14/2012 17:23	19446	90.014	22.758	345.235
3/14/2012 17:28	19746	89.771	22.761	345.798
3/14/2012 17:33	20046	89.771	22.766	345.798
3/14/2012 17:38	20346	89.616	22.771	346.155
3/14/2012 17:43	20646	89.609	22.776	346.172

3/14/2012 17:48	20946	89.492	22.778	346.442
3/14/2012 17:53	21246	89.324	22.782	346.829
3/14/2012 17:58	21545.999	89.263	22.796	346.971
3/14/2012 18:03	21846	89.162	22.79	347.204
3/14/2012 18:08	22146	88.602	22.793	348.495
3/14/2012 18:13	22446	88.467	22.798	348.807
3/14/2012 18:18	22746	88.265	22.8	349.274
3/14/2012 18:23	23046	88.157	22.804	349.524
3/14/2012 18:28	23346	88.07	22.811	349.724
3/14/2012 18:33	23646	87.879	22.814	350.166
3/14/2012 18:38	23946	87.919	22.815	350.074
3/14/2012 18:43	24246	87.772	22.821	350.413
3/14/2012 18:48	24546	87.67	22.822	350.648
3/14/2012 18:53	24846	87.548	22.827	350.929
3/14/2012 18:58	25146	87.482	22.827	351.083
3/14/2012 19:03	25446	87.434	22.835	351.194
3/14/2012 19:08	25746	87.324	22.836	351.447
3/14/2012 19:13	26046	87.251	22.838	351.615
3/14/2012 19:18	26346	87.172	22.841	351.798
3/14/2012 19:23	26646	87.048	22.844	352.084
3/14/2012 19:28	26946	87.023	22.846	352.143
3/14/2012 19:33	27246	86.914	22.848	352.393
3/14/2012 19:38	27546	86.848	22.849	352.546
3/14/2012 19:43	27846	86.82	22.854	352.611
3/14/2012 19:48	28146	86.702	22.857	352.883
3/14/2012 19:53	28446	86.612	22.861	353.09
3/14/2012 19:58	28746	86.537	22.868	353.264
3/14/2012 20:03	29046	86.443	22.866	353.482
3/14/2012 20:08	29346	86.354	22.867	353.686
3/14/2012 20:13	29646	86.301	22.867	353.81
3/14/2012 20:18	29946	86.227	22.871	353.981
3/14/2012 20:23	30246	86.214	22.876	354.009
3/14/2012 20:28	30546	86.049	22.874	354.39
3/14/2012 20:33	30846	85.95	22.878	354.619
3/14/2012 20:38	31146	85.886	22.88	354.767
3/14/2012 20:43	31446	85.853	22.883	354.844
3/14/2012 20:48	31746	85.744	22.884	355.096
3/14/2012 20:53	32046	85.62	22.889	355.382
3/14/2012 20:58	32346	85.6	22.891	355.428
3/14/2012 21:03	32646	85.37	22.894	355.958
3/14/2012 21:08	32946	84.759	22.892	357.371
3/14/2012 21:13	33246	84.563	22.891	357.822
3/14/2012 21:18	33546	84.421	22.895	358.15
3/14/2012 21:23	33846	84.274	22.896	358.491
3/14/2012 21:28	34146	84.155	22.897	358.765
3/14/2012 21:33	34446	84.079	22.901	358.94
3/14/2012 21:38	34746	84.047	22.9	359.014
3/14/2012 21:43	35046	83.935	22.906	359.272
3/14/2012 21:48	35346	83.792	22.906	359.601
3/14/2012 21:53	35646	83.678	22.907	359.866
3/14/2012 21:58	35946	83.636	22.909	359.964
3/14/2012 22:03	36246	83.472	22.908	360.342
3/14/2012 22:08	36546	83.458	22.914	360.375
3/14/2012 22:13	36846	83.441	22.912	360.413

3/14/2012 22:18	37146	83.245	22.92	360.865
3/14/2012 22:23	37446	83.271	22.917	360.806
3/14/2012 22:28	37746	83.083	22.917	361.24
3/14/2012 22:33	38046	83.12	22.919	361.155
3/14/2012 22:38	38346	83.022	22.921	361.381
3/14/2012 22:43	38646	83.004	22.923	361.421
3/14/2012 22:48	38946	82.936	22.925	361.579
3/14/2012 22:53	39246	82.871	22.926	361.728
3/14/2012 22:58	39545.999	82.75	22.95	362.008
3/14/2012 23:03	39846	82.695	22.936	362.137
3/14/2012 23:08	40146	82.703	22.927	362.118
3/14/2012 23:13	40446	82.596	22.93	362.365
3/14/2012 23:18	40746	82.533	22.932	362.509
3/14/2012 23:23	41046	82.544	22.933	362.484
3/14/2012 23:28	41346	82.391	22.933	362.836
3/14/2012 23:33	41646	82.373	22.933	362.88
3/14/2012 23:38	41946	82.335	22.939	362.966
3/14/2012 23:43	42246	82.245	22.936	363.174
3/14/2012 23:48	42546	82.157	22.939	363.378
3/14/2012 23:53	42846	82.046	22.94	363.634
3/14/2012 23:58	43145.999	81.889	22.961	363.997
3/15/2012 0:03	43445.999	81.893	22.966	363.988
3/15/2012 0:08	43745.999	81.83	22.965	364.132
3/15/2012 0:13	44045.999	81.734	22.965	364.355
3/15/2012 0:18	44345.999	81.697	22.97	364.441
3/15/2012 0:23	44645.999	81.718	22.97	364.392
3/15/2012 0:28	44945.999	81.547	22.973	364.787
3/15/2012 0:33	45245.999	81.565	22.97	364.746
3/15/2012 0:38	45545.999	81.483	22.97	364.934
3/15/2012 0:43	45845.999	81.427	22.972	365.063
3/15/2012 0:48	46145.999	81.338	22.973	365.269
3/15/2012 0:53	46445.999	81.323	22.978	365.303
3/15/2012 0:58	46745.999	81.286	22.976	365.39
3/15/2012 1:03	47045.999	81.198	22.979	365.592
3/15/2012 1:08	47345.999	81.167	22.978	365.664
3/15/2012 1:13	47645.999	81.139	22.978	365.729
3/15/2012 1:18	47946	81.101	22.978	365.817
3/15/2012 1:23	48245.999	81.091	22.983	365.84
3/15/2012 1:28	48545.999	80.908	22.985	366.261
3/15/2012 1:33	48845.999	80.92	22.982	366.233
3/15/2012 1:38	49145.999	80.918	22.983	366.238
3/15/2012 1:43	49445.999	80.787	22.99	366.541
3/15/2012 1:48	49745.999	80.755	22.984	366.614
3/15/2012 1:53	50045.999	80.786	22.987	366.542
3/15/2012 1:58	50345.999	80.659	22.989	366.836
3/15/2012 2:03	50646	80.418	22.967	367.394
3/15/2012 2:08	50946	80.165	22.967	367.977
3/15/2012 2:13	51246	80.034	22.962	368.28
3/15/2012 2:18	51546	79.991	22.966	368.378
3/15/2012 2:23	51846	79.851	22.968	368.702
3/15/2012 2:28	52146	79.906	22.97	368.575
3/15/2012 2:33	52446	79.797	22.97	368.827
3/15/2012 2:38	52746	79.806	22.969	368.807
3/15/2012 2:43	53046	79.744	22.97	368.949

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3/15/2012 2:53	53646	79.682	22.973	369.093
3/15/2012 2:58	53946	79.593	22.971	369.297
3/15/2012 3:03	54246	79.575	22.973	369.34
3/15/2012 3:08	54546	79.569	22.973	369.354
3/15/2012 3:13	54846	79.54	22.973	369.42
3/15/2012 3:18	55146	79.475	22.973	369.571
3/15/2012 3:23	55446	79.406	22.973	369.729
3/15/2012 3:28	55746	79.394	22.976	369.758
3/15/2012 3:33	56046	79.319	22.977	369.931
3/15/2012 3:38	56346	79.295	22.978	369.985
3/15/2012 3:43	56646	79.176	22.979	370.26
3/15/2012 3:48	56946	79.18	22.976	370.251
3/15/2012 3:53	57246	79.175	22.979	370.263
3/15/2012 3:58	57546	79.102	22.98	370.431
3/15/2012 4:03	57845.999	79.091	22.992	370.457
3/15/2012 4:08	58146	79.018	22.984	370.625
3/15/2012 4:13	58446	78.97	22.983	370.737
3/15/2012 4:18	58746	78.87	22.984	370.967
3/15/2012 4:23	59046	78.915	22.981	370.862
3/15/2012 4:28	59346	78.869	22.986	370.97
3/15/2012 4:33	59646	78.778	22.986	371.18
3/15/2012 4:38	59946	78.834	22.986	371.051
3/15/2012 4:43	60246	78.759	22.982	371.223
3/15/2012 4:48	60546	78.679	22.986	371.409
3/15/2012 4:53	60846	78.605	22.986	371.578
3/15/2012 4:58	61146	78.609	22.985	371.571
3/15/2012 5:03	61446	78.65	22.99	371.476
3/15/2012 5:08	61746	78.56	22.987	371.683
3/15/2012 5:13	62046	78.49	22.987	371.846
3/15/2012 5:18	62346	78.496	22.988	371.83
3/15/2012 5:23	62646	78.397	22.991	372.06
3/15/2012 5:28	62946	78.401	22.99	372.051
3/15/2012 5:33	63246	78.307	22.994	372.267
3/15/2012 5:38	63546	78.264	22.991	372.367
3/15/2012 5:43	63846	78.312	22.992	372.255
3/15/2012 5:48	64146	78.242	22.994	372.418
3/15/2012 5:53	64446	78.2	22.992	372.515
3/15/2012 5:58	64746	78.135	22.992	372.665
3/15/2012 6:03	65046	78.181	22.991	372.557
3/15/2012 6:08	65346	78.13	22.992	372.676
3/15/2012 6:13	65646	78.101	22.993	372.743
3/15/2012 6:18	65946	77.83	22.991	373.369
3/15/2012 6:23	66246	78.022	22.992	372.925
3/15/2012 6:28	66546	78.074	22.994	372.806
3/15/2012 6:33	66846	77.995	22.996	372.987
3/15/2012 6:38	67146	77.944	22.993	373.106
3/15/2012 6:43	67446	77.83	22.993	373.368
3/15/2012 6:48	67746	77.859	22.994	373.302
3/15/2012 6:53	68046	77.746	22.994	373.563
3/15/2012 6:58	68346	77.738	22.993	373.581
3/15/2012 7:03	68646	77.683	22.998	373.707
3/15/2012 7:08	68946	77.687	22.999	373.699
3/15/2012 7:13	69246	77.662	22.999	373.757

3/15/2012 7:18	69546	77.69	22.995	373.691
3/15/2012 7:23	69846	77.546	22.997	374.025
3/15/2012 7:28	70146	77.513	22.996	374.1
3/15/2012 7:33	70446	77.526	22.997	374.071
3/15/2012 7:38	70746	77.483	22.995	374.169
3/15/2012 7:43	71046	77.421	22.998	374.312
3/15/2012 7:48	71346	77.392	23	374.38
3/15/2012 7:53	71646	77.37	23.001	374.432
3/15/2012 7:58	71946	77.42	22.998	374.315
3/15/2012 8:03	72246	77.316	23.009	374.555
3/15/2012 8:08	72546	77.235	23.013	374.742
3/15/2012 8:13	72846	77.283	23.004	374.631
3/15/2012 8:18	73146	77.235	23.006	374.742
3/15/2012 8:23	73446	77.173	23.004	374.885
3/15/2012 8:28	73746	77.149	23.003	374.942
3/15/2012 8:33	74046	77.143	23.006	374.955
3/15/2012 8:38	74346	77.095	23.006	375.066
3/15/2012 8:43	74646	77.023	23.002	375.232
3/15/2012 8:48	74946	76.989	23.008	375.31
3/15/2012 8:53	75246	76.911	23.003	375.49
3/15/2012 8:58	75546	76.883	23.007	375.556
3/15/2012 9:03	75846	76.896	23.007	375.526
3/15/2012 9:08	76146	76.84	23.006	375.655
3/15/2012 9:13	76446	76.895	23.007	375.527
3/15/2012 9:18	76746	76.885	23.006	375.552
3/15/2012 9:23	77046	76.802	23.008	375.741
3/15/2012 9:28	77346	76.8	23.008	375.747
3/15/2012 9:33	77646	76.703	23.01	375.971
3/15/2012 9:38	77945.999	76.725	23.038	375.92
3/15/2012 9:43	78246	76.688	23.014	376.006
3/15/2012 9:48	78546	76.621	23.01	376.161
3/15/2012 9:53	78846	76.622	23.01	376.157
3/15/2012 9:58	79146	76.635	23.01	376.128
3/15/2012 10:03	79446	76.557	23.011	376.308
3/15/2012 10:08	79746	76.553	23.008	376.316
3/15/2012 10:13	80046	76.498	23.014	376.444
3/15/2012 10:18	80346	76.504	23.011	376.43
3/15/2012 10:23	80646	76.485	23.013	376.473
3/15/2012 10:28	80946	76.46	23.012	376.532
3/15/2012 10:33	81246	76.372	23.011	376.735
3/15/2012 10:38	81546	76.399	23.014	376.673
3/15/2012 10:43	81846	76.317	23.014	376.863
3/15/2012 10:48	82146	76.37	23.013	376.74
3/15/2012 10:53	82446	76.329	23.014	376.834
3/15/2012 10:58	82746	76.275	23.015	376.959
3/15/2012 11:03	83046	76.228	23.014	377.068
3/15/2012 11:08	83346	76.188	23.017	377.159
3/15/2012 11:13	83646	76.223	23.015	377.078
3/15/2012 11:18	83946	76.163	23.017	377.218
3/15/2012 11:23	84246	76.137	23.015	377.278
3/15/2012 11:28	84546	76.109	23.016	377.341
3/15/2012 11:33	84846	76.156	23.017	377.234
3/15/2012 11:38	85146	76.152	23.018	377.244
3/15/2012 11:43	85446	76.095	23.017	377.374

3/15/2012 11:48	85746	76.138	23.017	377.275
3/15/2012 11:53	86046	75.977	23.016	377.646
3/15/2012 11:58	86346	75.921	23.017	377.776
3/15/2012 12:03	86646	76.025	23.019	377.536
3/15/2012 12:08	86946	76.008	23.018	377.576
3/15/2012 12:13	87246	75.943	23.021	377.727
3/15/2012 12:18	87546	75.934	23.018	377.745
3/15/2012 12:23	87846	75.922	23.021	377.774
3/15/2012 12:28	88146	75.825	23.022	377.997
3/15/2012 12:33	88446	75.858	23.02	377.922
3/15/2012 12:38	88746	75.84	23.019	377.963
3/15/2012 12:43	89046	75.754	23.019	378.163
3/15/2012 12:48	89346	75.818	23.023	378.014
3/15/2012 12:53	89646	75.748	23.024	378.177
3/15/2012 12:58	89946	75.738	23.021	378.198
3/15/2012 13:03	90246	75.44	23.023	378.887
3/15/2012 13:08	90546	75.36	23.025	379.073
3/15/2012 13:13	90846	75.351	23.029	379.091
3/15/2012 13:18	91146	75.355	23.031	379.082
3/15/2012 13:23	91446	75.211	23.026	379.415
3/15/2012 13:28	91746	75.161	23.03	379.531
3/15/2012 13:33	92046	75.23	23.03	379.371
3/15/2012 13:38	92346	75.218	23.026	379.401
3/15/2012 13:43	92646	75.128	23.027	379.607
3/15/2012 13:48	92946	75.242	23.03	379.343
3/15/2012 13:53	93246	75.189	23.025	379.467
3/15/2012 13:58	93546	75.13	23.028	379.603
3/15/2012 14:03	93846	75.086	23.03	379.705
3/15/2012 14:08	94146	75.033	23.025	379.826
3/15/2012 14:13	94446	75.058	23.028	379.769
3/15/2012 14:18	94746	75.028	23.03	379.838
3/15/2012 14:23	95046	75.018	23.029	379.862
3/15/2012 14:28	95346	74.973	23.03	379.964
3/15/2012 14:33	95646	74.967	23.028	379.978
3/15/2012 14:38	95946	74.945	23.031	380.029
3/15/2012 14:43	96246	74.85	23.038	380.25
3/15/2012 14:48	96546	74.782	23.03	380.406
3/15/2012 14:53	96846	74.916	23.032	380.098
3/15/2012 14:58	97146	74.894	23.033	380.148
3/15/2012 15:03	97446	74.869	23.032	380.207
3/15/2012 15:08	97746	74.827	23.032	380.302
3/15/2012 15:13	98046	74.781	23.029	380.409
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3/15/2012 15:28	98946	74.638	23.03	380.738
3/15/2012 15:33	99246	74.705	23.03	380.585
3/15/2012 15:38	99546	74.658	23.03	380.693
3/15/2012 15:43	99846	74.629	23.033	380.76
3/15/2012 15:48	100146	74.618	23.031	380.785
3/15/2012 15:53	100446	74.611	23.029	380.8
3/15/2012 15:58	100746	74.51	23.03	381.033
3/15/2012 16:03	101046	74.587	23.032	380.857
3/15/2012 16:08	101346	74.604	23.033	380.818
3/15/2012 16:13	101646	74.512	23.032	381.03

3/15/2012 16:18	101946	74.499	23.033	381.059
3/15/2012 16:23	102246	74.523	23.033	381.004
3/15/2012 16:28	102546	74.407	23.032	381.273
3/15/2012 16:33	102846	74.435	23.034	381.209
3/15/2012 16:38	103146	74.388	23.034	381.316
3/15/2012 16:43	103446	74.366	23.032	381.366
3/15/2012 16:48	103746	74.346	23.033	381.412
3/15/2012 16:53	104046	74.294	23.038	381.532
3/15/2012 16:58	104346	74.415	23.031	381.254
3/15/2012 17:03	104646	74.318	23.035	381.478
3/15/2012 17:08	104946	74.292	23.035	381.539
3/15/2012 17:13	105246	74.228	23.033	381.685
3/15/2012 17:18	105546	74.213	23.035	381.72
3/15/2012 17:23	105846	74.204	23.034	381.742
3/15/2012 17:28	106146	74.202	23.03	381.744
3/15/2012 17:33	106446	74.179	23.035	381.798
3/15/2012 17:38	106746	74.136	23.034	381.897
3/15/2012 17:43	107046	74.136	23.034	381.898
3/15/2012 17:48	107346	74.086	23.037	382.014
3/15/2012 17:53	107646	74.125	23.035	381.923
3/15/2012 17:58	107946	74.091	23.036	382.002
3/15/2012 18:03	108246	74.062	23.039	382.068
3/15/2012 18:08	108546	74.068	23.038	382.054
3/15/2012 18:13	108846	73.974	23.04	382.272
3/15/2012 18:18	109146	73.93	23.038	382.374
3/15/2012 18:23	109446	73.999	23.038	382.215
3/15/2012 18:28	109746	73.931	23.035	382.371
3/15/2012 18:33	110046	73.965	23.038	382.292
3/15/2012 18:38	110346	73.939	23.038	382.353
3/15/2012 18:43	110646	73.887	23.04	382.472
3/15/2012 18:48	110946	73.877	23.039	382.497
3/15/2012 18:53	111246	73.868	23.037	382.517
3/15/2012 18:58	111546	73.806	23.039	382.659
3/15/2012 19:03	111846	73.795	23.039	382.685
3/15/2012 19:08	112146	73.778	23.039	382.725
3/15/2012 19:13	112446	73.723	23.04	382.852
3/15/2012 19:18	112746	73.744	23.039	382.803
3/15/2012 19:23	113046	73.677	23.04	382.957
3/15/2012 19:28	113346	73.683	23.039	382.944
3/15/2012 19:33	113646	73.671	23.039	382.972
3/15/2012 19:38	113946	73.672	23.039	382.968
3/15/2012 19:43	114246	73.649	23.039	383.021
3/15/2012 19:48	114546	73.582	23.04	383.177
3/15/2012 19:53	114846	73.563	23.035	383.221
3/15/2012 19:58	115146	73.614	23.04	383.103
3/15/2012 20:03	115446	72.914	23.035	384.72
3/15/2012 20:08	115746	72.685	23.042	385.247
3/15/2012 20:13	116046	72.635	23.042	385.364
3/15/2012 20:18	116346	72.619	23.045	385.4
3/15/2012 20:23	116646	72.585	23.043	385.479
3/15/2012 20:28	116946	72.545	23.043	385.571
3/15/2012 20:33	117246	72.575	23.043	385.502
3/15/2012 20:38	117546	72.48	23.04	385.722
3/15/2012 20:43	117846	72.515	23.04	385.641

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3/15/2012 20:58	118746	72.421	23.042	385.858
3/15/2012 21:03	119046	72.402	23.04	385.901
3/15/2012 21:08	119346	72.36	23.04	385.999
3/15/2012 21:13	119646	72.391	23.04	385.926
3/15/2012 21:18	119946	72.34	23.04	386.045
3/15/2012 21:23	120246	72.291	23.041	386.158
3/15/2012 21:28	120546	72.231	23.041	386.297
3/15/2012 21:33	120846	72.152	23.041	386.478
3/15/2012 21:38	121146	72.228	23.039	386.304
3/15/2012 21:43	121446	72.244	23.039	386.267
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3/15/2012 21:53	122046	72.126	23.039	386.538
3/15/2012 21:58	122346	72.159	23.04	386.462
3/15/2012 22:03	122646	72.107	23.038	386.583
3/15/2012 22:08	122946	72.017	23.043	386.79
3/15/2012 22:13	123246	72.053	23.041	386.708
3/15/2012 22:18	123546	72.011	23.038	386.805
3/15/2012 22:23	123846	72	23.04	386.83
3/15/2012 22:28	124146	71.984	23.04	386.866
3/15/2012 22:33	124446	72.048	23.042	386.72
3/15/2012 22:38	124746	71.933	23.042	386.986
3/15/2012 22:43	125046	71.895	23.044	387.072
3/15/2012 22:48	125346	71.935	23.041	386.98
3/15/2012 22:53	125646	71.931	23.04	386.989
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3/15/2012 23:03	126246	71.869	23.041	387.133
3/15/2012 23:08	126546	71.789	23.04	387.317
3/15/2012 23:13	126846	71.833	23.041	387.215
3/15/2012 23:18	127146	71.838	23.04	387.203
3/15/2012 23:23	127446	71.741	23.041	387.429
3/15/2012 23:28	127746	71.748	23.04	387.411
3/15/2012 23:33	128046	71.701	23.049	387.519
3/15/2012 23:38	128346	71.61	23.059	387.731
3/15/2012 23:43	128646	71.734	23.061	387.445
3/15/2012 23:48	128946	71.355	23.058	388.32
3/15/2012 23:53	129246	71.83	23.058	387.223
3/15/2012 23:58	129546	71.719	23.058	387.478
3/15/2012 23:59	129597.894	71.711	23.053	387.498
3/15/2012 23:59	129598.144	71.755	23.075	387.396
3/15/2012 23:59	129598.396	71.813	23.087	387.263
3/15/2012 23:59	129598.689	71.732	23.114	387.45
3/15/2012 23:59	129598.91	71.699	23.12	387.525
3/15/2012 23:59	129599.145	71.73	23.123	387.453
3/15/2012 23:59	129599.395	71.715	23.125	387.487
3/15/2012 23:59	129599.645	71.763	23.128	387.376
3/15/2012 23:59	129599.895	71.753	23.13	387.399
3/15/2012 23:59	129600.145	71.739	23.133	387.432
3/15/2012 23:59	129600.395	71.748	23.135	387.412
3/15/2012 23:59	129600.645	77.154	23.136	374.928
3/15/2012 23:59	129600.895	78.546	23.134	371.716
3/15/2012 23:59	129601.145	76.177	23.138	377.185
3/15/2012 23:59	129601.395	72.7	23.141	385.213

3/15/2012 23:59	129601.645	71.106	23.145	388.894
3/15/2012 23:59	129601.895	71.602	23.143	387.749
3/15/2012 23:59	129602.145	70.454	23.145	390.399
3/15/2012 23:59	129602.395	71.844	23.147	387.189
3/15/2012 23:59	129602.645	72.762	23.15	385.071
3/15/2012 23:59	129602.895	73.417	23.143	383.559
3/15/2012 23:59	129603.145	72.784	23.151	385.019
3/15/2012 23:59	129603.395	72.97	23.154	384.59
3/15/2012 23:59	129603.645	72.396	23.15	385.915
3/15/2012 23:59	129603.895	72.503	23.152	385.669
3/15/2012 23:59	129604.255	72.674	23.143	385.275
3/15/2012 23:59	129604.615	73.242	23.139	383.962
3/15/2012 23:59	129605.035	73.422	23.132	383.547
3/15/2012 23:59	129605.455	73.328	23.128	383.763
3/15/2012 23:59	129605.875	73.337	23.126	383.743
3/15/2012 23:59	129606.355	73.62	23.121	383.09
3/15/2012 23:59	129606.895	73.851	23.117	382.555
3/15/2012 23:59	129607.375	73.899	23.116	382.446
3/15/2012 23:59	129607.975	74.177	23.113	381.804
3/15/2012 23:59	129608.575	74.439	23.11	381.197
3/16/2012 0:00	129609.175	74.546	23.108	380.952
3/16/2012 0:00	129609.835	74.672	23.108	380.66
3/16/2012 0:00	129610.554	75.006	23.103	379.89
3/16/2012 0:00	129611.335	75.155	23.101	379.546
3/16/2012 0:00	129612.115	75.458	23.102	378.846
3/16/2012 0:00	129612.955	75.671	23.101	378.353
3/16/2012 0:00	129613.855	75.921	23.097	377.777
3/16/2012 0:00	129614.814	76.246	23.097	377.027
3/16/2012 0:00	129615.775	76.52	23.096	376.393
3/16/2012 0:00	129616.855	76.811	23.093	375.722
3/16/2012 0:00	129617.995	77.12	23.092	375.008
3/16/2012 0:00	129619.195	77.502	23.092	374.126
3/16/2012 0:00	129620.455	77.82	23.091	373.392
3/16/2012 0:00	129621.775	78.176	23.09	372.569
3/16/2012 0:00	129623.215	78.552	23.088	371.702
3/16/2012 0:00	129624.715	78.933	23.089	370.822
3/16/2012 0:00	129626.274	79.352	23.088	369.855
3/16/2012 0:00	129627.955	79.759	23.086	368.914
3/16/2012 0:00	129629.755	80.218	23.085	367.855
3/16/2012 0:00	129631.615	80.667	23.083	366.818
3/16/2012 0:00	129633.655	81.153	23.082	365.696
3/16/2012 0:00	129635.754	81.633	23.084	364.588
3/16/2012 0:00	129637.974	82.164	23.083	363.361
3/16/2012 0:00	129640.375	82.691	23.081	362.145
3/16/2012 0:00	129642.895	83.243	23.078	360.87
3/16/2012 0:00	129645.535	83.812	23.079	359.557
3/16/2012 0:00	129648.355	84.408	23.079	358.18
3/16/2012 0:00	129651.355	85.014	23.077	356.781
3/16/2012 0:00	129654.535	85.624	23.075	355.374
3/16/2012 0:00	129657.895	86.262	23.077	353.898
3/16/2012 0:00	129661.494	86.925	23.074	352.369
3/16/2012 0:00	129665.095	87.548	23.073	350.93
3/16/2012 0:01	129669.295	88.242	23.071	349.328
3/16/2012 0:01	129673.494	88.93	23.068	347.74

3/16/2012 0:01	129677.695	89.569	23.069	346.265
3/16/2012 0:01	129682.494	90.25	23.066	344.69
3/16/2012 0:01	129687.895	90.963	23.066	343.045
3/16/2012 0:01	129692.695	91.606	23.069	341.559
3/16/2012 0:01	129698.694	92.401	23.065	339.724
3/16/2012 0:01	129704.695	93.109	23.064	338.091
3/16/2012 0:01	129710.694	93.776	23.064	336.55
3/16/2012 0:01	129717.294	94.454	23.062	334.984
3/16/2012 0:01	129724.495	95.177	23.062	333.315
3/16/2012 0:02	129732.294	95.88	23.062	331.691
3/16/2012 0:02	129740.095	96.545	23.063	330.157
3/16/2012 0:02	129748.495	97.205	23.06	328.633
3/16/2012 0:02	129757.494	97.873	23.056	327.09
3/16/2012 0:02	129767.094	98.497	23.057	325.648
3/16/2012 0:02	129776.695	99.083	23.06	324.295
3/16/2012 0:02	129787.494	99.7	23.062	322.872
3/16/2012 0:03	129798.894	100.284	23.058	321.524
3/16/2012 0:03	129810.895	100.858	23.062	320.197
3/16/2012 0:03	129823.668	101.387	23.063	318.976
3/16/2012 0:03	129836.694	101.908	23.062	317.774
3/16/2012 0:04	129851.094	102.414	23.065	316.606
3/16/2012 0:04	129866.094	102.937	23.067	315.397
3/16/2012 0:04	129881.694	103.387	23.066	314.359
3/16/2012 0:04	129898.494	103.826	23.069	313.344
3/16/2012 0:05	129916.494	104.294	23.072	312.263
3/16/2012 0:05	129935.094	104.691	23.076	311.348
3/16/2012 0:05	129955.494	105.135	23.075	310.323
3/16/2012 0:06	129976.494	105.522	23.074	309.429
3/16/2012 0:06	129998.694	105.915	23.076	308.521
3/16/2012 0:06	130022.694	106.313	23.075	307.601
3/16/2012 0:07	130047.894	106.675	23.081	306.767
3/16/2012 0:07	130074.294	107.036	23.094	305.934
3/16/2012 0:08	130102.494	107.395	23.083	305.103
3/16/2012 0:08	130132.494	107.756	23.086	304.27
3/16/2012 0:09	130164.294	108.114	23.102	303.445
3/16/2012 0:09	130197.894	108.475	23.093	302.611
3/16/2012 0:10	130233.894	108.83	23.122	301.79
3/16/2012 0:11	130269.894	109.171	23.1	301.004
3/16/2012 0:11	130311.894	109.55	23.099	300.128
3/16/2012 0:12	130353.894	109.87	23.131	299.39
3/16/2012 0:13	130395.894	110.195	23.105	298.639
3/16/2012 0:13	130444.031	110.536	23.122	297.851
3/16/2012 0:14	130497.894	110.877	23.109	297.065
3/16/2012 0:15	130545.894	111.197	23.114	296.325
3/16/2012 0:16	130605.894	111.512	23.117	295.598
3/16/2012 0:17	130665.894	111.876	23.119	294.758
3/16/2012 0:18	130725.894	112.182	23.114	294.05
3/16/2012 0:19	130791.894	112.476	23.114	293.372
3/16/2012 0:20	130863.894	112.828	23.139	292.559
3/16/2012 0:22	130941.894	113.127	23.108	291.87
3/16/2012 0:23	131019.894	113.441	23.105	291.144
3/16/2012 0:24	131103.995	113.752	23.105	290.426
3/16/2012 0:26	131193.994	114.06	23.11	289.714
3/16/2012 0:28	131289.894	114.387	23.115	288.96

3/16/2012 0:29	131385.894	114.693	23.123	288.254
3/16/2012 0:31	131493.986	115.009	23.117	287.524
3/16/2012 0:33	131607.894	115.331	23.121	286.78
3/16/2012 0:35	131727.894	115.621	23.128	286.111
3/16/2012 0:37	131853.979	115.942	23.145	285.37
3/16/2012 0:39	131985.894	116.233	23.163	284.697
3/16/2012 0:42	132129.894	116.545	23.173	283.977
3/16/2012 0:44	132279.894	116.844	23.176	283.286
3/16/2012 0:47	132435.894	117.143	23.172	282.596
3/16/2012 0:49	132603.955	117.448	23.186	281.891
3/16/2012 0:52	132783.95	117.764	23.184	281.163
3/16/2012 0:56	132969.894	118.071	23.162	280.453
3/16/2012 0:59	133173.951	118.401	23.172	279.691
3/16/2012 1:02	133383.938	118.673	23.2	279.063
3/16/2012 1:06	133605.894	118.998	23.168	278.313
3/16/2012 1:10	133845.894	119.314	23.166	277.584
3/16/2012 1:14	134097.894	119.619	23.174	276.878
3/16/2012 1:19	134361.894	119.947	23.172	276.121
3/16/2012 1:23	134643.894	120.271	23.182	275.374
3/16/2012 1:28	134943.894	120.567	23.186	274.69
3/16/2012 1:33	135243.894	120.898	23.165	273.925
3/16/2012 1:38	135543.894	121.201	23.135	273.227
3/16/2012 1:43	135843.894	121.483	23.115	272.574
3/16/2012 1:48	136143.894	121.759	23.086	271.938
3/16/2012 1:53	136443.894	122.022	23.059	271.33
3/16/2012 1:58	136743.894	122.269	23.009	270.76
3/16/2012 2:03	137043.894	122.531	22.957	270.156
3/16/2012 2:08	137343.894	122.752	22.963	269.644
3/16/2012 2:13	137643.894	122.999	22.954	269.075
3/16/2012 2:18	137943.894	123.228	22.957	268.547
3/16/2012 2:23	138243.894	123.45	22.952	268.034
3/16/2012 2:28	138543.894	123.643	22.932	267.587
3/16/2012 2:33	138843.894	123.826	22.927	267.166
3/16/2012 2:38	139143.894	124.047	22.921	266.655
3/16/2012 2:43	139443.894	124.25	22.925	266.187
3/16/2012 2:48	139743.894	124.45	22.94	265.726
3/16/2012 2:53	140043.894	124.628	22.948	265.313
3/16/2012 2:58	140343.894	124.844	22.974	264.814
3/16/2012 3:03	140643.894	124.988	22.963	264.483
3/16/2012 3:08	140943.894	125.173	22.933	264.055
3/16/2012 3:13	141243.894	125.371	22.909	263.597
3/16/2012 3:18	141543.894	125.514	22.876	263.268
3/16/2012 3:23	141843.894	125.693	22.844	262.854
3/16/2012 3:28	142143.894	125.876	22.824	262.432
3/16/2012 3:33	142443.894	126.031	22.805	262.074
3/16/2012 3:38	142743.894	126.152	22.804	261.796
3/16/2012 3:43	143043.894	126.352	22.774	261.332
3/16/2012 3:48	143343.894	126.481	22.75	261.035
3/16/2012 3:53	143643.894	126.634	22.738	260.681
3/16/2012 3:58	143943.894	126.786	22.707	260.33
3/16/2012 4:03	144243.894	126.921	22.681	260.018
3/16/2012 4:08	144543.894	127.049	22.666	259.724
3/16/2012 4:13	144843.894	127.193	22.601	259.391
3/16/2012 4:18	145143.894	127.348	22.524	259.034

3/16/2012 4:23	145443.894	127.462	22.476	258.769
3/16/2012 4:28	145743.894	127.625	22.439	258.395
3/16/2012 4:33	146043.894	127.771	22.43	258.056
3/16/2012 4:38	146343.894	127.889	22.403	257.784
3/16/2012 4:43	146643.894	128.005	22.397	257.516
3/16/2012 4:48	146943.894	128.17	22.397	257.135
3/16/2012 4:53	147243.894	128.277	22.405	256.888
3/16/2012 4:58	147543.894	128.39	22.366	256.628
3/16/2012 5:03	147843.894	128.502	22.359	256.368
3/16/2012 5:08	148143.894	128.648	22.392	256.032
3/16/2012 5:13	148443.894	128.729	22.4	255.845
3/16/2012 5:18	148743.894	128.86	22.368	255.542
3/16/2012 5:23	149043.894	128.982	22.363	255.261
3/16/2012 5:28	149343.894	129.11	22.336	254.964
3/16/2012 5:33	149643.894	129.2	22.339	254.757
3/16/2012 5:38	149943.894	129.319	22.329	254.482
3/16/2012 5:43	150243.894	129.431	22.349	254.224
3/16/2012 5:48	150543.894	129.52	22.321	254.019
3/16/2012 5:53	150843.894	129.652	22.322	253.713
3/16/2012 5:58	151143.894	129.743	22.323	253.504
3/16/2012 6:03	151443.894	129.846	22.328	253.266
3/16/2012 6:08	151743.894	129.956	22.313	253.012
3/16/2012 6:13	152043.894	130.06	22.308	252.772
3/16/2012 6:18	152343.894	130.168	22.307	252.521
3/16/2012 6:23	152643.894	130.241	22.289	252.352
3/16/2012 6:28	152943.894	130.337	22.294	252.131
3/16/2012 6:33	153243.894	130.433	22.296	251.91
3/16/2012 6:38	153543.894	130.519	22.275	251.711
3/16/2012 6:43	153843.894	130.622	22.279	251.474
3/16/2012 6:48	154143.894	130.715	22.302	251.259
3/16/2012 6:53	154443.894	130.787	22.294	251.093
3/16/2012 6:58	154743.894	130.901	22.28	250.83
3/16/2012 7:03	155043.894	131.005	22.282	250.59
3/16/2012 7:08	155343.894	131.099	22.265	250.373
3/16/2012 7:13	155643.894	131.186	22.25	250.172
3/16/2012 7:18	155943.894	131.264	22.254	249.99
3/16/2012 7:23	156243.894	131.363	22.254	249.762
3/16/2012 7:28	156543.894	131.446	22.253	249.57
3/16/2012 7:33	156843.894	131.511	22.241	249.422
3/16/2012 7:38	157143.894	131.581	22.261	249.26
3/16/2012 7:43	157443.894	131.699	22.272	248.988
3/16/2012 7:48	157743.894	131.798	22.256	248.758
3/16/2012 7:53	158043.894	131.872	22.247	248.586
3/16/2012 7:58	158343.894	131.893	22.243	248.539
3/16/2012 8:03	158643.894	132	22.232	248.292
3/16/2012 8:08	158943.894	132.105	22.242	248.05
3/16/2012 8:13	159243.894	132.15	22.241	247.946
3/16/2012 8:18	159543.894	132.254	22.26	247.706
3/16/2012 8:23	159843.894	132.346	22.237	247.493
3/16/2012 8:28	160143.894	132.402	22.256	247.364
3/16/2012 8:33	160443.894	132.486	22.235	247.169
3/16/2012 8:38	160743.894	132.551	22.235	247.02
3/16/2012 8:43	161043.894	132.598	22.242	246.911
3/16/2012 8:48	161343.894	132.676	22.215	246.731

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3/16/2012 8:58	161943.894	132.813	22.208	246.415
3/16/2012 9:03	162243.894	132.867	22.214	246.289
3/16/2012 9:08	162543.894	132.93	22.223	246.145
3/16/2012 9:13	162843.894	132.967	22.229	246.058
3/16/2012 9:18	163143.894	133.042	22.213	245.886
3/16/2012 9:23	163443.894	133.098	22.185	245.757
3/16/2012 9:28	163743.894	133.154	22.2	245.628
3/16/2012 9:33	164043.894	133.189	22.205	245.546
3/16/2012 9:38	164343.894	133.228	22.205	245.456
3/16/2012 9:43	164643.894	133.29	22.201	245.314
3/16/2012 9:48	164943.894	133.332	22.205	245.216
3/16/2012 9:53	165243.894	133.355	22.213	245.162
3/16/2012 9:58	165543.894	133.444	22.215	244.958
3/16/2012 10:03	165843.894	133.564	22.211	244.682
3/16/2012 10:08	166143.894	133.642	22.209	244.501
3/16/2012 10:13	166443.894	133.726	22.215	244.306
3/16/2012 10:18	166743.894	133.807	22.21	244.12
3/16/2012 10:23	167043.894	133.897	22.202	243.912
3/16/2012 10:28	167343.894	133.957	22.201	243.772
3/16/2012 10:33	167643.894	134.008	22.21	243.655
3/16/2012 10:38	167943.894	134.079	22.203	243.492
3/16/2012 10:43	168243.894	134.141	22.213	243.348
3/16/2012 10:48	168543.894	134.189	22.205	243.236
3/16/2012 10:53	168843.894	134.255	22.2	243.086
3/16/2012 10:58	169143.894	134.323	22.212	242.928
3/16/2012 11:03	169443.894	134.4	22.192	242.75
3/16/2012 11:08	169743.894	134.465	22.193	242.6
3/16/2012 11:13	170043.894	134.512	22.2	242.492
3/16/2012 11:18	170343.894	134.593	22.192	242.304
3/16/2012 11:23	170643.894	134.653	22.181	242.167
3/16/2012 11:28	170943.894	134.696	22.202	242.066
3/16/2012 11:33	171243.894	134.747	22.199	241.949
3/16/2012 11:38	171543.894	134.82	22.192	241.78
3/16/2012 11:43	171843.894	134.872	22.173	241.661
3/16/2012 11:48	172143.894	134.913	22.166	241.566
3/16/2012 11:53	172443.894	134.966	22.176	241.443
3/16/2012 11:58	172743.894	135.028	22.167	241.299
3/16/2012 12:03	173043.894	135.079	22.179	241.183
3/16/2012 12:08	173343.894	135.131	22.167	241.063
3/16/2012 12:13	173643.894	135.158	22.168	241.001
3/16/2012 12:18	173943.894	135.242	22.17	240.806
3/16/2012 12:23	174243.894	135.255	22.163	240.776
3/16/2012 12:28	174543.894	135.34	22.178	240.58
3/16/2012 12:33	174843.894	135.393	22.185	240.456
3/16/2012 12:38	175143.894	135.446	22.184	240.334
3/16/2012 12:43	175443.894	135.485	22.18	240.244
3/16/2012 12:48	175743.894	135.549	22.173	240.097
3/16/2012 12:53	176043.894	135.576	22.16	240.035
3/16/2012 12:58	176343.894	135.649	22.173	239.867
3/16/2012 13:03	176643.894	135.671	22.163	239.815
3/16/2012 13:08	176943.894	135.761	22.164	239.608
3/16/2012 13:13	177243.894	135.812	22.169	239.49
3/16/2012 13:18	177543.894	135.837	22.151	239.431

3/16/2012 13:23	177843.894	135.88	22.136	239.334
3/16/2012 13:28	178143.894	135.919	22.14	239.242
3/16/2012 13:33	178443.894	135.972	22.141	239.12
3/16/2012 13:38	178743.894	136.023	22.138	239.003
3/16/2012 13:43	179043.894	136.084	22.145	238.862
3/16/2012 13:48	179343.894	136.165	22.149	238.676
3/16/2012 13:53	179643.894	136.172	22.138	238.659
3/16/2012 13:58	179943.894	136.24	22.152	238.501
3/16/2012 14:03	180243.894	136.272	22.146	238.428
3/16/2012 14:08	180543.894	136.308	22.143	238.345
3/16/2012 14:13	180843.894	136.353	22.145	238.241
3/16/2012 14:18	181143.894	136.437	22.164	238.048
3/16/2012 14:23	181443.894	136.452	22.152	238.012
3/16/2012 14:28	181743.894	136.495	22.14	237.913
3/16/2012 14:33	182043.894	136.563	22.131	237.756
3/16/2012 14:38	182343.894	136.58	22.141	237.716
3/16/2012 14:43	182643.894	136.628	22.136	237.605
3/16/2012 14:48	182943.894	136.693	22.138	237.456
3/16/2012 14:53	183243.894	136.702	22.141	237.435
3/16/2012 14:58	183543.894	136.747	22.145	237.33
3/16/2012 15:03	183843.894	136.822	22.148	237.158
3/16/2012 15:08	184143.894	136.842	22.149	237.112
3/16/2012 15:13	184443.894	136.887	22.142	237.007
3/16/2012 15:18	184743.894	136.931	22.141	236.906
3/16/2012 15:23	185043.894	136.982	22.123	236.789
3/16/2012 15:28	185343.894	137.012	22.125	236.719
3/16/2012 15:33	185643.894	137.073	22.134	236.579
3/16/2012 15:38	185943.894	137.098	22.143	236.52
3/16/2012 15:43	186243.894	137.145	22.132	236.411
3/16/2012 15:48	186543.894	137.175	22.141	236.342
3/16/2012 15:53	186843.894	137.234	22.134	236.206
3/16/2012 15:58	187143.894	137.264	22.135	236.137
3/16/2012 16:03	187443.894	137.314	22.123	236.021
3/16/2012 16:08	187743.894	137.358	22.112	235.919
3/16/2012 16:13	188043.894	137.396	22.115	235.832
3/16/2012 16:18	188343.894	137.438	22.105	235.734
3/16/2012 16:23	188643.894	137.479	22.113	235.64
3/16/2012 16:28	188943.894	137.509	22.122	235.571
3/16/2012 16:33	189243.894	137.552	22.119	235.472
3/16/2012 16:38	189543.894	137.587	22.118	235.39
3/16/2012 16:43	189843.894	137.629	22.123	235.294
3/16/2012 16:48	190143.894	137.65	22.128	235.246
3/16/2012 16:53	190443.894	137.687	22.115	235.161
3/16/2012 16:58	190743.894	137.734	22.117	235.052
3/16/2012 17:03	191043.894	137.778	22.115	234.951
3/16/2012 17:08	191343.894	137.805	22.125	234.887
3/16/2012 17:13	191643.894	137.836	22.119	234.816
3/16/2012 17:18	191943.894	137.879	22.105	234.717
3/16/2012 17:23	192243.894	137.918	22.116	234.628
3/16/2012 17:28	192543.894	137.953	22.118	234.546
3/16/2012 17:33	192843.894	137.988	22.116	234.465
3/16/2012 17:38	193143.894	138.021	22.128	234.389
3/16/2012 17:43	193443.894	138.05	22.112	234.323
3/16/2012 17:48	193743.894	138.088	22.113	234.235

3/16/2012 17:53	194043.894	138.132	22.117	234.132
3/16/2012 17:58	194343.894	138.168	22.113	234.049
3/16/2012 18:03	194643.894	138.21	22.111	233.953
3/16/2012 18:08	194943.894	138.222	22.121	233.924
3/16/2012 18:13	195243.894	138.285	22.092	233.781
3/16/2012 18:18	195543.894	138.309	22.092	233.723
3/16/2012 18:23	195843.894	138.312	22.099	233.718
3/16/2012 18:28	196143.894	138.358	22.119	233.61
3/16/2012 18:33	196443.894	138.411	22.107	233.49
3/16/2012 18:38	196743.894	138.438	22.106	233.427
3/16/2012 18:43	197043.894	138.459	22.116	233.378
3/16/2012 18:48	197343.894	138.504	22.112	233.275
3/16/2012 18:53	197643.894	138.533	22.098	233.207
3/16/2012 18:58	197943.894	138.579	22.095	233.1
3/16/2012 19:03	198243.894	138.593	22.104	233.068
3/16/2012 19:08	198543.894	138.639	22.113	232.962
3/16/2012 19:13	198843.894	138.66	22.1	232.915
3/16/2012 19:18	199143.894	138.7	22.098	232.822
3/16/2012 19:23	199443.894	138.723	22.113	232.769
3/16/2012 19:28	199743.894	138.754	22.11	232.697
3/16/2012 19:33	200043.894	138.794	22.11	232.606
3/16/2012 19:38	200343.894	138.817	22.112	232.551
3/16/2012 19:43	200643.894	138.823	22.108	232.538
3/16/2012 19:48	200943.894	138.91	22.102	232.336
3/16/2012 19:53	201243.894	138.925	22.105	232.303
3/16/2012 19:58	201543.894	138.948	22.102	232.25
3/16/2012 20:03	201843.894	138.979	22.1	232.177
3/16/2012 20:08	202143.894	139.008	22.113	232.11
3/16/2012 20:13	202443.894	139.05	22.111	232.013
3/16/2012 20:18	202743.894	139.078	22.104	231.948
3/16/2012 20:23	203043.894	139.072	22.093	231.963
3/16/2012 20:28	203343.894	139.114	22.116	231.866
3/16/2012 20:33	203643.894	139.152	22.097	231.778
3/16/2012 20:38	203943.894	139.172	22.11	231.731
3/16/2012 20:43	204243.894	139.198	22.107	231.671
3/16/2012 20:48	204543.894	139.223	22.102	231.613
3/16/2012 20:53	204843.894	139.26	22.092	231.528
3/16/2012 20:58	205143.894	139.265	22.08	231.518
3/16/2012 21:03	205443.894	139.283	22.069	231.475
3/16/2012 21:08	205743.894	139.339	22.078	231.345
3/16/2012 21:13	206043.894	139.352	22.077	231.317
3/16/2012 21:18	206343.894	139.419	22.088	231.161
3/16/2012 21:23	206643.894	139.426	22.102	231.146
3/16/2012 21:28	206943.894	139.451	22.092	231.088
3/16/2012 21:33	207243.894	139.468	22.103	231.047
3/16/2012 21:38	207543.894	139.512	22.098	230.947
3/16/2012 21:43	207843.894	139.535	22.085	230.894
3/16/2012 21:48	208143.894	139.562	22.092	230.831
3/16/2012 21:53	208443.894	139.588	22.098	230.771
3/16/2012 21:58	208743.894	139.596	22.104	230.752
3/16/2012 22:03	209043.894	139.628	22.107	230.679
3/16/2012 22:08	209343.894	139.658	22.092	230.611
3/16/2012 22:13	209643.894	139.694	22.089	230.526
3/16/2012 22:18	209943.894	139.717	22.089	230.474

3/16/2012 22:23	210243.894	139.731	22.091	230.441
3/16/2012 22:28	210543.894	139.745	22.069	230.409
3/16/2012 22:33	210843.894	139.749	22.079	230.399
3/16/2012 22:38	211143.894	139.814	22.1	230.25
3/16/2012 22:43	211443.894	139.857	22.102	230.15
3/16/2012 22:48	211743.894	139.877	22.098	230.104
3/16/2012 22:53	212043.894	139.881	22.075	230.095
3/16/2012 22:58	212343.894	139.91	22.082	230.027
3/16/2012 23:03	212643.894	139.938	22.08	229.963
3/16/2012 23:08	212943.894	139.983	22.079	229.858
3/16/2012 23:13	213243.894	140.031	22.092	229.747
3/16/2012 23:18	213543.894	140.051	22.085	229.703
3/16/2012 23:23	213843.894	140.025	22.075	229.762
3/16/2012 23:28	214143.894	140.076	22.094	229.644
3/16/2012 23:33	214443.894	140.105	22.097	229.578
3/16/2012 23:38	214743.894	140.094	22.093	229.602
3/16/2012 23:43	215043.894	140.112	22.082	229.56
3/16/2012 23:48	215343.894	140.19	22.089	229.381
3/16/2012 23:53	215643.894	140.173	22.088	229.421
3/16/2012 23:58	215943.894	140.221	22.085	229.309
3/17/2012 0:03	216243.894	140.251	22.087	229.24
3/17/2012 0:08	216543.894	140.25	22.08	229.242
3/17/2012 0:13	216843.894	140.29	22.08	229.15
3/17/2012 0:18	217143.894	140.324	22.089	229.071
3/17/2012 0:23	217443.894	140.306	22.079	229.113
3/17/2012 0:28	217743.894	140.365	22.076	228.978
3/17/2012 0:33	218043.894	140.398	22.072	228.902
3/17/2012 0:38	218343.894	140.423	22.089	228.843
3/17/2012 0:43	218643.894	140.414	22.081	228.865
3/17/2012 0:48	218943.894	140.441	22.082	228.802
3/17/2012 0:53	219243.894	140.48	22.088	228.713
3/17/2012 0:58	219543.894	140.479	22.066	228.713
3/17/2012 1:03	219843.894	140.506	22.071	228.652
3/17/2012 1:08	220143.894	140.533	22.067	228.59
3/17/2012 1:13	220443.894	140.543	22.08	228.566
3/17/2012 1:18	220743.894	140.6	22.064	228.434
3/17/2012 1:23	221043.894	140.617	22.062	228.395
3/17/2012 1:28	221343.894	140.63	22.076	228.365
3/17/2012 1:33	221643.894	140.673	22.091	228.265
3/17/2012 1:38	221943.894	140.683	22.08	228.243
3/17/2012 1:43	222243.894	140.708	22.077	228.185
3/17/2012 1:48	222543.894	140.726	22.065	228.143
3/17/2012 1:53	222843.894	140.744	22.07	228.103
3/17/2012 1:58	223143.894	140.802	22.073	227.967
3/17/2012 2:03	223443.894	140.822	22.075	227.923
3/17/2012 2:08	223743.894	140.814	22.068	227.939
3/17/2012 2:13	224043.894	140.863	22.081	227.827
3/17/2012 2:18	224343.894	140.854	22.071	227.849
3/17/2012 2:23	224643.894	140.883	22.07	227.781
3/17/2012 2:28	224943.894	140.908	22.069	227.723
3/17/2012 2:33	225243.894	140.927	22.068	227.679
3/17/2012 2:38	225543.894	140.957	22.073	227.61
3/17/2012 2:43	225843.894	140.967	22.063	227.587
3/17/2012 2:48	226143.894	140.986	22.057	227.543

3/17/2012 2:53	226443.894	141.017	22.07	227.471
3/17/2012 2:58	226743.894	141.08	22.072	227.327
3/17/2012 3:03	227043.894	141.073	22.068	227.343
3/17/2012 3:08	227343.894	141.094	22.066	227.294
3/17/2012 3:13	227643.894	141.105	22.06	227.269
3/17/2012 3:18	227943.894	141.134	22.051	227.201
3/17/2012 3:23	228243.894	141.15	22.062	227.164
3/17/2012 3:28	228543.894	141.183	22.064	227.088
3/17/2012 3:33	228843.894	141.2	22.061	227.048
3/17/2012 3:38	229143.894	141.227	22.07	226.987
3/17/2012 3:43	229443.894	141.228	22.075	226.985
3/17/2012 3:48	229743.894	141.269	22.063	226.891
3/17/2012 3:53	230043.894	141.286	22.06	226.85
3/17/2012 3:58	230343.894	141.304	22.057	226.809
3/17/2012 4:03	230643.894	141.338	22.068	226.73
3/17/2012 4:08	230943.894	141.364	22.077	226.671
3/17/2012 4:13	231243.894	141.385	22.068	226.621
3/17/2012 4:18	231543.894	141.4	22.064	226.587
3/17/2012 4:23	231843.894	141.427	22.057	226.525
3/17/2012 4:28	232143.894	141.456	22.058	226.458
3/17/2012 4:33	232443.894	141.462	22.052	226.445
3/17/2012 4:38	232743.894	141.506	22.047	226.343
3/17/2012 4:43	233043.894	141.528	22.065	226.293
3/17/2012 4:48	233343.894	141.546	22.063	226.25
3/17/2012 4:53	233643.894	141.573	22.054	226.188
3/17/2012 4:58	233943.894	141.59	22.08	226.148
3/17/2012 5:03	234243.894	141.616	22.08	226.089
3/17/2012 5:08	234543.894	141.635	22.077	226.045
3/17/2012 5:13	234843.894	141.655	22.045	225.998
3/17/2012 5:18	235143.894	141.696	22.038	225.903
3/17/2012 5:23	235443.894	141.699	22.048	225.896
3/17/2012 5:28	235743.894	141.716	22.051	225.859
3/17/2012 5:33	236043.894	141.737	22.057	225.81
3/17/2012 5:38	236343.894	141.776	22.038	225.72
3/17/2012 5:43	236643.894	141.794	22.037	225.678
3/17/2012 5:48	236943.894	141.82	22.037	225.617
3/17/2012 5:53	237243.894	141.832	22.034	225.591
3/17/2012 5:58	237543.894	141.856	22.027	225.534
3/17/2012 6:03	237843.894	141.868	22.04	225.508
3/17/2012 6:08	238143.894	141.887	22.044	225.462
3/17/2012 6:13	238443.894	141.904	22.045	225.423
3/17/2012 6:18	238743.894	141.91	22.06	225.41
3/17/2012 6:23	239043.894	141.932	22.047	225.359
3/17/2012 6:28	239343.894	141.976	22.053	225.257
3/17/2012 6:33	239643.894	141.984	22.041	225.238
3/17/2012 6:38	239943.894	142.011	22.038	225.177
3/17/2012 6:43	240243.894	142.023	22.046	225.148
3/17/2012 6:48	240543.894	142.035	22.056	225.121
3/17/2012 6:53	240843.894	142.056	22.046	225.072
3/17/2012 6:58	241143.894	142.068	22.051	225.045
3/17/2012 7:03	241443.894	142.089	22.036	224.998
3/17/2012 7:08	241743.894	142.116	22.036	224.933
3/17/2012 7:13	242043.894	142.14	22.045	224.878
3/17/2012 7:18	242343.894	142.149	22.051	224.859

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3/17/2012 7:28	242943.894	142.188	22.048	224.768
3/17/2012 7:33	243243.894	142.207	22.046	224.724
3/17/2012 7:38	243543.894	142.226	22.028	224.679
3/17/2012 7:43	243843.894	142.255	22.043	224.614
3/17/2012 7:48	244143.894	142.254	22.039	224.615
3/17/2012 7:53	244443.894	142.269	22.048	224.582
3/17/2012 7:58	244743.894	142.28	22.063	224.556
3/17/2012 8:03	245043.894	142.311	22.053	224.485
3/17/2012 8:08	245343.894	142.316	22.06	224.473
3/17/2012 8:13	245643.894	142.351	22.045	224.391
3/17/2012 8:18	245943.894	142.372	22.036	224.343
3/17/2012 8:23	246243.894	142.387	22.031	224.308
3/17/2012 8:28	246543.894	142.4	22.034	224.278
3/17/2012 8:33	246843.894	142.421	22.022	224.23
3/17/2012 8:38	247143.894	142.44	22.02	224.186
3/17/2012 8:43	247443.894	142.439	22.042	224.188
3/17/2012 8:48	247743.894	142.461	22.025	224.138
3/17/2012 8:53	248043.894	142.483	22.025	224.086
3/17/2012 8:58	248343.894	142.486	22.029	224.08
3/17/2012 9:03	248643.894	142.512	22.027	224.02
3/17/2012 9:08	248943.894	142.525	22.037	223.99
3/17/2012 9:13	249243.894	142.542	22.034	223.95
3/17/2012 9:18	249543.894	142.565	22.047	223.899
3/17/2012 9:23	249843.894	142.581	22.053	223.86
3/17/2012 9:28	250143.894	142.602	22.037	223.812
3/17/2012 9:33	250443.894	142.604	22.047	223.808
3/17/2012 9:38	250743.894	142.62	22.045	223.771
3/17/2012 9:43	251043.894	142.647	22.034	223.708
3/17/2012 9:48	251343.894	142.663	22.025	223.67
3/17/2012 9:53	251643.894	142.671	22.032	223.652
3/17/2012 9:58	251943.894	142.698	22.042	223.59
3/17/2012 10:03	252243.894	142.736	22.033	223.503
3/17/2012 10:08	252543.894	142.739	22.025	223.496
3/17/2012 10:13	252843.894	142.743	22.045	223.487
3/17/2012 10:18	253143.894	142.761	22.04	223.444
3/17/2012 10:23	253443.894	142.789	22.037	223.38
3/17/2012 10:28	253743.894	142.803	22.046	223.348
3/17/2012 10:33	254043.894	142.837	22.02	223.271
3/17/2012 10:38	254343.894	142.83	22.024	223.287
3/17/2012 10:43	254643.894	142.87	22.004	223.193
3/17/2012 10:48	254943.894	142.88	22.023	223.169
3/17/2012 10:53	255243.894	142.864	22.021	223.208
3/17/2012 10:58	255543.894	142.898	22.033	223.128
3/17/2012 11:03	255843.894	142.905	22.036	223.113
3/17/2012 11:08	256143.894	142.94	22.029	223.032
3/17/2012 11:13	256443.894	142.931	22.011	223.052
3/17/2012 11:18	256743.894	142.937	22.014	223.039
3/17/2012 11:23	257043.894	142.975	22.025	222.95
3/17/2012 11:28	257343.894	143.006	22.032	222.88
3/17/2012 11:33	257643.894	143.005	22.038	222.881
3/17/2012 11:38	257943.894	143.047	22.02	222.784
3/17/2012 11:43	258243.894	143.052	22.03	222.774
3/17/2012 11:48	258543.894	143.065	22.029	222.742

3/17/2012 11:53	258843.894	143.087	22.027	222.692
3/17/2012 11:58	259143.894	143.114	22.024	222.63
3/17/2012 12:03	259443.894	143.127	22.035	222.599
3/17/2012 12:08	259743.894	143.112	22.021	222.634
3/17/2012 12:13	260043.894	143.16	22.028	222.523
3/17/2012 12:18	260343.894	143.182	22.042	222.474
3/17/2012 12:23	260643.894	143.193	22.051	222.447
3/17/2012 12:28	260943.894	143.204	22.045	222.423
3/17/2012 12:33	261243.894	143.221	22.025	222.382
3/17/2012 12:38	261543.894	143.246	22.043	222.325
3/17/2012 12:43	261843.894	143.235	22.039	222.351
3/17/2012 12:48	262143.894	143.284	22.042	222.236
3/17/2012 12:53	262443.894	143.296	22.025	222.21
3/17/2012 12:58	262743.894	143.298	22.034	222.206
3/17/2012 13:03	263043.894	143.332	22.031	222.127
3/17/2012 13:08	263343.894	143.32	22.018	222.154
3/17/2012 13:13	263643.894	143.374	22.025	222.03
3/17/2012 13:18	263943.894	143.383	22.024	222.01
3/17/2012 13:23	264243.894	143.417	22.033	221.93
3/17/2012 13:28	264543.894	143.427	22.03	221.908
3/17/2012 13:33	264843.894	143.459	22.014	221.834
3/17/2012 13:38	265143.894	143.476	22.013	221.793
3/17/2012 13:43	265443.894	143.494	22.011	221.753
3/17/2012 13:48	265743.894	143.516	22.017	221.702
3/17/2012 13:53	266043.894	143.521	22.025	221.69
3/17/2012 13:58	266343.894	143.549	22.024	221.626
3/17/2012 14:03	266643.894	143.544	22.035	221.637
3/17/2012 14:08	266943.894	143.573	22.035	221.57
3/17/2012 14:13	267243.894	143.595	22.024	221.52
3/17/2012 14:18	267543.894	143.612	22.02	221.48
3/17/2012 14:23	267843.894	143.637	22.022	221.422
3/17/2012 14:28	268143.894	143.657	22.022	221.376
3/17/2012 14:33	268443.894	143.663	22.025	221.362
3/17/2012 14:38	268743.894	143.683	22.016	221.316
3/17/2012 14:43	269043.894	143.71	22.022	221.253
3/17/2012 14:48	269343.894	143.725	22.036	221.219
3/17/2012 14:53	269643.894	143.742	22.036	221.18
3/17/2012 14:58	269943.894	143.757	22.029	221.144
3/17/2012 15:03	270243.894	143.787	22.014	221.075
3/17/2012 15:08	270543.894	143.787	22.015	221.075
3/17/2012 15:13	270843.894	143.824	22.016	220.991
3/17/2012 15:18	271143.894	143.831	22.023	220.974
3/17/2012 15:23	271443.894	143.832	22.009	220.972
3/17/2012 15:28	271743.894	143.859	22.018	220.909
3/17/2012 15:33	272043.894	143.88	22.002	220.862
3/17/2012 15:38	272343.894	143.907	22.009	220.799
3/17/2012 15:43	272643.894	143.902	22.013	220.81
3/17/2012 15:48	272943.894	143.927	22.02	220.752
3/17/2012 15:53	273243.894	143.955	22.031	220.689
3/17/2012 15:58	273543.894	143.962	22.017	220.671
3/17/2012 16:03	273843.894	143.938	22.014	220.728
3/17/2012 16:08	274143.894	143.999	22.026	220.585
3/17/2012 16:13	274443.894	144	22.025	220.584
3/17/2012 16:18	274743.894	144.032	22.011	220.51

3/17/2012 16:23	275043.894	144.016	22.01	220.548
3/17/2012 16:28	275343.894	144.058	22.008	220.451
3/17/2012 16:33	275643.894	144.081	22.015	220.398
3/17/2012 16:38	275943.894	144.099	22.018	220.356
3/17/2012 16:43	276243.894	144.11	22.02	220.33
3/17/2012 16:48	276543.894	144.124	22.021	220.297
3/17/2012 16:53	276843.894	144.158	22.001	220.219
3/17/2012 16:58	277143.894	144.126	22.008	220.293
3/17/2012 17:03	277443.894	144.175	22.012	220.18
3/17/2012 17:08	277743.894	144.182	22.02	220.164
3/17/2012 17:13	278043.894	144.197	22.016	220.128
3/17/2012 17:18	278343.894	144.223	22.018	220.068
3/17/2012 17:23	278643.894	144.221	21.988	220.074
3/17/2012 17:28	278943.894	144.266	21.994	219.971
3/17/2012 17:33	279243.894	144.262	22.002	219.979
3/17/2012 17:38	279543.894	144.305	22.006	219.881
3/17/2012 17:43	279843.894	144.275	22.012	219.95
3/17/2012 17:48	280143.894	144.296	21.987	219.902
3/17/2012 17:53	280443.894	144.308	21.989	219.873
3/17/2012 17:58	280743.894	144.309	21.995	219.87
3/17/2012 18:03	281043.894	144.328	21.998	219.827
3/17/2012 18:08	281343.894	144.367	22.008	219.737
3/17/2012 18:13	281643.894	144.367	22.009	219.737
3/17/2012 18:18	281943.894	144.378	21.997	219.712
3/17/2012 18:23	282243.894	144.392	21.996	219.68
3/17/2012 18:28	282543.894	144.43	22.015	219.591
3/17/2012 18:33	282843.894	144.396	22.008	219.669
3/17/2012 18:38	283143.894	144.452	22.005	219.541
3/17/2012 18:43	283443.894	144.436	21.998	219.578
3/17/2012 18:48	283743.894	144.459	21.99	219.523
3/17/2012 18:53	284043.894	144.5	22.001	219.429
3/17/2012 18:58	284343.894	144.502	21.995	219.425
3/17/2012 19:03	284643.894	144.534	22.003	219.352
3/17/2012 19:08	284943.894	144.533	21.996	219.353
3/17/2012 19:13	285243.894	144.559	22.008	219.294
3/17/2012 19:18	285543.894	144.565	22.008	219.279
3/17/2012 19:23	285843.894	144.564	22.005	219.283
3/17/2012 19:28	286143.894	144.554	21.996	219.304
3/17/2012 19:33	286443.894	144.577	21.998	219.251
3/17/2012 19:38	286743.894	144.601	21.996	219.197
3/17/2012 19:43	287043.894	144.61	21.997	219.177
3/17/2012 19:48	287343.894	144.601	22.015	219.195
3/17/2012 19:53	287643.894	144.626	22.014	219.139
3/17/2012 19:58	287943.894	144.666	22.015	219.045
3/17/2012 20:03	288243.894	144.684	22.011	219.005
3/17/2012 20:08	288543.894	144.68	22.013	219.015
3/17/2012 20:13	288843.894	144.701	22.017	218.966
3/17/2012 20:18	289143.894	144.665	22.003	219.049
3/17/2012 20:23	289443.894	144.721	22.014	218.919
3/17/2012 20:28	289743.894	144.717	22.015	218.929
3/17/2012 20:33	290043.894	144.743	22.01	218.868
3/17/2012 20:38	290343.894	144.752	22.017	218.849
3/17/2012 20:43	290643.894	144.768	22.024	218.812
3/17/2012 20:48	290943.894	144.794	22.019	218.75

3/17/2012 20:53	291243.894	144.807	22.021	218.72
3/17/2012 20:58	291543.894	144.811	22.009	218.711
3/17/2012 21:03	291843.894	144.806	22.008	218.724
3/17/2012 21:08	292143.894	144.8	21.997	218.737
3/17/2012 21:13	292443.894	144.803	21.996	218.73
3/17/2012 21:18	292743.894	144.863	22.007	218.591
3/17/2012 21:23	293043.894	144.824	22	218.683
3/17/2012 21:28	293343.894	144.85	21.988	218.622
3/17/2012 21:33	293643.894	144.897	22.002	218.512
3/17/2012 21:38	293943.894	144.865	22	218.587
3/17/2012 21:43	294243.894	144.903	22.021	218.499
3/17/2012 21:48	294543.894	144.935	22.019	218.426
3/17/2012 21:53	294843.894	144.899	22.004	218.509
3/17/2012 21:58	295143.894	144.922	22.002	218.456
3/17/2012 22:03	295443.894	144.944	22.017	218.404
3/17/2012 22:08	295743.894	144.977	22.001	218.329
3/17/2012 22:13	296043.894	144.986	21.997	218.307
3/17/2012 22:18	296343.894	144.982	22.004	218.316
3/17/2012 22:23	296643.894	144.997	22.02	218.283
3/17/2012 22:28	296943.894	145.011	22.02	218.25
3/17/2012 22:33	297243.894	145.003	21.998	218.268
3/17/2012 22:38	297543.894	145.022	21.988	218.224
3/17/2012 22:43	297843.894	145.05	22.003	218.159
3/17/2012 22:48	298143.894	145.048	22.017	218.165
3/17/2012 22:53	298443.894	145.087	22.013	218.074
3/17/2012 22:58	298743.894	145.076	22.002	218.101
3/17/2012 23:03	299043.894	145.089	21.99	218.069
3/17/2012 23:08	299343.894	145.095	21.995	218.056
3/17/2012 23:13	299643.894	145.09	21.997	218.068
3/17/2012 23:18	299943.894	145.105	22.003	218.032
3/17/2012 23:23	300243.894	145.124	21.992	217.988
3/17/2012 23:28	300543.894	145.177	22.003	217.867
3/17/2012 23:33	300843.894	145.146	21.981	217.937
3/17/2012 23:38	301143.894	145.172	21.978	217.877
3/17/2012 23:43	301443.894	145.203	21.999	217.807
3/17/2012 23:48	301743.894	145.211	21.987	217.787
3/17/2012 23:53	302043.894	145.243	22.003	217.714
3/17/2012 23:58	302343.894	145.211	22.001	217.788
3/18/2012 0:03	302643.894	145.222	21.986	217.763
3/18/2012 0:08	302943.894	145.242	21.999	217.717
3/18/2012 0:13	303243.894	145.252	21.998	217.694
3/18/2012 0:18	303543.894	145.302	21.995	217.578
3/18/2012 0:23	303843.894	145.288	21.985	217.609
3/18/2012 0:28	304143.894	145.316	21.981	217.546
3/18/2012 0:33	304443.894	145.314	22	217.551
3/18/2012 0:38	304743.894	145.324	21.989	217.526
3/18/2012 0:43	305043.894	145.342	22.005	217.484
3/18/2012 0:48	305343.894	145.349	22.005	217.47
3/18/2012 0:53	305643.894	145.39	21.996	217.375
3/18/2012 0:58	305943.894	145.415	22.002	217.317
3/18/2012 1:03	306243.894	145.423	22.006	217.299
3/18/2012 1:08	306543.894	145.427	22.013	217.29
3/18/2012 1:13	306843.894	145.401	22.009	217.35
3/18/2012 1:18	307143.894	145.446	22.007	217.245

3/18/2012 1:23	307443.894	145.473	22.001	217.184
3/18/2012 1:28	307743.894	145.469	21.997	217.193
3/18/2012 1:33	308043.894	145.474	22.001	217.181
3/18/2012 1:38	308343.894	145.521	22.005	217.072
3/18/2012 1:43	308643.894	145.501	21.989	217.119
3/18/2012 1:48	308943.894	145.515	21.983	217.087
3/18/2012 1:53	309243.894	145.528	21.983	217.056
3/18/2012 1:58	309543.894	145.56	21.997	216.982
3/18/2012 2:03	309843.894	145.553	21.998	216.999
3/18/2012 2:08	310143.894	145.589	21.978	216.915
3/18/2012 2:13	310443.894	145.576	21.979	216.946
3/18/2012 2:18	310743.894	145.609	21.97	216.869
3/18/2012 2:23	311043.894	145.648	21.977	216.78
3/18/2012 2:28	311343.894	145.638	21.975	216.802
3/18/2012 2:33	311643.894	145.659	21.987	216.753
3/18/2012 2:38	311943.894	145.646	21.999	216.783
3/18/2012 2:43	312243.894	145.669	21.978	216.73
3/18/2012 2:48	312543.894	145.727	22	216.596
3/18/2012 2:53	312843.894	145.723	21.992	216.606
3/18/2012 2:58	313143.894	145.724	21.996	216.604
3/18/2012 3:03	313443.894	145.727	21.994	216.597
3/18/2012 3:08	313743.894	145.759	22.001	216.524
3/18/2012 3:13	314043.894	145.757	21.983	216.526
3/18/2012 3:18	314343.894	145.782	21.982	216.47
3/18/2012 3:23	314643.894	145.804	21.983	216.419
3/18/2012 3:28	314943.894	145.808	21.988	216.41
3/18/2012 3:33	315243.894	145.814	21.99	216.396
3/18/2012 3:38	315543.894	145.839	21.982	216.337
3/18/2012 3:43	315843.894	145.844	21.991	216.327
3/18/2012 3:48	316143.894	145.859	21.982	216.291
3/18/2012 3:53	316443.894	145.85	21.996	216.313
3/18/2012 3:58	316743.894	145.89	21.994	216.22
3/18/2012 4:03	317043.894	145.891	22.003	216.219
3/18/2012 4:08	317343.894	145.914	21.993	216.165
3/18/2012 4:13	317643.894	145.909	21.982	216.175
3/18/2012 4:18	317943.894	145.934	21.974	216.118
3/18/2012 4:23	318243.894	145.945	21.968	216.092
3/18/2012 4:28	318543.894	145.973	21.969	216.029
3/18/2012 4:33	318843.894	145.955	21.979	216.069
3/18/2012 4:38	319143.894	145.973	21.995	216.028
3/18/2012 4:43	319443.894	146.015	21.995	215.931
3/18/2012 4:48	319743.894	145.995	21.995	215.978
3/18/2012 4:53	320043.894	146.021	21.987	215.917
3/18/2012 4:58	320343.894	146.036	21.99	215.883
3/18/2012 5:03	320643.894	146.023	21.999	215.913
3/18/2012 5:08	320943.894	146.047	21.983	215.857
3/18/2012 5:13	321243.894	146.068	21.984	215.81
3/18/2012 5:18	321543.894	146.083	21.976	215.776
3/18/2012 5:23	321843.894	146.086	21.969	215.768
3/18/2012 5:28	322143.894	146.094	21.99	215.75
3/18/2012 5:33	322443.894	146.109	21.985	215.714
3/18/2012 5:38	322743.894	146.113	21.984	215.706
3/18/2012 5:43	323043.894	146.106	22.002	215.721
3/18/2012 5:48	323343.894	146.144	21.981	215.634

3/18/2012 5:53	323643.894	146.166	21.971	215.584
3/18/2012 5:58	323943.894	146.166	21.996	215.582
3/18/2012 6:03	324243.894	146.194	21.99	215.519
3/18/2012 6:08	324543.894	146.198	21.989	215.509
3/18/2012 6:13	324843.894	146.207	21.991	215.488
3/18/2012 6:18	325143.894	146.22	21.975	215.459
3/18/2012 6:23	325443.894	146.239	21.965	215.413
3/18/2012 6:28	325743.894	146.246	21.981	215.397
3/18/2012 6:33	326043.894	146.254	21.997	215.379
3/18/2012 6:38	326343.894	146.269	21.995	215.346
3/18/2012 6:43	326643.894	146.29	21.983	215.296
3/18/2012 6:48	326943.894	146.288	21.988	215.3
3/18/2012 6:53	327243.894	146.289	21.974	215.298
3/18/2012 6:58	327543.894	146.303	21.973	215.267
3/18/2012 7:03	327843.894	146.319	21.969	215.23
3/18/2012 7:08	328143.894	146.324	21.971	215.218
3/18/2012 7:13	328443.894	146.336	21.98	215.19
3/18/2012 7:18	328743.894	146.333	21.988	215.197
3/18/2012 7:23	329043.894	146.355	21.985	215.145
3/18/2012 7:28	329343.894	146.357	21.972	215.142
3/18/2012 7:33	329643.894	146.374	21.988	215.102
3/18/2012 7:38	329943.894	146.378	21.99	215.094
3/18/2012 7:43	330243.894	146.401	21.976	215.04
3/18/2012 7:48	330543.894	146.393	21.988	215.058
3/18/2012 7:53	330843.894	146.403	21.983	215.035
3/18/2012 7:58	331143.894	146.434	21.988	214.965
3/18/2012 8:03	331443.894	146.435	21.997	214.962
3/18/2012 8:08	331743.894	146.438	21.986	214.955
3/18/2012 8:13	332043.894	146.455	21.987	214.915
3/18/2012 8:18	332343.894	146.447	21.997	214.935
3/18/2012 8:23	332643.894	146.473	21.984	214.874
3/18/2012 8:28	332943.894	146.481	21.977	214.856
3/18/2012 8:33	333243.894	146.475	21.96	214.869
3/18/2012 8:38	333543.894	146.508	21.972	214.794
3/18/2012 8:43	333843.894	146.503	21.978	214.804
3/18/2012 8:48	334143.894	146.519	21.964	214.767
3/18/2012 8:53	334443.894	146.536	21.969	214.728
3/18/2012 8:58	334743.894	146.536	21.976	214.728
3/18/2012 9:03	335043.894	146.544	21.973	214.711
3/18/2012 9:08	335343.894	146.555	21.964	214.684
3/18/2012 9:13	335643.894	146.549	21.977	214.698
3/18/2012 9:18	335943.894	146.553	21.977	214.688
3/18/2012 9:23	336243.894	146.583	21.959	214.621
3/18/2012 9:28	336543.894	146.577	21.967	214.634
3/18/2012 9:33	336843.894	146.592	21.964	214.598
3/18/2012 9:38	337143.894	146.602	21.964	214.577
3/18/2012 9:43	337443.894	146.607	21.985	214.565
3/18/2012 9:48	337743.894	146.623	21.978	214.528
3/18/2012 9:53	338043.894	146.635	21.976	214.499
3/18/2012 9:58	338343.894	146.643	21.981	214.482
3/18/2012 10:03	338643.894	146.652	21.972	214.461
3/18/2012 10:08	338943.894	146.658	21.967	214.446
3/18/2012 10:13	339243.894	146.661	21.953	214.439
3/18/2012 10:18	339543.894	146.68	21.95	214.396

3/18/2012 10:23	339843.894	146.708	21.963	214.332
3/18/2012 10:28	340143.894	146.69	21.973	214.373
3/18/2012 10:33	340443.894	146.693	21.984	214.366
3/18/2012 10:38	340743.894	146.708	21.969	214.332
3/18/2012 10:43	341043.894	146.724	21.968	214.294
3/18/2012 10:48	341343.894	146.737	21.958	214.264
3/18/2012 10:53	341643.894	146.746	21.952	214.243
3/18/2012 10:58	341943.894	146.763	21.954	214.206
3/18/2012 11:03	342243.894	146.765	21.958	214.2
3/18/2012 11:08	342543.894	146.782	21.956	214.161
3/18/2012 11:13	342843.894	146.792	21.963	214.138
3/18/2012 11:18	343143.894	146.802	21.97	214.114
3/18/2012 11:23	343443.894	146.797	21.964	214.127
3/18/2012 11:28	343743.894	146.805	21.958	214.108
3/18/2012 11:33	344043.894	146.821	21.973	214.071
3/18/2012 11:38	344343.894	146.814	21.973	214.087
3/18/2012 11:43	344643.894	146.858	21.969	213.985
3/18/2012 11:48	344943.894	146.863	21.958	213.973
3/18/2012 11:53	345243.894	146.879	21.957	213.938
3/18/2012 11:58	345543.894	146.871	21.959	213.955
3/18/2012 12:03	345843.894	146.887	21.973	213.919
3/18/2012 12:08	346143.894	146.882	21.961	213.929
3/18/2012 12:13	346443.894	146.92	21.967	213.843
3/18/2012 12:18	346743.894	146.921	21.967	213.84
3/18/2012 12:23	347043.894	146.939	21.966	213.797
3/18/2012 12:28	347343.894	146.942	21.98	213.79
3/18/2012 12:33	347643.894	146.952	21.97	213.767
3/18/2012 12:38	347943.894	146.973	21.967	213.72
3/18/2012 12:43	348243.894	146.97	21.979	213.727
3/18/2012 12:48	348543.894	146.994	21.971	213.671
3/18/2012 12:53	348843.894	147.003	21.968	213.651
3/18/2012 12:58	349143.894	147.019	21.969	213.613
3/18/2012 13:03	349443.894	147.02	21.965	213.611
3/18/2012 13:08	349743.894	147.037	21.974	213.572
3/18/2012 13:13	350043.894	147.058	21.968	213.524
3/18/2012 13:18	350343.894	147.067	21.967	213.503
3/18/2012 13:23	350643.894	147.074	21.977	213.486
3/18/2012 13:28	350943.894	147.084	21.974	213.464
3/18/2012 13:33	351243.894	147.106	21.97	213.413
3/18/2012 13:38	351543.894	147.126	21.954	213.367
3/18/2012 13:43	351843.894	147.104	21.978	213.416
3/18/2012 13:48	352143.894	147.143	21.976	213.327
3/18/2012 13:53	352443.894	147.151	21.976	213.309
3/18/2012 13:58	352743.894	147.16	21.971	213.287
3/18/2012 14:03	353043.894	147.168	21.963	213.269
3/18/2012 14:08	353343.894	147.188	21.964	213.223
3/18/2012 14:13	353643.894	147.173	21.98	213.257
3/18/2012 14:18	353943.894	147.22	21.982	213.15
3/18/2012 14:23	354243.894	147.198	21.982	213.2
3/18/2012 14:28	354543.894	147.225	21.965	213.138
3/18/2012 14:33	354843.894	147.238	21.964	213.108
3/18/2012 14:38	355143.894	147.258	21.949	213.062
3/18/2012 14:43	355443.894	147.26	21.961	213.058
3/18/2012 14:48	355743.894	147.282	21.963	213.005

3/18/2012 14:53	356043.894	147.286	21.963	212.998
3/18/2012 14:58	356343.894	147.304	21.966	212.955
3/18/2012 15:03	356643.894	147.302	21.973	212.961
3/18/2012 15:08	356943.894	147.35	21.956	212.85
3/18/2012 15:13	357243.894	147.341	21.969	212.87
3/18/2012 15:18	357543.894	147.361	21.968	212.823
3/18/2012 15:23	357843.894	147.37	21.966	212.803
3/18/2012 15:28	358143.894	147.369	21.965	212.804
3/18/2012 15:33	358443.894	147.395	21.961	212.746
3/18/2012 15:38	358743.894	147.411	21.964	212.708
3/18/2012 15:43	359043.894	147.417	21.98	212.694
3/18/2012 15:48	359343.894	147.43	21.967	212.664
3/18/2012 15:53	359643.894	147.459	21.974	212.597
3/18/2012 15:58	359943.894	147.467	21.973	212.579
3/18/2012 16:03	360243.894	147.487	21.964	212.534
3/18/2012 16:08	360543.894	147.49	21.96	212.527
3/18/2012 16:13	360843.894	147.496	21.964	212.512
3/18/2012 16:18	361143.894	147.484	21.977	212.541
3/18/2012 16:23	361443.894	147.518	21.958	212.462
3/18/2012 16:28	361743.894	147.536	21.963	212.419
3/18/2012 16:33	362043.894	147.526	21.958	212.443
3/18/2012 16:38	362343.894	147.534	21.964	212.423
3/18/2012 16:43	362643.894	147.564	21.962	212.356
3/18/2012 16:48	362943.894	147.584	21.964	212.309
3/18/2012 16:53	363243.894	147.552	21.969	212.383
3/18/2012 16:58	363543.894	147.586	21.958	212.303
3/18/2012 17:03	363843.894	147.57	21.976	212.342
3/18/2012 17:08	364143.894	147.599	21.957	212.273
3/18/2012 17:13	364443.894	147.608	21.956	212.253
3/18/2012 17:18	364743.894	147.611	21.96	212.246
3/18/2012 17:23	365043.894	147.617	21.956	212.232
3/18/2012 17:28	365343.894	147.638	21.963	212.184
3/18/2012 17:33	365643.894	147.654	21.948	212.148
3/18/2012 17:38	365943.894	147.662	21.958	212.128
3/18/2012 17:43	366243.894	147.668	21.951	212.115
3/18/2012 17:48	366543.894	147.671	21.979	212.108
3/18/2012 17:53	366843.894	147.678	21.979	212.092
3/18/2012 17:58	367143.894	147.696	21.962	212.051
3/18/2012 18:03	367443.894	147.692	21.971	212.058
3/18/2012 18:08	367743.894	147.709	21.964	212.019
3/18/2012 18:13	368043.894	147.706	21.963	212.028
3/18/2012 18:18	368343.894	147.718	21.956	211.999
3/18/2012 18:23	368643.894	147.74	21.955	211.948
3/18/2012 18:28	368943.894	147.734	21.938	211.962
3/18/2012 18:33	369243.894	147.744	21.938	211.939
3/18/2012 18:38	369543.894	147.74	21.954	211.948
3/18/2012 18:43	369843.894	147.755	21.943	211.915
3/18/2012 18:48	370143.894	147.738	21.928	211.952
3/18/2012 18:53	370443.894	147.767	21.956	211.886
3/18/2012 18:58	370743.894	147.776	21.951	211.866
3/18/2012 19:03	371043.894	147.785	21.94	211.845
3/18/2012 19:08	371343.894	147.807	21.946	211.794
3/18/2012 19:13	371643.894	147.816	21.946	211.773
3/18/2012 19:18	371943.894	147.813	21.955	211.78

3/18/2012 19:23	372243.894	147.806	21.949	211.796
3/18/2012 19:28	372543.894	147.82	21.949	211.765
3/18/2012 19:33	372843.894	147.814	21.981	211.777
3/18/2012 19:38	373143.894	147.828	21.965	211.744
3/18/2012 19:43	373443.894	147.826	21.958	211.75
3/18/2012 19:48	373743.894	147.846	21.94	211.703
3/18/2012 19:53	374043.894	147.852	21.957	211.69
3/18/2012 19:58	374343.894	147.848	21.984	211.698
3/18/2012 20:03	374643.894	147.866	21.974	211.657
3/18/2012 20:08	374943.894	147.859	21.966	211.673
3/18/2012 20:13	375243.894	147.889	21.959	211.605
3/18/2012 20:18	375543.894	147.89	21.952	211.601
3/18/2012 20:23	375843.894	147.891	21.942	211.6
3/18/2012 20:28	376143.894	147.894	21.95	211.594
3/18/2012 20:33	376443.894	147.91	21.962	211.557
3/18/2012 20:38	376743.894	147.925	21.933	211.521
3/18/2012 20:43	377043.894	147.933	21.942	211.504
3/18/2012 20:48	377343.894	147.917	21.938	211.541
3/18/2012 20:53	377643.894	147.941	21.936	211.484
3/18/2012 20:58	377943.894	147.947	21.937	211.471
3/18/2012 21:03	378243.894	147.953	21.961	211.456
3/18/2012 21:08	378543.894	147.966	21.946	211.428
3/18/2012 21:13	378843.894	147.951	21.955	211.461
3/18/2012 21:18	379143.894	147.963	21.964	211.434
3/18/2012 21:23	379443.894	147.965	21.955	211.429
3/18/2012 21:28	379743.894	147.977	21.943	211.402
3/18/2012 21:33	380043.894	147.988	21.951	211.376
3/18/2012 21:38	380343.894	147.979	21.941	211.396
3/18/2012 21:43	380643.894	148.012	21.936	211.32
3/18/2012 21:48	380943.894	148.016	21.93	211.312
3/18/2012 21:53	381243.894	148.021	21.923	211.3
3/18/2012 21:58	381543.894	148.017	21.926	211.309
3/18/2012 22:03	381843.894	148.024	21.958	211.292
3/18/2012 22:08	382143.894	148.035	21.949	211.267
3/18/2012 22:13	382443.894	148.025	21.944	211.29
3/18/2012 22:18	382743.894	148.056	21.928	211.219
3/18/2012 22:23	383043.894	148.039	21.938	211.259
3/18/2012 22:28	383343.894	148.041	21.932	211.254
3/18/2012 22:33	383643.894	148.051	21.936	211.23
3/18/2012 22:38	383943.894	148.052	21.935	211.227
3/18/2012 22:43	384243.894	148.062	21.931	211.206
3/18/2012 22:48	384543.894	148.077	21.936	211.171
3/18/2012 22:53	384843.894	148.083	21.942	211.157
3/18/2012 22:58	385143.894	148.077	21.942	211.17
3/18/2012 23:03	385443.894	148.1	21.927	211.117
3/18/2012 23:08	385743.894	148.094	21.954	211.131
3/18/2012 23:13	386043.894	148.088	21.954	211.146
3/18/2012 23:18	386343.894	148.106	21.931	211.102
3/18/2012 23:23	386643.894	148.086	21.929	211.15
3/18/2012 23:28	386943.894	148.127	21.958	211.055
3/18/2012 23:33	387243.894	148.131	21.97	211.047
3/18/2012 23:38	387543.894	148.135	21.962	211.037
3/18/2012 23:43	387843.894	148.15	21.968	211.002
3/18/2012 23:48	388143.894	148.154	21.954	210.994

3/18/2012 23:53	388443.894	148.171	21.941	210.954
3/18/2012 23:58	388743.894	148.165	21.954	210.966
3/19/2012 0:03	389043.894	148.198	21.945	210.892
3/19/2012 0:08	389343.894	148.206	21.93	210.872
3/19/2012 0:13	389643.894	148.176	21.929	210.942
3/19/2012 0:18	389943.894	148.217	21.959	210.846
3/19/2012 0:23	390243.894	148.221	21.946	210.839
3/19/2012 0:28	390543.894	148.224	21.956	210.83
3/19/2012 0:33	390843.894	148.234	21.958	210.809
3/19/2012 0:38	391143.894	148.279	21.948	210.704
3/19/2012 0:43	391443.894	148.281	21.963	210.699
3/19/2012 0:48	391743.894	148.281	21.945	210.699
3/19/2012 0:53	392043.894	148.316	21.947	210.618
3/19/2012 0:58	392343.894	148.302	21.964	210.65
3/19/2012 1:03	392643.894	148.333	21.963	210.58
3/19/2012 1:08	392943.894	148.342	21.951	210.558
3/19/2012 1:13	393243.894	148.339	21.949	210.565
3/19/2012 1:18	393543.894	148.356	21.951	210.525
3/19/2012 1:23	393843.894	148.373	21.949	210.487
3/19/2012 1:28	394143.894	148.381	21.947	210.469
3/19/2012 1:33	394443.894	148.404	21.94	210.415
3/19/2012 1:38	394743.894	148.371	21.924	210.492
3/19/2012 1:43	395043.894	148.407	21.942	210.408
3/19/2012 1:48	395343.894	148.407	21.948	210.408
3/19/2012 1:53	395643.894	148.429	21.938	210.358
3/19/2012 1:58	395943.894	148.445	21.941	210.32
3/19/2012 2:03	396243.894	148.459	21.934	210.288
3/19/2012 2:08	396543.894	148.459	21.934	210.289
3/19/2012 2:13	396843.894	148.447	21.937	210.316
3/19/2012 2:18	397143.894	148.473	21.953	210.257
3/19/2012 2:23	397443.894	148.462	21.928	210.281
3/19/2012 2:28	397743.894	148.508	21.92	210.174
3/19/2012 2:33	398043.894	148.49	21.907	210.217
3/19/2012 2:38	398343.894	148.483	21.916	210.233
3/19/2012 2:43	398643.894	148.518	21.916	210.153
3/19/2012 2:48	398943.894	148.561	21.936	210.054
3/19/2012 2:53	399243.894	148.547	21.944	210.085
3/19/2012 2:58	399543.894	148.562	21.952	210.05
3/19/2012 3:03	399843.894	148.551	21.936	210.076
3/19/2012 3:08	400143.894	148.57	21.927	210.031
3/19/2012 3:13	400443.894	148.574	21.929	210.024
3/19/2012 3:18	400743.894	148.595	21.922	209.974
3/19/2012 3:23	401043.894	148.597	21.929	209.97
3/19/2012 3:28	401343.894	148.657	21.937	209.831
3/19/2012 3:33	401643.894	148.65	21.932	209.846
3/19/2012 3:38	401943.894	148.654	21.934	209.839
3/19/2012 3:43	402243.894	148.654	21.928	209.838
3/19/2012 3:48	402543.894	148.654	21.934	209.838
3/19/2012 3:53	402843.894	148.684	21.943	209.769
3/19/2012 3:58	403143.894	148.655	21.936	209.835
3/19/2012 4:03	403443.894	148.719	21.932	209.689
3/19/2012 4:08	403743.894	148.716	21.928	209.696
3/19/2012 4:13	404043.894	148.745	21.931	209.627
3/19/2012 4:18	404343.894	148.737	21.94	209.647

3/19/2012 4:23	404643.894	148.76	21.925	209.594
3/19/2012 4:28	404943.894	148.758	21.937	209.599
3/19/2012 4:33	405243.894	148.772	21.933	209.565
3/19/2012 4:38	405543.894	148.75	21.917	209.616
3/19/2012 4:43	405843.894	148.753	21.928	209.61
3/19/2012 4:48	406143.894	148.794	21.933	209.515
3/19/2012 4:53	406443.894	148.812	21.916	209.474
3/19/2012 4:58	406743.894	148.812	21.921	209.472
3/19/2012 5:03	407043.894	148.821	21.932	209.452
3/19/2012 5:08	407343.894	148.829	21.926	209.435
3/19/2012 5:13	407643.894	148.788	21.926	209.528
3/19/2012 5:18	407943.894	148.837	21.92	209.415
3/19/2012 5:23	408243.894	148.842	21.931	209.405
3/19/2012 5:28	408543.894	148.868	21.932	209.343
3/19/2012 5:33	408843.894	148.88	21.939	209.316
3/19/2012 5:38	409143.894	148.871	21.925	209.336
3/19/2012 5:43	409443.894	148.869	21.917	209.341
3/19/2012 5:48	409743.894	148.857	21.929	209.37
3/19/2012 5:53	410043.894	148.868	21.939	209.345
3/19/2012 5:58	410343.894	148.912	21.933	209.243
3/19/2012 6:03	410643.894	148.902	21.928	209.265
3/19/2012 6:08	410943.894	148.902	21.929	209.265
3/19/2012 6:13	411243.894	148.944	21.928	209.169
3/19/2012 6:18	411543.894	148.954	21.937	209.146
3/19/2012 6:23	411843.894	148.936	21.919	209.186
3/19/2012 6:28	412143.894	148.946	21.899	209.165
3/19/2012 6:33	412443.894	148.968	21.918	209.114
3/19/2012 6:38	412743.894	148.992	21.94	209.058
3/19/2012 6:43	413043.894	148.985	21.938	209.074
3/19/2012 6:48	413343.894	149.007	21.919	209.024
3/19/2012 6:53	413643.894	149.004	21.93	209.03
3/19/2012 6:58	413943.894	148.978	21.927	209.09
3/19/2012 7:03	414243.894	148.989	21.917	209.064
3/19/2012 7:08	414543.894	149.005	21.915	209.029
3/19/2012 7:13	414843.894	149.01	21.917	209.016
3/19/2012 7:18	415143.894	149.048	21.939	208.929
3/19/2012 7:23	415443.894	149.054	21.939	208.915
3/19/2012 7:28	415743.894	149.023	21.926	208.987
3/19/2012 7:33	416043.894	149.038	21.913	208.951
3/19/2012 7:38	416343.894	149.084	21.919	208.845
3/19/2012 7:43	416643.894	149.041	21.924	208.945
3/19/2012 7:48	416943.894	149.047	21.922	208.931
3/19/2012 7:53	417243.894	149.058	21.934	208.905
3/19/2012 7:58	417543.894	149.088	21.948	208.836
3/19/2012 8:03	417843.894	149.105	21.941	208.798
3/19/2012 8:08	418143.894	149.085	21.91	208.844
3/19/2012 8:13	418443.894	149.098	21.916	208.812
3/19/2012 8:18	418743.894	149.1	21.921	208.808
3/19/2012 8:23	419043.894	149.127	21.919	208.746
3/19/2012 8:28	419343.894	149.134	21.92	208.73
3/19/2012 8:33	419643.894	149.109	21.912	208.787
3/19/2012 8:38	419943.894	149.121	21.904	208.761
3/19/2012 8:43	420243.894	149.119	21.905	208.765
3/19/2012 8:48	420543.894	149.134	21.923	208.731

3/19/2012 8:53	420843.894	149.145	21.918	208.705
3/19/2012 8:58	421143.894	149.134	21.921	208.731
3/19/2012 9:03	421443.894	149.177	21.946	208.63
3/19/2012 9:08	421743.894	149.155	21.926	208.681
3/19/2012 9:13	422043.894	149.198	21.926	208.583
3/19/2012 9:18	422343.894	149.206	21.926	208.563
3/19/2012 9:23	422643.894	149.178	21.911	208.629
3/19/2012 9:28	422943.894	149.187	21.917	208.608
3/19/2012 9:33	423243.894	149.203	21.912	208.57
3/19/2012 9:38	423543.894	149.195	21.906	208.589
3/19/2012 9:43	423843.894	149.241	21.919	208.483
3/19/2012 9:48	424143.894	149.225	21.903	208.52
3/19/2012 9:53	424443.894	149.214	21.926	208.545
3/19/2012 9:58	424743.894	149.218	21.909	208.536
3/19/2012 10:03	425043.894	149.225	21.907	208.519
3/19/2012 10:08	425343.894	149.237	21.921	208.493
3/19/2012 10:13	425643.894	149.243	21.923	208.479
3/19/2012 10:18	425943.894	149.278	21.919	208.398
3/19/2012 10:23	426243.894	149.26	21.916	208.438
3/19/2012 10:28	426543.894	149.296	21.931	208.355
3/19/2012 10:33	426843.894	149.259	21.906	208.441
3/19/2012 10:38	427143.894	149.287	21.892	208.377
3/19/2012 10:43	427443.894	149.281	21.91	208.391
3/19/2012 10:48	427743.894	149.294	21.896	208.36
3/19/2012 10:53	428043.894	149.29	21.903	208.37
3/19/2012 10:58	428343.894	149.317	21.897	208.307
3/19/2012 11:03	428643.894	149.314	21.906	208.314
3/19/2012 11:08	428943.894	149.308	21.908	208.328
3/19/2012 11:13	429243.894	149.371	21.919	208.182
3/19/2012 11:18	429543.894	149.365	21.918	208.197
3/19/2012 11:23	429843.894	149.337	21.91	208.262
3/19/2012 11:28	430143.894	149.348	21.897	208.237
3/19/2012 11:33	430443.894	149.348	21.906	208.235
3/19/2012 11:38	430743.894	149.381	21.905	208.159
3/19/2012 11:43	431043.894	149.384	21.909	208.154
3/19/2012 11:48	431343.894	149.393	21.922	208.132
3/19/2012 11:53	431643.894	149.392	21.918	208.133
3/19/2012 11:58	431943.894	149.392	21.916	208.135
3/19/2012 12:03	432243.894	149.403	21.916	208.109
3/19/2012 12:08	432543.894	149.41	21.912	208.093
3/19/2012 12:13	432843.894	149.462	21.917	207.972
3/19/2012 12:18	433143.894	149.434	21.923	208.038
3/19/2012 12:23	433443.894	149.431	21.915	208.043
3/19/2012 12:28	433743.894	149.46	21.927	207.977
3/19/2012 12:33	434043.894	149.465	21.919	207.966
3/19/2012 12:38	434343.894	149.469	21.92	207.957
3/19/2012 12:43	434643.894	149.502	21.932	207.879
3/19/2012 12:48	434943.894	149.478	21.929	207.936
3/19/2012 12:53	435243.894	149.496	21.921	207.894
3/19/2012 12:58	435543.894	149.498	21.914	207.89
3/19/2012 13:03	435843.894	149.515	21.915	207.851
3/19/2012 13:08	436143.894	149.548	21.928	207.775
3/19/2012 13:13	436443.894	149.531	21.919	207.814
3/19/2012 13:18	436743.894	149.546	21.902	207.778

TW-2 Pump Test Data

3/19/2012 13:23	437043.894	149.565	21.916	207.735
3/19/2012 13:28	437343.894	149.573	21.908	207.715
3/19/2012 13:33	437643.894	149.585	21.906	207.689

CS-1 Water Level Data
During TW-2 Pumping Test

Report Date: 5/16/2012 5:43:40 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:
File Name: CS1 TW2pt 2012-03-16 10.57.39.wsl
Create Date: 3/16/2012 10:57:24 AM

Device Properties:
Device: Level TROLL 700
Site: CS1
Device Name: CS-1
Serial Number: 125740
Firmware Version: 2.08
Hardware Version:
Device Address:
Device Comm Cfg:
Used Memory(%):
Used Battery(%):

Log Configuration
Log Name: CS1 TW2pt
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.4.2.0
Create Date: 3/13/2012 3:36:03 PM Central Standard Time (Ignore DST)
Log Setup Time Zone: Unknown
Notes Size(bytes): 4096
Overwrite when full: Disabled
Scheduled Start Time: 3/13/2012 5:00:00 PM Central Standard Time (Ignore DST)
Scheduled Stop Time: No Stop Time
Type: Linear
Interval: Days: 0 hrs: 00 mins: 10 secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 180.86 (ft)
Level Reference Head Pressure: 15.1101 (PSI)

Other Log Settings
Depth of Probe: 34.8883 (ft)
Head Pressure: 15.1099 (PSI)
Temperature: 21.6524 (C)

CS-1 Water Level Data
During TW-2 Pumping Test

Log Notes:

Date and Time	Note
3/13/2012 3:36:09 PM	User Note: "Level reference initialized to: 180.86"
3/16/2012 10:56:39 AM	Manual Stop Command

Log Data:
Record Count: 396
Sensors: 1
1 - 125740: Pressure/Temp 30 PSIG (21m/69ft)
Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 69ft SN#: 125740 Pressure (PSI)	Sensor: Pres(G) 69ft SN#: 125740 Temperature (C)	Sensor: Pres(G) 69ft SN#: 125740 Level Depth To Water (ft)
3/13/2012 17:00	0	15.287	21.314	180.452
3/13/2012 17:10	600.001	15.3	21.317	180.421
3/13/2012 17:20	1200.001	15.311	21.316	180.397
3/13/2012 17:30	1800.001	15.322	21.314	180.371
3/13/2012 17:40	2400.001	15.334	21.316	180.343
3/13/2012 17:50	3000.001	15.342	21.317	180.324
3/13/2012 18:00	3600.001	15.352	21.314	180.301
3/13/2012 18:10	4200.001	15.363	21.317	180.277
3/13/2012 18:20	4800.001	15.372	21.317	180.254
3/13/2012 18:30	5400.001	15.381	21.316	180.234
3/13/2012 18:40	6000.001	15.39	21.312	180.213
3/13/2012 18:50	6600.001	15.397	21.314	180.197
3/13/2012 19:00	7200.001	15.409	21.314	180.171
3/13/2012 19:10	7800.001	15.418	21.318	180.149
3/13/2012 19:20	8400.001	15.428	21.317	180.127
3/13/2012 19:30	9000.001	15.436	21.314	180.108
3/13/2012 19:40	9600.001	15.445	21.317	180.087
3/13/2012 19:50	10200.001	15.45	21.314	180.074
3/13/2012 20:00	10800.001	15.459	21.315	180.054
3/13/2012 20:10	11400.001	15.467	21.316	180.036
3/13/2012 20:20	12000.001	15.473	21.315	180.023
3/13/2012 20:30	12600.001	15.481	21.314	180.003
3/13/2012 20:40	13200.001	15.485	21.312	179.994
3/13/2012 20:50	13800.001	15.493	21.315	179.975
3/13/2012 21:00	14400.001	15.501	21.316	179.958
3/13/2012 21:10	15000.001	15.507	21.316	179.944
3/13/2012 21:20	15600.001	15.511	21.314	179.935
3/13/2012 21:30	16200.001	15.519	21.313	179.916
3/13/2012 21:40	16800.001	15.524	21.317	179.904
3/13/2012 21:50	17400.001	15.528	21.316	179.894
3/13/2012 22:00	18000.001	15.535	21.315	179.879
3/13/2012 22:10	18600.001	15.542	21.317	179.864
3/13/2012 22:20	19200.001	15.546	21.315	179.853
3/13/2012 22:30	19800.001	15.552	21.314	179.84
3/13/2012 22:40	20400.001	15.558	21.315	179.825

CS-1 Water Level Data
During TW-2 Pumping Test

3/13/2012 22:50	21000.001	15.561	21.314	179.82
3/13/2012 23:00	21600.001	15.567	21.312	179.804
3/13/2012 23:10	22200.001	15.574	21.314	179.79
3/13/2012 23:20	22800.001	15.577	21.314	179.781
3/13/2012 23:30	23400.001	15.582	21.32	179.77
3/13/2012 23:40	24000.001	15.586	21.318	179.761
3/13/2012 23:50	24600.001	15.59	21.316	179.751
3/14/2012 0:00	25200.001	15.596	21.317	179.739
3/14/2012 0:10	25800.001	15.599	21.314	179.732
3/14/2012 0:20	26400.001	15.603	21.316	179.721
3/14/2012 0:30	27000.001	15.607	21.314	179.713
3/14/2012 0:40	27600.001	15.611	21.318	179.704
3/14/2012 0:50	28200.001	15.614	21.316	179.696
3/14/2012 1:00	28800.001	15.618	21.317	179.688
3/14/2012 1:10	29400.001	15.625	21.317	179.672
3/14/2012 1:20	30000.001	15.629	21.316	179.662
3/14/2012 1:30	30600.001	15.633	21.317	179.653
3/14/2012 1:40	31200.001	15.638	21.314	179.641
3/14/2012 1:50	31800.001	15.644	21.312	179.627
3/14/2012 2:00	32400.001	15.648	21.316	179.617
3/14/2012 2:10	33000.001	15.657	21.316	179.597
3/14/2012 2:20	33600.001	15.662	21.316	179.586
3/14/2012 2:30	34200.001	15.667	21.316	179.574
3/14/2012 2:40	34800.001	15.671	21.316	179.564
3/14/2012 2:50	35400.001	15.677	21.316	179.552
3/14/2012 3:00	36000.001	15.68	21.316	179.543
3/14/2012 3:10	36600.001	15.689	21.313	179.523
3/14/2012 3:20	37200.001	15.695	21.315	179.509
3/14/2012 3:30	37800.001	15.7	21.317	179.498
3/14/2012 3:40	38400.001	15.707	21.313	179.483
3/14/2012 3:50	39000.001	15.711	21.314	179.473
3/14/2012 4:00	39600.001	15.715	21.316	179.463
3/14/2012 4:10	40200.001	15.723	21.318	179.445
3/14/2012 4:20	40800.001	15.728	21.317	179.434
3/14/2012 4:30	41400.001	15.733	21.316	179.421
3/14/2012 4:40	42000.001	15.739	21.318	179.407
3/14/2012 4:50	42600.001	15.746	21.317	179.391
3/14/2012 5:00	43200.001	15.755	21.319	179.372
3/14/2012 5:10	43800.001	15.76	21.316	179.36
3/14/2012 5:20	44400.001	15.763	21.317	179.352
3/14/2012 5:30	45000.001	15.77	21.315	179.337
3/14/2012 5:40	45600.001	15.777	21.317	179.32
3/14/2012 5:50	46200.001	15.779	21.315	179.315
3/14/2012 6:00	46800.001	15.786	21.317	179.299
3/14/2012 6:10	47400.001	15.791	21.316	179.288
3/14/2012 6:20	48000.001	15.798	21.314	179.272
3/14/2012 6:30	48600.001	15.804	21.317	179.257
3/14/2012 6:40	49200.001	15.807	21.314	179.251
3/14/2012 6:50	49800.001	15.813	21.313	179.238
3/14/2012 7:00	50400.001	15.819	21.316	179.222
3/14/2012 7:10	51000.001	15.826	21.316	179.207
3/14/2012 7:20	51600.001	15.832	21.318	179.192
3/14/2012 7:30	52200.001	15.835	21.316	179.186
3/14/2012 7:40	52800.001	15.841	21.311	179.173

CS-1 Water Level Data
During TW-2 Pumping Test

3/14/2012 7:50	53400.001	15.848	21.317	179.157
3/14/2012 8:00	54000.001	15.851	21.316	179.149
3/14/2012 8:10	54600.001	15.857	21.313	179.135
3/14/2012 8:20	55200.001	15.864	21.315	179.12
3/14/2012 8:30	55800.001	15.869	21.316	179.107
3/14/2012 8:40	56400.001	15.874	21.316	179.096
3/14/2012 8:50	57000.001	15.88	21.317	179.082
3/14/2012 9:00	57600.001	15.884	21.315	179.072
3/14/2012 9:10	58200.001	15.891	21.316	179.057
3/14/2012 9:20	58800.001	15.894	21.317	179.049
3/14/2012 9:30	59400.001	15.899	21.321	179.039
3/14/2012 9:40	60000.001	15.905	21.321	179.025
3/14/2012 9:50	60600.001	15.91	21.319	179.013
3/14/2012 10:00	61200.001	15.916	21.318	178.999
3/14/2012 10:10	61800.001	15.921	21.318	178.987
3/14/2012 10:20	62400.001	15.927	21.317	178.973
3/14/2012 10:30	63000.001	15.931	21.319	178.965
3/14/2012 10:40	63600.001	15.937	21.316	178.95
3/14/2012 10:50	64200.001	15.943	21.318	178.938
3/14/2012 11:00	64800.001	15.948	21.316	178.926
3/14/2012 11:10	65400.001	15.952	21.316	178.916
3/14/2012 11:20	66000.001	15.958	21.318	178.901
3/14/2012 11:30	66600.001	15.966	21.319	178.884
3/14/2012 11:40	67200.001	15.969	21.319	178.876
3/14/2012 11:50	67800.001	15.977	21.32	178.858
3/14/2012 12:00	68400.001	15.982	21.32	178.846
3/14/2012 12:10	69000.001	15.985	21.32	178.839
3/14/2012 12:20	69600.001	15.992	21.317	178.824
3/14/2012 12:30	70200.001	15.995	21.316	178.817
3/14/2012 12:40	70800.001	16.001	21.318	178.802
3/14/2012 12:50	71400.001	16.007	21.32	178.79
3/14/2012 13:00	72000.001	16.013	21.322	178.775
3/14/2012 13:10	72600.001	16.017	21.32	178.765
3/14/2012 13:20	73200.001	16.023	21.32	178.752
3/14/2012 13:30	73800.001	16.028	21.319	178.74
3/14/2012 13:40	74400.001	16.034	21.317	178.727
3/14/2012 13:50	75000.001	16.038	21.318	178.717
3/14/2012 14:00	75600.001	16.041	21.317	178.711
3/14/2012 14:10	76200.001	16.045	21.32	178.701
3/14/2012 14:20	76800.001	16.05	21.318	178.689
3/14/2012 14:30	77400.001	16.054	21.317	178.682
3/14/2012 14:40	78000.001	16.054	21.317	178.68
3/14/2012 14:50	78600.001	16.058	21.32	178.671
3/14/2012 15:00	79200.001	16.059	21.319	178.669
3/14/2012 15:10	79800.001	16.06	21.319	178.667
3/14/2012 15:20	80400.001	16.061	21.318	178.665
3/14/2012 15:30	81000.001	16.062	21.317	178.663
3/14/2012 15:40	81600.001	16.061	21.319	178.664
3/14/2012 15:50	82200.001	16.059	21.321	178.668
3/14/2012 16:00	82800.001	16.059	21.321	178.669
3/14/2012 16:10	83400.001	16.058	21.32	178.67
3/14/2012 16:20	84000.001	16.055	21.321	178.679
3/14/2012 16:30	84600.001	16.052	21.318	178.685
3/14/2012 16:40	85200.001	16.051	21.319	178.688

CS-1 Water Level Data
During TW-2 Pumping Test

3/14/2012 16:50	85800.001	16.048	21.32	178.693
3/14/2012 17:00	86400.001	16.046	21.321	178.699
3/14/2012 17:10	87000.001	16.044	21.316	178.703
3/14/2012 17:20	87600.001	16.042	21.32	178.709
3/14/2012 17:30	88200.001	16.039	21.32	178.714
3/14/2012 17:40	88800.001	16.036	21.318	178.723
3/14/2012 17:50	89400.001	16.033	21.32	178.728
3/14/2012 18:00	90000.001	16.028	21.318	178.74
3/14/2012 18:10	90600.001	16.025	21.318	178.748
3/14/2012 18:20	91200.001	16.022	21.316	178.754
3/14/2012 18:30	91800.001	16.021	21.321	178.756
3/14/2012 18:40	92400.001	16.017	21.319	178.765
3/14/2012 18:50	93000.001	16.012	21.32	178.777
3/14/2012 19:00	93600.001	16.006	21.32	178.79
3/14/2012 19:10	94200.001	16.003	21.325	178.797
3/14/2012 19:20	94800.001	15.998	21.319	178.81
3/14/2012 19:30	95400.001	15.994	21.318	178.818
3/14/2012 19:40	96000.001	15.99	21.317	178.829
3/14/2012 19:50	96600.001	15.987	21.318	178.836
3/14/2012 20:00	97200.001	15.982	21.321	178.848
3/14/2012 20:10	97800.001	15.978	21.318	178.857
3/14/2012 20:20	98400.001	15.974	21.32	178.866
3/14/2012 20:30	99000.001	15.969	21.32	178.877
3/14/2012 20:40	99600.001	15.965	21.32	178.885
3/14/2012 20:50	100200.001	15.958	21.317	178.902
3/14/2012 21:00	100800.001	15.956	21.319	178.908
3/14/2012 21:10	101400.001	15.951	21.32	178.919
3/14/2012 21:20	102000.001	15.945	21.32	178.931
3/14/2012 21:30	102600.001	15.942	21.32	178.94
3/14/2012 21:40	103200.001	15.937	21.317	178.951
3/14/2012 21:50	103800.001	15.934	21.321	178.958
3/14/2012 22:00	104400.001	15.927	21.321	178.975
3/14/2012 22:10	105000.001	15.924	21.321	178.981
3/14/2012 22:20	105600.001	15.916	21.319	178.998
3/14/2012 22:30	106200.001	15.914	21.32	179.004
3/14/2012 22:40	106800.001	15.91	21.323	179.013
3/14/2012 22:50	107400.001	15.905	21.317	179.025
3/14/2012 23:00	108000.001	15.9	21.322	179.035
3/14/2012 23:10	108600.001	15.895	21.318	179.047
3/14/2012 23:20	109200.001	15.892	21.322	179.054
3/14/2012 23:30	109800.001	15.889	21.321	179.062
3/14/2012 23:40	110400.001	15.886	21.321	179.069
3/14/2012 23:50	111000.001	15.881	21.319	179.079
3/15/2012 0:00	111600.001	15.879	21.32	179.085
3/15/2012 0:10	112200.001	15.876	21.32	179.091
3/15/2012 0:20	112800.001	15.873	21.316	179.099
3/15/2012 0:30	113400.001	15.869	21.314	179.107
3/15/2012 0:40	114000.001	15.868	21.316	179.111
3/15/2012 0:50	114600.001	15.864	21.32	179.119
3/15/2012 1:00	115200.001	15.861	21.316	179.127
3/15/2012 1:10	115800.001	15.858	21.318	179.133
3/15/2012 1:20	116400.001	15.856	21.318	179.139
3/15/2012 1:30	117000.001	15.85	21.319	179.152
3/15/2012 1:40	117600.001	15.849	21.319	179.154

CS-1 Water Level Data
During TW-2 Pumping Test

3/15/2012 1:50	118200.001	15.844	21.319	179.166
3/15/2012 2:00	118800.001	15.842	21.317	179.171
3/15/2012 2:10	119400.001	15.835	21.318	179.185
3/15/2012 2:20	120000.001	15.832	21.318	179.194
3/15/2012 2:30	120600.001	15.828	21.322	179.203
3/15/2012 2:40	121200.001	15.824	21.316	179.212
3/15/2012 2:50	121800.001	15.82	21.318	179.221
3/15/2012 3:00	122400.001	15.818	21.317	179.225
3/15/2012 3:10	123000.001	15.815	21.316	179.232
3/15/2012 3:20	123600.001	15.812	21.318	179.239
3/15/2012 3:30	124200.001	15.809	21.319	179.245
3/15/2012 3:40	124800.001	15.805	21.318	179.256
3/15/2012 3:50	125400.001	15.804	21.315	179.258
3/15/2012 4:00	126000.001	15.799	21.316	179.269
3/15/2012 4:10	126600.001	15.795	21.317	179.278
3/15/2012 4:20	127200.001	15.793	21.313	179.283
3/15/2012 4:30	127800.001	15.787	21.316	179.297
3/15/2012 4:40	128400.001	15.781	21.315	179.31
3/15/2012 4:50	129000.001	15.776	21.316	179.321
3/15/2012 5:00	129600.001	15.772	21.317	179.332
3/15/2012 5:10	130200.001	15.77	21.32	179.337
3/15/2012 5:20	130800.001	15.766	21.317	179.345
3/15/2012 5:30	131400.001	15.759	21.318	179.362
3/15/2012 5:40	132000.001	15.754	21.319	179.373
3/15/2012 5:50	132600.001	15.751	21.314	179.381
3/15/2012 6:00	133200.001	15.746	21.32	179.392
3/15/2012 6:10	133800.001	15.741	21.32	179.402
3/15/2012 6:20	134400.001	15.738	21.316	179.41
3/15/2012 6:30	135000.001	15.732	21.319	179.425
3/15/2012 6:40	135600.001	15.723	21.314	179.444
3/15/2012 6:50	136200.001	15.719	21.316	179.454
3/15/2012 7:00	136800.001	15.715	21.314	179.464
3/15/2012 7:10	137400.001	15.712	21.317	179.471
3/15/2012 7:20	138000.001	15.702	21.319	179.494
3/15/2012 7:30	138600.001	15.698	21.317	179.503
3/15/2012 7:40	139200.001	15.693	21.32	179.514
3/15/2012 7:50	139800.001	15.688	21.317	179.525
3/15/2012 8:00	140400.001	15.683	21.318	179.536
3/15/2012 8:10	141000.001	15.677	21.318	179.552
3/15/2012 8:20	141600.001	15.672	21.317	179.562
3/15/2012 8:30	142200.001	15.667	21.318	179.574
3/15/2012 8:40	142800.001	15.664	21.316	179.58
3/15/2012 8:50	143400.001	15.661	21.319	179.588
3/15/2012 9:00	144000.001	15.653	21.318	179.605
3/15/2012 9:10	144600.001	15.65	21.319	179.613
3/15/2012 9:20	145200.001	15.646	21.321	179.623
3/15/2012 9:30	145800.001	15.642	21.317	179.632
3/15/2012 9:40	146400.001	15.638	21.316	179.641
3/15/2012 9:50	147000.001	15.633	21.316	179.652
3/15/2012 10:00	147600.001	15.627	21.315	179.666
3/15/2012 10:10	148200.001	15.624	21.314	179.674
3/15/2012 10:20	148800.001	15.62	21.317	179.683
3/15/2012 10:30	149400.001	15.615	21.316	179.694
3/15/2012 10:40	150000.001	15.612	21.318	179.701

CS-1 Water Level Data
During TW-2 Pumping Test

3/15/2012 10:50	150600.001	15.61	21.316	179.707
3/15/2012 11:00	151200.001	15.606	21.319	179.714
3/15/2012 11:10	151800.001	15.604	21.315	179.72
3/15/2012 11:20	152400.001	15.6	21.314	179.729
3/15/2012 11:30	153000.001	15.598	21.319	179.732
3/15/2012 11:40	153600.001	15.594	21.316	179.743
3/15/2012 11:50	154200.001	15.594	21.314	179.743
3/15/2012 12:00	154800.001	15.589	21.317	179.754
3/15/2012 12:10	155400.001	15.588	21.317	179.757
3/15/2012 12:20	156000.001	15.586	21.316	179.762
3/15/2012 12:30	156600.001	15.583	21.314	179.767
3/15/2012 12:40	157200.001	15.58	21.314	179.774
3/15/2012 12:50	157800.001	15.578	21.313	179.779
3/15/2012 13:00	158400.001	15.576	21.315	179.785
3/15/2012 13:10	159000.001	15.574	21.317	179.788
3/15/2012 13:20	159600.001	15.575	21.316	179.786
3/15/2012 13:30	160200.001	15.571	21.317	179.795
3/15/2012 13:40	160800.001	15.569	21.316	179.801
3/15/2012 13:50	161400.001	15.567	21.318	179.804
3/15/2012 14:00	162000.001	15.564	21.319	179.812
3/15/2012 14:10	162600.001	15.563	21.317	179.813
3/15/2012 14:20	163200.001	15.561	21.318	179.819
3/15/2012 14:30	163800.001	15.561	21.321	179.819
3/15/2012 14:40	164400.001	15.559	21.317	179.823
3/15/2012 14:50	165000.001	15.558	21.313	179.825
3/15/2012 15:00	165600.001	15.556	21.314	179.831
3/15/2012 15:10	166200.001	15.555	21.314	179.832
3/15/2012 15:20	166800.001	15.553	21.317	179.838
3/15/2012 15:30	167400.001	15.55	21.314	179.843
3/15/2012 15:40	168000.001	15.55	21.316	179.844
3/15/2012 15:50	168600.001	15.545	21.313	179.855
3/15/2012 16:00	169200.001	15.546	21.316	179.853
3/15/2012 16:10	169800.001	15.542	21.313	179.862
3/15/2012 16:20	170400.001	15.539	21.316	179.871
3/15/2012 16:30	171000.001	15.536	21.316	179.877
3/15/2012 16:40	171600.001	15.532	21.314	179.886
3/15/2012 16:50	172200.001	15.53	21.316	179.89
3/15/2012 17:00	172800.001	15.528	21.316	179.894
3/15/2012 17:10	173400.001	15.526	21.312	179.899
3/15/2012 17:20	174000.001	15.524	21.315	179.903
3/15/2012 17:30	174600.001	15.522	21.313	179.91
3/15/2012 17:40	175200.001	15.519	21.311	179.916
3/15/2012 17:50	175800.001	15.515	21.314	179.924
3/15/2012 18:00	176400.001	15.513	21.313	179.929
3/15/2012 18:10	177000.001	15.509	21.317	179.939
3/15/2012 18:20	177600.001	15.507	21.314	179.943
3/15/2012 18:30	178200.001	15.501	21.314	179.958
3/15/2012 18:40	178800.001	15.498	21.316	179.965
3/15/2012 18:50	179400.001	15.495	21.314	179.972
3/15/2012 19:00	180000.001	15.491	21.315	179.982
3/15/2012 19:10	180600.001	15.484	21.313	179.996
3/15/2012 19:20	181200.001	15.481	21.316	180.003
3/15/2012 19:30	181800.001	15.476	21.318	180.016
3/15/2012 19:40	182400.001	15.473	21.316	180.023

CS-1 Water Level Data
During TW-2 Pumping Test

3/15/2012 19:50	183000.001	15.468	21.314	180.035
3/15/2012 20:00	183600.001	15.467	21.316	180.036
3/15/2012 20:10	184200.001	15.461	21.314	180.049
3/15/2012 20:20	184800.001	15.457	21.316	180.058
3/15/2012 20:30	185400.001	15.452	21.317	180.071
3/15/2012 20:40	186000.001	15.449	21.316	180.077
3/15/2012 20:50	186600.001	15.445	21.314	180.086
3/15/2012 21:00	187200.001	15.443	21.316	180.092
3/15/2012 21:10	187800.001	15.439	21.315	180.101
3/15/2012 21:20	188400.001	15.436	21.316	180.108
3/15/2012 21:30	189000.001	15.433	21.316	180.115
3/15/2012 21:40	189600.001	15.428	21.315	180.126
3/15/2012 21:50	190200.001	15.423	21.314	180.136
3/15/2012 22:00	190800.001	15.426	21.316	180.131
3/15/2012 22:10	191400.001	15.419	21.314	180.146
3/15/2012 22:20	192000.001	15.417	21.316	180.151
3/15/2012 22:30	192600.001	15.412	21.316	180.162
3/15/2012 22:40	193200.001	15.41	21.316	180.167
3/15/2012 22:50	193800.001	15.409	21.312	180.17
3/15/2012 23:00	194400.001	15.407	21.317	180.175
3/15/2012 23:10	195000.001	15.405	21.314	180.178
3/15/2012 23:20	195600.001	15.403	21.314	180.184
3/15/2012 23:30	196200.001	15.399	21.314	180.192
3/15/2012 23:40	196800.001	15.401	21.313	180.189
3/15/2012 23:50	197400.001	15.399	21.317	180.193
3/16/2012 0:00	198000.001	15.398	21.316	180.196
3/16/2012 0:10	198600.001	15.395	21.314	180.202
3/16/2012 0:20	199200.001	15.395	21.312	180.203
3/16/2012 0:30	199800.001	15.393	21.311	180.206
3/16/2012 0:40	200400.001	15.393	21.311	180.206
3/16/2012 0:50	201000.001	15.392	21.309	180.208
3/16/2012 1:00	201600.001	15.392	21.314	180.209
3/16/2012 1:10	202200.001	15.393	21.317	180.208
3/16/2012 1:20	202800.001	15.39	21.316	180.214
3/16/2012 1:30	203400.001	15.388	21.314	180.218
3/16/2012 1:40	204000.001	15.389	21.313	180.215
3/16/2012 1:50	204600.001	15.388	21.316	180.219
3/16/2012 2:00	205200.001	15.384	21.316	180.227
3/16/2012 2:10	205800.001	15.387	21.313	180.222
3/16/2012 2:20	206400.001	15.386	21.312	180.222
3/16/2012 2:30	207000.001	15.389	21.314	180.216
3/16/2012 2:40	207600.001	15.387	21.314	180.22
3/16/2012 2:50	208200.001	15.39	21.314	180.214
3/16/2012 3:00	208800.001	15.392	21.316	180.209
3/16/2012 3:10	209400.001	15.394	21.316	180.204
3/16/2012 3:20	210000.001	15.396	21.314	180.199
3/16/2012 3:30	210600.001	15.397	21.315	180.197
3/16/2012 3:40	211200.001	15.4	21.312	180.19
3/16/2012 3:50	211800.001	15.403	21.317	180.183
3/16/2012 4:00	212400.001	15.407	21.316	180.174
3/16/2012 4:10	213000.001	15.409	21.316	180.17
3/16/2012 4:20	213600.001	15.412	21.317	180.162
3/16/2012 4:30	214200.001	15.419	21.316	180.147
3/16/2012 4:40	214800.001	15.422	21.314	180.139

CS-1 Water Level Data
During TW-2 Pumping Test

3/16/2012 4:50	215400.001	15.425	21.312	180.132
3/16/2012 5:00	216000.001	15.429	21.314	180.123
3/16/2012 5:10	216600.001	15.435	21.314	180.111
3/16/2012 5:20	217200.001	15.437	21.313	180.105
3/16/2012 5:30	217800.001	15.441	21.316	180.096
3/16/2012 5:40	218400.001	15.444	21.314	180.09
3/16/2012 5:50	219000.001	15.448	21.314	180.08
3/16/2012 6:00	219600.001	15.452	21.317	180.071
3/16/2012 6:10	220200.001	15.456	21.316	180.062
3/16/2012 6:20	220800.001	15.46	21.317	180.052
3/16/2012 6:30	221400.001	15.465	21.316	180.04
3/16/2012 6:40	222000.001	15.466	21.316	180.039
3/16/2012 6:50	222600.001	15.472	21.312	180.025
3/16/2012 7:00	223200.001	15.474	21.314	180.019
3/16/2012 7:10	223800.001	15.479	21.316	180.008
3/16/2012 7:20	224400.001	15.485	21.314	179.994
3/16/2012 7:30	225000.001	15.486	21.314	179.991
3/16/2012 7:40	225600.001	15.495	21.318	179.971
3/16/2012 7:50	226200.001	15.499	21.31	179.963
3/16/2012 8:00	226800.001	15.503	21.316	179.954
3/16/2012 8:10	227400.001	15.508	21.315	179.94
3/16/2012 8:20	228000.001	15.512	21.312	179.932
3/16/2012 8:30	228600.001	15.516	21.314	179.924
3/16/2012 8:40	229200.001	15.519	21.315	179.916
3/16/2012 8:50	229800.001	15.522	21.318	179.908
3/16/2012 9:00	230400.001	15.527	21.316	179.896
3/16/2012 9:10	231000.001	15.53	21.316	179.891
3/16/2012 9:20	231600.001	15.535	21.316	179.878
3/16/2012 9:30	232200.001	15.542	21.314	179.863
3/16/2012 9:40	232800.001	15.544	21.316	179.857
3/16/2012 9:50	233400.001	15.55	21.314	179.844
3/16/2012 10:00	234000.001	15.553	21.316	179.837
3/16/2012 10:10	234600.001	15.557	21.314	179.828
3/16/2012 10:20	235200.001	15.559	21.314	179.823
3/16/2012 10:30	235800.001	15.564	21.317	179.812
3/16/2012 10:40	236400.001	15.569	21.317	179.801
3/16/2012 10:50	237000.001	15.575	21.313	179.786

Red Wine

TW-2 (CS-13 Test Well) Pumping Test

WELL MW7-LGR **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl⁻ *(PPM)*	Initials	Notes
3-13-12		~~245.44~~	245.84				Set 10 min Linear test to start @ 1700
3-14-12	11:21	244.80	241.65			SP	Test Running
	13:21	241.52	~~241.52~~ 241.	30		SP	
	1718	~~240~~.82	—			EN	
	1809	240.52	240.71			EN	
	2024	240.43	—			EN	
	2313	240.04	239.84			EN	
3/15/12	0148	239.68	—			SP	
	0415	239.32	239.12			SP	
	0557	239.11	238.93			SP	
	0951	238.75	238.54			JWB	well was sampled approx. 1000 by GW crew - SE and JM
	1229	—	238.25			EN	
	1412	~~238.22~~	238.04			EN	
	1800	237.78	~~237~~.59			EN	
	2053	237.55	237.37			EN	
	2325	237.32	237.16			EN	
3/16/12	0140	237.10	236.93			SP	Recovery Phase
		~~162.47~~					
	11:17	236.35	236.15			SP	END TEST FILE: MW7 TW2 PT

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

Report Date: 5/16/2012 6:08:21 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:
File Name: MW17 TW2PT 2012-03-16 11.18.28.wsl
Create Date: 3/16/2012 11:18:07 AM

Device Properties:
Device: Level TROLL 700
Site: Mw17 TW2PT
Device Name:
Serial Number: 160746
Firmware Version: 2.08
Hardware Version:
Device Address:
Device Comm Cfg:
Used Memory(%):
Used Battery(%):

Log Configuration
Log Name: MW17 TW2PT
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.4.2.0
Create Date: 3/13/2012 2:49:29 PM Central Standard Time (Ignore DST)
Log Setup Time Zone: Unknown
Notes Size(bytes): 4096
Overwrite when full: Disabled
Scheduled Start Time: 3/13/2012 5:00:00 PM Central Standard Time (Ignore DST)
Scheduled Stop Time: No Stop Time
Type: Linear
Interval: Days: 0 hrs: 00 mins: 10 secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 245.84 (ft)
Level Reference Head Pressure: 13.3349 (PSI)

Other Log Settings
Depth of Probe: 30.7895 (ft)
Head Pressure: 13.3348 (PSI)
Temperature: 21.5285 (C)

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

Log Notes:

Date and Time	Note
3/13/2012 1:49:50 PM	User Note: "Level reference initialized to: 245.84"
3/16/2012 11:17:01 AM	Manual Stop Command

Log Data:
Record Count: 398
Sensors: 1
1 - 160746: Pressure/Temp 30 PSIG (21m/69ft)
Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 69ft SN#: 160746 Pressure (PSI)	Sensor: Pres(G) 69ft SN#: 160746 Temperature (C)	Sensor: Pres(G) 69ft SN#: 160746 Level Depth To Water (ft)
3/13/2012 17:00	0	13.577	21.305	245.281
3/13/2012 17:10	600.001	13.596	21.305	245.238
3/13/2012 17:20	1200.001	13.617	21.303	245.189
3/13/2012 17:30	1800.001	13.632	21.309	245.155
3/13/2012 17:40	2400.001	13.648	21.308	245.116
3/13/2012 17:50	3000.001	13.665	21.306	245.077
3/13/2012 18:00	3600.001	13.686	21.303	245.03
3/13/2012 18:10	4200.001	13.7	21.307	244.996
3/13/2012 18:20	4800.001	13.718	21.306	244.955
3/13/2012 18:30	5400.001	13.735	21.305	244.916
3/13/2012 18:40	6000.001	13.75	21.307	244.881
3/13/2012 18:50	6600.001	13.762	21.308	244.853
3/13/2012 19:00	7200.001	13.783	21.307	244.806
3/13/2012 19:10	7800.001	13.796	21.306	244.775
3/13/2012 19:20	8400.001	13.816	21.309	244.729
3/13/2012 19:30	9000.001	13.829	21.309	244.699
3/13/2012 19:40	9600.001	13.845	21.305	244.662
3/13/2012 19:50	10200.001	13.862	21.307	244.622
3/13/2012 20:00	10800.001	13.876	21.308	244.591
3/13/2012 20:10	11400.001	13.89	21.305	244.559
3/13/2012 20:20	12000.001	13.907	21.307	244.518
3/13/2012 20:30	12600.001	13.918	21.307	244.493
3/13/2012 20:40	13200.001	13.937	21.308	244.45
3/13/2012 20:50	13800.001	13.948	21.305	244.424
3/13/2012 21:00	14400.001	13.965	21.306	244.385
3/13/2012 21:10	15000.001	13.982	21.304	244.346
3/13/2012 21:20	15600.001	13.994	21.305	244.318
3/13/2012 21:30	16200.001	14.006	21.303	244.29
3/13/2012 21:40	16800.001	14.02	21.304	244.258
3/13/2012 21:50	17400.001	14.036	21.303	244.222
3/13/2012 22:00	18000.001	14.052	21.306	244.184
3/13/2012 22:10	18600.001	14.065	21.302	244.154
3/13/2012 22:20	19200.001	14.079	21.304	244.122
3/13/2012 22:30	19800.001	14.094	21.304	244.086
3/13/2012 22:40	20400.001	14.11	21.303	244.051

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/13/2012 22:50	21000.001	14.124	21.302	244.018
3/13/2012 23:00	21600.001	14.141	21.303	243.979
3/13/2012 23:10	22200.001	14.155	21.303	243.947
3/13/2012 23:20	22800.001	14.172	21.301	243.907
3/13/2012 23:30	23400.001	14.185	21.303	243.876
3/13/2012 23:40	24000.001	14.198	21.304	243.846
3/13/2012 23:50	24600.001	14.214	21.303	243.81
3/14/2012 0:00	25200.001	14.23	21.3	243.772
3/14/2012 0:10	25800.001	14.25	21.303	243.727
3/14/2012 0:20	26400.001	14.265	21.302	243.693
3/14/2012 0:30	27000.001	14.277	21.303	243.665
3/14/2012 0:40	27600.001	14.29	21.305	243.635
3/14/2012 0:50	28200.001	14.311	21.303	243.587
3/14/2012 1:00	28800.001	14.32	21.302	243.565
3/14/2012 1:10	29400.001	14.341	21.302	243.517
3/14/2012 1:20	30000.001	14.356	21.303	243.483
3/14/2012 1:30	30600.001	14.371	21.3	243.447
3/14/2012 1:40	31200.001	14.386	21.304	243.414
3/14/2012 1:50	31800.001	14.407	21.302	243.364
3/14/2012 2:00	32400.001	14.422	21.302	243.331
3/14/2012 2:10	33000.001	14.436	21.301	243.297
3/14/2012 2:20	33600.001	14.452	21.302	243.26
3/14/2012 2:30	34200.001	14.471	21.303	243.216
3/14/2012 2:40	34800.001	14.482	21.302	243.192
3/14/2012 2:50	35400.001	14.496	21.307	243.158
3/14/2012 3:00	36000.001	14.511	21.304	243.123
3/14/2012 3:10	36600.001	14.527	21.304	243.088
3/14/2012 3:20	37200.001	14.543	21.302	243.052
3/14/2012 3:30	37800.001	14.557	21.303	243.018
3/14/2012 3:40	38400.001	14.572	21.302	242.984
3/14/2012 3:50	39000.001	14.585	21.302	242.952
3/14/2012 4:00	39600.001	14.599	21.302	242.92
3/14/2012 4:10	40200.001	14.615	21.302	242.884
3/14/2012 4:20	40800.001	14.628	21.302	242.855
3/14/2012 4:30	41400.001	14.643	21.301	242.821
3/14/2012 4:40	42000.001	14.655	21.302	242.792
3/14/2012 4:50	42600.001	14.671	21.304	242.754
3/14/2012 5:00	43200.001	14.686	21.3	242.72
3/14/2012 5:10	43800.001	14.701	21.305	242.687
3/14/2012 5:20	44400.001	14.713	21.304	242.657
3/14/2012 5:30	45000.001	14.726	21.301	242.627
3/14/2012 5:40	45600.001	14.739	21.305	242.598
3/14/2012 5:50	46200.001	14.75	21.304	242.572
3/14/2012 6:00	46800.001	14.763	21.301	242.542
3/14/2012 6:10	47400.001	14.776	21.302	242.512
3/14/2012 6:20	48000.001	14.793	21.303	242.473
3/14/2012 6:30	48600.001	14.804	21.303	242.447
3/14/2012 6:40	49200.001	14.815	21.303	242.421
3/14/2012 6:50	49800.001	14.827	21.305	242.395
3/14/2012 7:00	50400.001	14.842	21.302	242.36
3/14/2012 7:10	51000.001	14.854	21.3	242.332
3/14/2012 7:20	51600.001	14.866	21.303	242.304
3/14/2012 7:30	52200.001	14.88	21.303	242.272
3/14/2012 7:40	52800.001	14.889	21.303	242.252

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 7:50	53400.001	14.902	21.305	242.222
3/14/2012 8:00	54000.001	14.914	21.304	242.194
3/14/2012 8:10	54600.001	14.927	21.302	242.164
3/14/2012 8:20	55200.001	14.94	21.305	242.133
3/14/2012 8:30	55800.001	14.953	21.301	242.104
3/14/2012 8:40	56400.001	14.964	21.303	242.078
3/14/2012 8:50	57000.001	14.975	21.304	242.053
3/14/2012 9:00	57600.001	14.988	21.301	242.022
3/14/2012 9:10	58200.001	14.999	21.303	241.998
3/14/2012 9:20	58800.001	15.01	21.302	241.971
3/14/2012 9:30	59400.001	15.02	21.303	241.95
3/14/2012 9:40	60000.001	15.033	21.307	241.92
3/14/2012 9:50	60600.001	15.045	21.303	241.892
3/14/2012 10:00	61200.001	15.057	21.301	241.863
3/14/2012 10:10	61800.001	15.07	21.303	241.834
3/14/2012 10:20	62400.001	15.082	21.304	241.805
3/14/2012 10:30	63000.001	15.093	21.304	241.781
3/14/2012 10:40	63600.001	15.106	21.304	241.751
3/14/2012 10:50	64200.001	15.115	21.303	241.73
3/14/2012 11:00	64800.001	15.127	21.304	241.701
3/14/2012 11:10	65400.001	15.14	21.302	241.672
3/14/2012 11:20	66000.001	15.154	21.301	241.64
3/14/2012 11:30	66600.001	15.173	21.304	241.597
3/14/2012 11:40	67200.001	15.182	21.303	241.575
3/14/2012 11:50	67800.001	15.196	21.303	241.542
3/14/2012 12:00	68400.001	15.205	21.305	241.521
3/14/2012 12:10	69000.001	15.218	21.302	241.492
3/14/2012 12:20	69600.001	15.229	21.301	241.467
3/14/2012 12:30	70200.001	15.243	21.303	241.435
3/14/2012 12:40	70800.001	15.255	21.304	241.406
3/14/2012 12:50	71400.001	15.267	21.303	241.379
3/14/2012 13:00	72000.001	15.277	21.302	241.356
3/14/2012 13:10	72600.001	15.292	21.302	241.321
3/14/2012 13:20	73200.001	15.305	21.303	241.29
3/14/2012 13:30	73800.001	15.318	21.302	241.261
3/14/2012 13:40	74400.001	15.332	21.305	241.228
3/14/2012 13:50	75000.001	15.345	21.306	241.198
3/14/2012 14:00	75600.001	15.362	21.301	241.159
3/14/2012 14:10	76200.001	15.372	21.303	241.137
3/14/2012 14:20	76800.001	15.386	21.301	241.103
3/14/2012 14:30	77400.001	15.399	21.303	241.074
3/14/2012 14:40	78000.001	15.411	21.3	241.046
3/14/2012 14:50	78600.001	15.427	21.305	241.009
3/14/2012 15:00	79200.001	15.439	21.303	240.981
3/14/2012 15:10	79800.001	15.449	21.304	240.959
3/14/2012 15:20	80400.001	15.462	21.306	240.928
3/14/2012 15:30	81000.001	15.475	21.303	240.899
3/14/2012 15:40	81600.001	15.484	21.304	240.877
3/14/2012 15:50	82200.001	15.495	21.302	240.851
3/14/2012 16:00	82800.001	15.509	21.302	240.821
3/14/2012 16:10	83400.001	15.52	21.306	240.795
3/14/2012 16:20	84000.001	15.531	21.304	240.768
3/14/2012 16:30	84600.001	15.543	21.306	240.741
3/14/2012 16:40	85200.001	15.551	21.302	240.722

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 16:50	85800.001	15.562	21.3	240.698
3/14/2012 17:00	86400.001	15.572	21.302	240.673
3/14/2012 17:10	87000.001	15.584	21.304	240.647
3/14/2012 17:20	87600.001	15.595	21.302	240.621
3/14/2012 17:30	88200.001	15.605	21.307	240.598
3/14/2012 17:40	88800.001	15.617	21.304	240.57
3/14/2012 17:50	89400.001	15.626	21.305	240.55
3/14/2012 18:00	90000.001	15.636	21.301	240.527
3/14/2012 18:10	90600.001	15.648	21.301	240.499
3/14/2012 18:20	91200.001	15.662	21.3	240.467
3/14/2012 18:30	91800.001	15.67	21.303	240.449
3/14/2012 18:40	92400.001	15.682	21.301	240.42
3/14/2012 18:50	93000.001	15.695	21.302	240.391
3/14/2012 19:00	93600.001	15.699	21.3	240.381
3/14/2012 19:10	94200.001	15.71	21.303	240.357
3/14/2012 19:20	94800.001	15.718	21.299	240.337
3/14/2012 19:30	95400.001	15.728	21.301	240.315
3/14/2012 19:40	96000.001	15.739	21.299	240.289
3/14/2012 19:50	96600.001	15.748	21.303	240.269
3/14/2012 20:00	97200.001	15.757	21.303	240.248
3/14/2012 20:10	97800.001	15.766	21.303	240.226
3/14/2012 20:20	98400.001	15.777	21.304	240.202
3/14/2012 20:30	99000.001	15.785	21.306	240.183
3/14/2012 20:40	99600.001	15.796	21.301	240.158
3/14/2012 20:50	100200.001	15.803	21.301	240.141
3/14/2012 21:00	100800.001	15.812	21.305	240.12
3/14/2012 21:10	101400.001	15.821	21.304	240.099
3/14/2012 21:20	102000.001	15.831	21.303	240.076
3/14/2012 21:30	102600.001	15.84	21.301	240.055
3/14/2012 21:40	103200.001	15.85	21.302	240.033
3/14/2012 21:50	103800.001	15.859	21.302	240.011
3/14/2012 22:00	104400.001	15.868	21.305	239.991
3/14/2012 22:10	105000.001	15.877	21.302	239.969
3/14/2012 22:20	105600.001	15.886	21.3	239.949
3/14/2012 22:30	106200.001	15.895	21.3	239.929
3/14/2012 22:40	106800.001	15.905	21.302	239.906
3/14/2012 22:50	107400.001	15.914	21.302	239.885
3/14/2012 23:00	108000.001	15.922	21.303	239.866
3/14/2012 23:10	108600.001	15.933	21.302	239.84
3/14/2012 23:20	109200.001	15.942	21.306	239.821
3/14/2012 23:30	109800.001	15.953	21.302	239.794
3/14/2012 23:40	110400.001	15.963	21.302	239.773
3/14/2012 23:50	111000.001	15.973	21.301	239.748
3/15/2012 0:00	111600.001	15.986	21.302	239.719
3/15/2012 0:10	112200.001	15.995	21.305	239.698
3/15/2012 0:20	112800.001	16.006	21.301	239.673
3/15/2012 0:30	113400.001	16.015	21.301	239.653
3/15/2012 0:40	114000.001	16.027	21.304	239.624
3/15/2012 0:50	114600.001	16.039	21.301	239.597
3/15/2012 1:00	115200.001	16.051	21.299	239.569
3/15/2012 1:10	115800.001	16.059	21.301	239.55
3/15/2012 1:20	116400.001	16.07	21.303	239.524
3/15/2012 1:30	117000.001	16.08	21.301	239.502
3/15/2012 1:40	117600.001	16.09	21.305	239.479

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 1:50	118200.001	16.099	21.302	239.458
3/15/2012 2:00	118800.001	16.11	21.301	239.433
3/15/2012 2:10	119400.001	16.117	21.303	239.415
3/15/2012 2:20	120000.001	16.125	21.302	239.398
3/15/2012 2:30	120600.001	16.137	21.302	239.37
3/15/2012 2:40	121200.001	16.146	21.302	239.349
3/15/2012 2:50	121800.001	16.162	21.305	239.312
3/15/2012 3:00	122400.001	16.168	21.304	239.298
3/15/2012 3:10	123000.001	16.179	21.303	239.273
3/15/2012 3:20	123600.001	16.19	21.304	239.247
3/15/2012 3:30	124200.001	16.198	21.305	239.229
3/15/2012 3:40	124800.001	16.21	21.305	239.202
3/15/2012 3:50	125400.001	16.22	21.303	239.178
3/15/2012 4:00	126000.001	16.23	21.302	239.156
3/15/2012 4:10	126600.001	16.239	21.302	239.135
3/15/2012 4:20	127200.001	16.249	21.304	239.11
3/15/2012 4:30	127800.001	16.257	21.302	239.093
3/15/2012 4:40	128400.001	16.263	21.302	239.08
3/15/2012 4:50	129000.001	16.273	21.304	239.057
3/15/2012 5:00	129600.001	16.282	21.302	239.035
3/15/2012 5:10	130200.001	16.291	21.301	239.015
3/15/2012 5:20	130800.001	16.299	21.302	238.995
3/15/2012 5:30	131400.001	16.308	21.3	238.975
3/15/2012 5:40	132000.001	16.315	21.303	238.959
3/15/2012 5:50	132600.001	16.325	21.302	238.937
3/15/2012 6:00	133200.001	16.326	21.306	238.933
3/15/2012 6:10	133800.001	16.341	21.302	238.898
3/15/2012 6:20	134400.001	16.349	21.302	238.88
3/15/2012 6:30	135000.001	16.357	21.304	238.863
3/15/2012 6:40	135600.001	16.361	21.299	238.853
3/15/2012 6:50	136200.001	16.368	21.306	238.836
3/15/2012 7:00	136800.001	16.378	21.304	238.815
3/15/2012 7:10	137400.001	16.383	21.301	238.802
3/15/2012 7:20	138000.001	16.388	21.299	238.79
3/15/2012 7:30	138600.001	16.396	21.301	238.773
3/15/2012 7:40	139200.001	16.403	21.301	238.755
3/15/2012 7:50	139800.001	16.411	21.303	238.737
3/15/2012 8:00	140400.001	16.418	21.301	238.721
3/15/2012 8:10	141000.001	16.424	21.302	238.708
3/15/2012 8:20	141600.001	16.431	21.304	238.691
3/15/2012 8:30	142200.001	16.439	21.305	238.672
3/15/2012 8:40	142800.001	16.447	21.302	238.655
3/15/2012 8:50	143400.001	16.454	21.302	238.638
3/15/2012 9:00	144000.001	16.46	21.305	238.624
3/15/2012 9:10	144600.001	16.469	21.301	238.604
3/15/2012 9:20	145200.001	16.475	21.305	238.588
3/15/2012 9:30	145800.001	16.483	21.302	238.57
3/15/2012 9:40	146400.001	16.49	21.302	238.556
3/15/2012 9:50	147000.001	16.498	21.301	238.536
3/15/2012 10:00	147600.001	16.505	21.304	238.521
3/15/2012 10:10	148200.001	16.511	21.304	238.507
3/15/2012 10:20	148800.001	16.485	21.301	238.566
3/15/2012 10:30	149400.001	16.494	21.301	238.547
3/15/2012 10:40	150000.001	16.505	21.301	238.52

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 10:50	150600.001	16.538	21.305	238.444
3/15/2012 11:00	151200.001	16.55	21.303	238.417
3/15/2012 11:10	151800.001	16.559	21.301	238.395
3/15/2012 11:20	152400.001	16.566	21.303	238.38
3/15/2012 11:30	153000.001	16.576	21.304	238.356
3/15/2012 11:40	153600.001	16.583	21.303	238.339
3/15/2012 11:50	154200.001	16.595	21.303	238.314
3/15/2012 12:00	154800.001	16.601	21.302	238.299
3/15/2012 12:10	155400.001	16.61	21.302	238.277
3/15/2012 12:20	156000.001	16.621	21.302	238.253
3/15/2012 12:30	156600.001	16.629	21.307	238.233
3/15/2012 12:40	157200.001	16.634	21.304	238.222
3/15/2012 12:50	157800.001	16.647	21.303	238.193
3/15/2012 13:00	158400.001	16.654	21.307	238.175
3/15/2012 13:10	159000.001	16.667	21.302	238.147
3/15/2012 13:20	159600.001	16.676	21.305	238.124
3/15/2012 13:30	160200.001	16.686	21.303	238.102
3/15/2012 13:40	160800.001	16.692	21.304	238.088
3/15/2012 13:50	161400.001	16.702	21.303	238.065
3/15/2012 14:00	162000.001	16.711	21.301	238.045
3/15/2012 14:10	162600.001	16.72	21.304	238.025
3/15/2012 14:20	163200.001	16.73	21.301	238.002
3/15/2012 14:30	163800.001	16.736	21.302	237.988
3/15/2012 14:40	164400.001	16.75	21.301	237.955
3/15/2012 14:50	165000.001	16.759	21.303	237.935
3/15/2012 15:00	165600.001	16.766	21.301	237.918
3/15/2012 15:10	166200.001	16.775	21.303	237.896
3/15/2012 15:20	166800.001	16.785	21.302	237.875
3/15/2012 15:30	167400.001	16.793	21.302	237.856
3/15/2012 15:40	168000.001	16.803	21.305	237.833
3/15/2012 15:50	168600.001	16.811	21.302	237.814
3/15/2012 16:00	169200.001	16.82	21.301	237.793
3/15/2012 16:10	169800.001	16.826	21.303	237.78
3/15/2012 16:20	170400.001	16.835	21.305	237.758
3/15/2012 16:30	171000.001	16.843	21.306	237.741
3/15/2012 16:40	171600.001	16.849	21.301	237.727
3/15/2012 16:50	172200.001	16.857	21.302	237.707
3/15/2012 17:00	172800.001	16.864	21.305	237.691
3/15/2012 17:10	173400.001	16.873	21.306	237.671
3/15/2012 17:20	174000.001	16.883	21.303	237.648
3/15/2012 17:30	174600.001	16.888	21.303	237.635
3/15/2012 17:40	175200.001	16.896	21.304	237.617
3/15/2012 17:50	175800.001	16.906	21.302	237.593
3/15/2012 18:00	176400.001	16.914	21.311	237.576
3/15/2012 18:10	177000.001	16.918	21.303	237.567
3/15/2012 18:20	177600.001	16.923	21.302	237.555
3/15/2012 18:30	178200.001	16.928	21.304	237.544
3/15/2012 18:40	178800.001	16.934	21.304	237.529
3/15/2012 18:50	179400.001	16.941	21.304	237.514
3/15/2012 19:00	180000.001	16.947	21.304	237.5
3/15/2012 19:10	180600.001	16.951	21.302	237.49
3/15/2012 19:20	181200.001	16.958	21.299	237.474
3/15/2012 19:30	181800.001	16.962	21.301	237.466
3/15/2012 19:40	182400.001	16.967	21.302	237.454

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 19:50	183000.001	16.975	21.301	237.435
3/15/2012 20:00	183600.001	16.981	21.303	237.422
3/15/2012 20:10	184200.001	16.985	21.3	237.411
3/15/2012 20:20	184800.001	16.987	21.302	237.407
3/15/2012 20:30	185400.001	16.995	21.304	237.39
3/15/2012 20:40	186000.001	17.002	21.303	237.372
3/15/2012 20:50	186600.001	17.006	21.304	237.363
3/15/2012 21:00	187200.001	17.014	21.305	237.346
3/15/2012 21:10	187800.001	17.02	21.301	237.331
3/15/2012 21:20	188400.001	17.025	21.304	237.319
3/15/2012 21:30	189000.001	17.031	21.302	237.307
3/15/2012 21:40	189600.001	17.036	21.301	237.294
3/15/2012 21:50	190200.001	17.041	21.3	237.283
3/15/2012 22:00	190800.001	17.046	21.304	237.271
3/15/2012 22:10	191400.001	17.052	21.3	237.257
3/15/2012 22:20	192000.001	17.057	21.302	237.246
3/15/2012 22:30	192600.001	17.064	21.301	237.229
3/15/2012 22:40	193200.001	17.07	21.304	237.216
3/15/2012 22:50	193800.001	17.078	21.302	237.198
3/15/2012 23:00	194400.001	17.086	21.3	237.178
3/15/2012 23:10	195000.001	17.096	21.3	237.157
3/15/2012 23:20	195600.001	17.098	21.304	237.151
3/15/2012 23:30	196200.001	17.108	21.3	237.128
3/15/2012 23:40	196800.001	17.113	21.303	237.117
3/15/2012 23:50	197400.001	17.122	21.303	237.097
3/16/2012 0:00	198000.001	17.128	21.303	237.081
3/16/2012 0:10	198600.001	17.138	21.305	237.058
3/16/2012 0:20	199200.001	17.142	21.304	237.048
3/16/2012 0:30	199800.001	17.15	21.304	237.031
3/16/2012 0:40	200400.001	17.159	21.3	237.01
3/16/2012 0:50	201000.001	17.167	21.3	236.992
3/16/2012 1:00	201600.001	17.174	21.301	236.975
3/16/2012 1:10	202200.001	17.182	21.301	236.957
3/16/2012 1:20	202800.001	17.187	21.3	236.947
3/16/2012 1:30	203400.001	17.194	21.3	236.929
3/16/2012 1:40	204000.001	17.202	21.301	236.911
3/16/2012 1:50	204600.001	17.208	21.303	236.897
3/16/2012 2:00	205200.001	17.212	21.302	236.888
3/16/2012 2:10	205800.001	17.221	21.301	236.868
3/16/2012 2:20	206400.001	17.226	21.304	236.856
3/16/2012 2:30	207000.001	17.238	21.303	236.828
3/16/2012 2:40	207600.001	17.242	21.302	236.819
3/16/2012 2:50	208200.001	17.249	21.303	236.803
3/16/2012 3:00	208800.001	17.256	21.303	236.787
3/16/2012 3:10	209400.001	17.262	21.303	236.772
3/16/2012 3:20	210000.001	17.269	21.301	236.756
3/16/2012 3:30	210600.001	17.275	21.301	236.743
3/16/2012 3:40	211200.001	17.279	21.301	236.733
3/16/2012 3:50	211800.001	17.287	21.302	236.716
3/16/2012 4:00	212400.001	17.296	21.302	236.695
3/16/2012 4:10	213000.001	17.3	21.302	236.684
3/16/2012 4:20	213600.001	17.307	21.3	236.668
3/16/2012 4:30	214200.001	17.315	21.298	236.649
3/16/2012 4:40	214800.001	17.321	21.303	236.636

CS-MW17-LGR Water Level Data
During TW-2 Pumping Test

3/16/2012 4:50	215400.001	17.329	21.302	236.617
3/16/2012 5:00	216000.001	17.336	21.299	236.602
3/16/2012 5:10	216600.001	17.34	21.304	236.592
3/16/2012 5:20	217200.001	17.347	21.303	236.575
3/16/2012 5:30	217800.001	17.351	21.304	236.568
3/16/2012 5:40	218400.001	17.354	21.301	236.56
3/16/2012 5:50	219000.001	17.36	21.302	236.547
3/16/2012 6:00	219600.001	17.365	21.301	236.536
3/16/2012 6:10	220200.001	17.37	21.306	236.522
3/16/2012 6:20	220800.001	17.374	21.301	236.513
3/16/2012 6:30	221400.001	17.38	21.298	236.499
3/16/2012 6:40	222000.001	17.383	21.302	236.492
3/16/2012 6:50	222600.001	17.391	21.301	236.474
3/16/2012 7:00	223200.001	17.394	21.301	236.469
3/16/2012 7:10	223800.001	17.4	21.301	236.454
3/16/2012 7:20	224400.001	17.406	21.302	236.44
3/16/2012 7:30	225000.001	17.411	21.302	236.428
3/16/2012 7:40	225600.001	17.416	21.298	236.417
3/16/2012 7:50	226200.001	17.423	21.303	236.401
3/16/2012 8:00	226800.001	17.426	21.299	236.395
3/16/2012 8:10	227400.001	17.432	21.299	236.38
3/16/2012 8:20	228000.001	17.439	21.302	236.365
3/16/2012 8:30	228600.001	17.439	21.302	236.363
3/16/2012 8:40	229200.001	17.443	21.3	236.354
3/16/2012 8:50	229800.001	17.448	21.303	236.344
3/16/2012 9:00	230400.001	17.455	21.301	236.328
3/16/2012 9:10	231000.001	17.456	21.302	236.325
3/16/2012 9:20	231600.001	17.465	21.302	236.304
3/16/2012 9:30	232200.001	17.466	21.301	236.301
3/16/2012 9:40	232800.001	17.471	21.303	236.289
3/16/2012 9:50	233400.001	17.474	21.302	236.284
3/16/2012 10:00	234000.001	17.477	21.3	236.276
3/16/2012 10:10	234600.001	17.481	21.303	236.267
3/16/2012 10:20	235200.001	17.483	21.3	236.262
3/16/2012 10:30	235800.001	17.488	21.303	236.25
3/16/2012 10:40	236400.001	17.491	21.301	236.244
3/16/2012 10:50	237000.001	17.499	21.302	236.225
3/16/2012 11:00	237600.001	17.507	21.302	236.206
3/16/2012 11:10	238200.001	17.527	21.301	236.161

TW-2 (CS-13 Test Well) Pumping Test

WELL MW21-LGR **Groundwater Level Measurements**

Date	Time	E-Line DTW *(ft BTOC)*	Level Troll DTW *(ft BTOC)*	Pumping Well *Flow Rate (GPM)*	Free Cl *(PPM)*	Initials	Notes
3/13/12		172.71	172.71				Sch. Start @ 17:00
3/14/2012	11:09	~~170.60~~	167.62			SP	Test Running. Red E-line
↓	13:29	167.28	167.21			SP	
	1608	166.82	166.78			EN	
	1822	166.44	166.49			EN	
	2009	166.15	—			EN	
↓	2323	165.70	165.81			EN	
3/15/12	0140	165.52	—			SP	
↓	0423	165.02	165.14			JDB	
	0551	164.86	165.00			JDB	
	1001	164.59	164.59			JDB	
	1238	164.23	164.32			EN	
	1405	—	164.16			EN	
	1752	—	163.77			EN	
	2043	—	163.56			END	
↓	2317	—	163.32			EN	
3/16/12	0150	162.92	163.07			EN	
↓	1010	162.47	162.46			SP	SlgTest. Download MW21 TW2 PT

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

Report Date: 5/16/2012 6:11:46 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:
File Name: MW21 TW2PT 2012-03-16 10.13.27.wsl
Create Date: 3/16/2012 10:12:50 AM

Device Properties:
Device: Level TROLL 500
Site: MW21-LGR
Device Name: MW21-LGR
Serial Number: 114866
Firmware Version: 2.04
Hardware Version:
Device Address:
Device Comm Cfg:
Used Memory(%):
Used Battery(%):

Log Configuration
Log Name: MW21 TW2PT
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.4.2.0
Create Date: 3/13/2012 10:28:46 AM Central Standard Time (Ignore DST)
Log Setup Time Zone: Unknown
Notes Size(bytes): 4096
Overwrite when full: Disabled
Scheduled Start Time: 3/13/2012 5:00:00 PM Central Standard Time (Ignore DST)
Scheduled Stop Time: No Stop Time
Type: Linear
Interval: Days: 0 hrs: 00 mins: 10 secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 172.71 (ft)
Level Reference Head Pressure: 46.0777 (PSI)

Other Log Settings
Depth of Probe: 106.381 (ft)
Head Pressure: 46.0729 (PSI)
Temperature: 22.017 (C)

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

Log Notes:

Date and Time	Note
3/13/2012 10:28:52 AM	User Note: "Level reference initialized to: 172.71"
3/16/2012 10:11:41 AM	Manual Stop Command

Log Data:
Record Count: 392
Sensors: 1
1 - 114866: Pressure/Temp 100 PSIG (70m/231ft)
Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 231ft SN#: 114866 Level Depth To Water (f	Sensor: Pres(G) 231ft SN#: 114866 Pressure (PSI)	Sensor: Pres(G) 231ft SN#: 114866 Temperature (C)
3/13/2012 17:00	0	171.064	46.791	21.969
3/13/2012 17:10	600.001	171.004	46.816	21.971
3/13/2012 17:20	1200.001	170.951	46.84	21.969
3/13/2012 17:30	1800.001	170.93	46.849	21.971
3/13/2012 17:40	2400.001	170.878	46.871	21.968
3/13/2012 17:50	3000.001	170.855	46.881	21.97
3/13/2012 18:00	3600.001	170.826	46.894	21.969
3/13/2012 18:10	4200.001	170.795	46.907	21.971
3/13/2012 18:20	4800.001	170.754	46.925	21.974
3/13/2012 18:30	5400.001	170.691	46.952	21.97
3/13/2012 18:40	6000.001	170.679	46.957	21.97
3/13/2012 18:50	6600.001	170.621	46.982	21.972
3/13/2012 19:00	7200.001	170.601	46.991	21.972
3/13/2012 19:10	7800.001	170.539	47.018	21.97
3/13/2012 19:20	8400.001	170.503	47.034	21.972
3/13/2012 19:30	9000.001	170.49	47.039	21.971
3/13/2012 19:40	9600.001	170.455	47.055	21.97
3/13/2012 19:50	10200.001	170.387	47.084	21.97
3/13/2012 20:00	10800.001	170.363	47.094	21.968
3/13/2012 20:10	11400.001	170.353	47.098	21.97
3/13/2012 20:20	12000.001	170.293	47.124	21.968
3/13/2012 20:30	12600.001	170.248	47.144	21.971
3/13/2012 20:40	13200.001	170.222	47.155	21.97
3/13/2012 20:50	13800.001	170.193	47.168	21.971
3/13/2012 21:00	14400.001	170.151	47.186	21.972
3/13/2012 21:10	15000.001	170.141	47.19	21.968
3/13/2012 21:20	15600.001	170.088	47.213	21.97
3/13/2012 21:30	16200.001	170.072	47.22	21.97
3/13/2012 21:40	16800.001	170.017	47.244	21.97
3/13/2012 21:50	17400.001	169.989	47.256	21.969
3/13/2012 22:00	18000.001	169.965	47.267	21.969
3/13/2012 22:10	18600.001	169.92	47.286	21.973
3/13/2012 22:20	19200.001	169.881	47.303	21.968
3/13/2012 22:30	19800.001	169.873	47.306	21.968
3/13/2012 22:40	20400.001	169.809	47.334	21.971

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/13/2012 22:50	21000.001	169.813	47.332	21.972
3/13/2012 23:00	21600.001	169.744	47.362	21.969
3/13/2012 23:10	22200.001	169.727	47.37	21.971
3/13/2012 23:20	22800.001	169.672	47.394	21.971
3/13/2012 23:30	23400.001	169.668	47.395	21.968
3/13/2012 23:40	24000.001	169.639	47.408	21.969
3/13/2012 23:50	24600.001	169.563	47.441	21.968
3/14/2012 0:00	25200.001	169.544	47.449	21.968
3/14/2012 0:10	25800.001	169.529	47.455	21.971
3/14/2012 0:20	26400.001	169.494	47.471	21.969
3/14/2012 0:30	27000.001	169.435	47.496	21.971
3/14/2012 0:40	27600.001	169.398	47.512	21.97
3/14/2012 0:50	28200.001	169.359	47.529	21.971
3/14/2012 1:00	28800.001	169.335	47.539	21.97
3/14/2012 1:10	29400.001	169.293	47.558	21.972
3/14/2012 1:20	30000.001	169.247	47.578	21.971
3/14/2012 1:30	30600.001	169.218	47.59	21.968
3/14/2012 1:40	31200.001	169.177	47.608	21.971
3/14/2012 1:50	31800.001	169.166	47.613	21.967
3/14/2012 2:00	32400.001	169.111	47.637	21.97
3/14/2012 2:10	33000.001	169.077	47.651	21.969
3/14/2012 2:20	33600.001	169.059	47.659	21.969
3/14/2012 2:30	34200.001	169.03	47.672	21.971
3/14/2012 2:40	34800.001	168.971	47.697	21.969
3/14/2012 2:50	35400.001	168.973	47.696	21.971
3/14/2012 3:00	36000.001	168.92	47.719	21.973
3/14/2012 3:10	36600.001	168.911	47.723	21.971
3/14/2012 3:20	37200.001	168.876	47.738	21.97
3/14/2012 3:30	37800.001	168.842	47.753	21.971
3/14/2012 3:40	38400.001	168.805	47.769	21.97
3/14/2012 3:50	39000.001	168.775	47.782	21.968
3/14/2012 4:00	39600.001	168.746	47.794	21.97
3/14/2012 4:10	40200.001	168.697	47.816	21.972
3/14/2012 4:20	40800.001	168.664	47.83	21.966
3/14/2012 4:30	41400.001	168.625	47.847	21.972
3/14/2012 4:40	42000.001	168.595	47.86	21.968
3/14/2012 4:50	42600.001	168.591	47.862	21.971
3/14/2012 5:00	43200.001	168.525	47.89	21.97
3/14/2012 5:10	43800.001	168.492	47.904	21.971
3/14/2012 5:20	44400.001	168.471	47.913	21.97
3/14/2012 5:30	45000.001	168.465	47.916	21.971
3/14/2012 5:40	45600.001	168.408	47.941	21.972
3/14/2012 5:50	46200.001	168.381	47.953	21.971
3/14/2012 6:00	46800.001	168.348	47.967	21.972
3/14/2012 6:10	47400.001	168.337	47.972	21.97
3/14/2012 6:20	48000.001	168.317	47.98	21.973
3/14/2012 6:30	48600.001	168.288	47.993	21.97
3/14/2012 6:40	49200.001	168.238	48.014	21.969
3/14/2012 6:50	49800.001	168.238	48.014	21.969
3/14/2012 7:00	50400.001	168.174	48.042	21.97
3/14/2012 7:10	51000.001	168.182	48.039	21.967
3/14/2012 7:20	51600.001	168.127	48.063	21.969
3/14/2012 7:30	52200.001	168.133	48.06	21.974
3/14/2012 7:40	52800.001	168.065	48.089	21.97

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 7:50	53400.001	168.067	48.089	21.971
3/14/2012 8:00	54000.001	168.006	48.115	21.968
3/14/2012 8:10	54600.001	168.001	48.117	21.968
3/14/2012 8:20	55200.001	167.981	48.126	21.972
3/14/2012 8:30	55800.001	167.933	48.147	21.969
3/14/2012 8:40	56400.001	167.897	48.162	21.968
3/14/2012 8:50	57000.001	167.874	48.172	21.969
3/14/2012 9:00	57600.001	167.846	48.184	21.973
3/14/2012 9:10	58200.001	167.816	48.197	21.97
3/14/2012 9:20	58800.001	167.791	48.208	21.97
3/14/2012 9:30	59400.001	167.833	48.19	21.968
3/14/2012 9:40	60000.001	167.808	48.201	21.968
3/14/2012 9:50	60600.001	167.777	48.214	21.971
3/14/2012 10:00	61200.001	167.773	48.216	21.97
3/14/2012 10:10	61800.001	167.745	48.228	21.967
3/14/2012 10:20	62400.001	167.72	48.239	21.972
3/14/2012 10:30	63000.001	167.689	48.252	21.97
3/14/2012 10:40	63600.001	167.635	48.276	21.969
3/14/2012 10:50	64200.001	167.641	48.273	21.969
3/14/2012 11:00	64800.001	167.607	48.288	21.97
3/14/2012 11:10	65400.001	167.58	48.3	21.988
3/14/2012 11:20	66000.001	167.55	48.313	21.969
3/14/2012 11:30	66600.001	167.522	48.324	21.971
3/14/2012 11:40	67200.001	167.5	48.334	21.969
3/14/2012 11:50	67800.001	167.445	48.358	21.968
3/14/2012 12:00	68400.001	167.416	48.37	21.973
3/14/2012 12:10	69000.001	167.419	48.369	21.969
3/14/2012 12:20	69600.001	167.397	48.379	21.972
3/14/2012 12:30	70200.001	167.353	48.398	21.971
3/14/2012 12:40	70800.001	167.335	48.406	21.97
3/14/2012 12:50	71400.001	167.314	48.415	21.969
3/14/2012 13:00	72000.001	167.255	48.44	21.968
3/14/2012 13:10	72600.001	167.259	48.439	21.969
3/14/2012 13:20	73200.001	167.232	48.45	21.969
3/14/2012 13:30	73800.177	167.149	48.486	21.994
3/14/2012 13:40	74400.001	167.158	48.482	21.971
3/14/2012 13:50	75000.001	167.108	48.504	21.968
3/14/2012 14:00	75600.001	167.069	48.521	21.968
3/14/2012 14:10	76200.001	167.053	48.528	21.972
3/14/2012 14:20	76800.001	167.058	48.526	21.968
3/14/2012 14:30	77400.001	166.993	48.554	21.966
3/14/2012 14:40	78000.001	166.99	48.555	21.967
3/14/2012 14:50	78600.001	166.937	48.578	21.969
3/14/2012 15:00	79200.001	166.93	48.581	21.967
3/14/2012 15:10	79800.001	166.891	48.598	21.967
3/14/2012 15:20	80400.001	166.884	48.601	21.97
3/14/2012 15:30	81000.001	166.858	48.612	21.968
3/14/2012 15:40	81600.001	166.832	48.623	21.972
3/14/2012 15:50	82200.001	166.783	48.645	21.969
3/14/2012 16:00	82800.001	166.765	48.652	21.97
3/14/2012 16:10	83400.001	166.783	48.644	21.978
3/14/2012 16:20	84000.001	166.736	48.665	21.97
3/14/2012 16:30	84600.001	166.69	48.685	21.97
3/14/2012 16:40	85200.001	166.693	48.684	21.972

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 16:50	85800.001	166.647	48.703	21.973
3/14/2012 17:00	86400.001	166.642	48.706	21.971
3/14/2012 17:10	87000.001	166.637	48.708	21.97
3/14/2012 17:20	87600.001	166.574	48.735	21.969
3/14/2012 17:30	88200.001	166.548	48.747	21.969
3/14/2012 17:40	88800.001	166.552	48.745	21.97
3/14/2012 17:50	89400.001	166.529	48.755	21.971
3/14/2012 18:00	90000.001	166.501	48.767	21.97
3/14/2012 18:10	90600.001	166.479	48.776	21.97
3/14/2012 18:20	91200.001	166.466	48.782	21.989
3/14/2012 18:30	91800.001	166.387	48.816	21.97
3/14/2012 18:40	92400.001	166.37	48.824	21.971
3/14/2012 18:50	93000.001	166.341	48.836	21.968
3/14/2012 19:00	93600.001	166.321	48.845	21.971
3/14/2012 19:10	94200.001	166.32	48.845	21.97
3/14/2012 19:20	94800.001	166.313	48.848	21.97
3/14/2012 19:30	95400.001	166.297	48.855	21.97
3/14/2012 19:40	96000.001	166.242	48.879	21.968
3/14/2012 19:50	96600.001	166.213	48.891	21.971
3/14/2012 20:00	97200.001	166.19	48.902	21.971
3/14/2012 20:10	97800.001	166.214	48.891	21.97
3/14/2012 20:20	98400.001	166.178	48.907	21.969
3/14/2012 20:30	99000.001	166.128	48.929	21.97
3/14/2012 20:40	99600.001	166.136	48.925	21.97
3/14/2012 20:50	100200.001	166.12	48.932	21.97
3/14/2012 21:00	100800.001	166.107	48.937	21.971
3/14/2012 21:10	101400.001	166.05	48.962	21.972
3/14/2012 21:20	102000.001	166.019	48.976	21.971
3/14/2012 21:30	102600.001	165.994	48.986	21.971
3/14/2012 21:40	103200.001	165.968	48.998	21.967
3/14/2012 21:50	103800.001	165.978	48.993	21.972
3/14/2012 22:00	104400.001	165.967	48.998	21.97
3/14/2012 22:10	105000.001	165.941	49.009	21.969
3/14/2012 22:20	105600.001	165.893	49.03	21.971
3/14/2012 22:30	106200.001	165.891	49.031	21.968
3/14/2012 22:40	106800.001	165.848	49.05	21.971
3/14/2012 22:50	107400.001	165.836	49.055	21.967
3/14/2012 23:00	108000.001	165.809	49.066	21.969
3/14/2012 23:10	108600.001	165.81	49.066	21.968
3/14/2012 23:20	109200.001	165.76	49.088	21.968
3/14/2012 23:30	109800.001	165.737	49.098	21.972
3/14/2012 23:40	110400.001	165.715	49.107	21.967
3/14/2012 23:50	111000.001	165.697	49.115	21.972
3/15/2012 0:00	111600.001	165.667	49.128	21.971
3/15/2012 0:10	112200.001	165.647	49.137	21.97
3/15/2012 0:20	112800.001	165.648	49.136	21.972
3/15/2012 0:30	113400.001	165.618	49.149	21.971
3/15/2012 0:40	114000.001	165.567	49.171	21.97
3/15/2012 0:50	114600.001	165.548	49.179	21.969
3/15/2012 1:00	115200.001	165.516	49.193	21.969
3/15/2012 1:10	115800.001	165.501	49.2	21.97
3/15/2012 1:20	116400.001	165.484	49.207	21.968
3/15/2012 1:30	117000.001	165.479	49.209	21.97
3/15/2012 1:40	117600.001	165.451	49.222	21.97

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 1:50	118200.001	165.417	49.236	21.971
3/15/2012 2:00	118800.001	165.389	49.248	21.968
3/15/2012 2:10	119400.001	165.365	49.259	21.967
3/15/2012 2:20	120000.001	165.376	49.254	21.969
3/15/2012 2:30	120600.001	165.32	49.278	21.967
3/15/2012 2:40	121200.001	165.297	49.288	21.967
3/15/2012 2:50	121800.001	165.278	49.296	21.97
3/15/2012 3:00	122400.001	165.263	49.303	21.969
3/15/2012 3:10	123000.001	165.262	49.304	21.971
3/15/2012 3:20	123600.001	165.22	49.322	21.969
3/15/2012 3:30	124200.001	165.219	49.322	21.97
3/15/2012 3:40	124800.001	165.199	49.331	21.973
3/15/2012 3:50	125400.001	165.143	49.355	21.969
3/15/2012 4:00	126000.001	165.151	49.352	21.969
3/15/2012 4:10	126600.001	165.112	49.368	21.967
3/15/2012 4:20	127200.001	165.111	49.369	21.969
3/15/2012 4:30	127800.001	165.088	49.379	21.971
3/15/2012 4:40	128400.001	165.049	49.395	21.967
3/15/2012 4:50	129000.001	165.036	49.401	21.97
3/15/2012 5:00	129600.001	165.033	49.403	21.967
3/15/2012 5:10	130200.001	164.992	49.42	21.967
3/15/2012 5:20	130800.001	164.996	49.418	21.967
3/15/2012 5:30	131400.001	164.979	49.426	21.971
3/15/2012 5:40	132000.001	164.975	49.428	21.97
3/15/2012 5:50	132600.001	164.926	49.449	21.968
3/15/2012 6:00	133200.001	164.916	49.453	21.97
3/15/2012 6:10	133800.001	164.915	49.454	21.968
3/15/2012 6:20	134400.001	164.895	49.462	21.971
3/15/2012 6:30	135000.001	164.875	49.471	21.968
3/15/2012 6:40	135600.001	164.864	49.476	21.968
3/15/2012 6:50	136200.001	164.859	49.478	21.97
3/15/2012 7:00	136800.001	164.794	49.506	21.968
3/15/2012 7:10	137400.001	164.816	49.496	21.968
3/15/2012 7:20	138000.001	164.778	49.513	21.969
3/15/2012 7:30	138600.001	164.797	49.505	21.97
3/15/2012 7:40	139200.001	164.738	49.53	21.969
3/15/2012 7:50	139800.001	164.739	49.53	21.97
3/15/2012 8:00	140400.001	164.746	49.527	21.969
3/15/2012 8:10	141000.001	164.735	49.532	21.971
3/15/2012 8:20	141600.001	164.699	49.547	21.968
3/15/2012 8:30	142200.001	164.67	49.56	21.969
3/15/2012 8:40	142800.001	164.648	49.569	21.969
3/15/2012 8:50	143400.001	164.672	49.559	21.97
3/15/2012 9:00	144000.001	164.623	49.58	21.968
3/15/2012 9:10	144600.001	164.609	49.586	21.968
3/15/2012 9:20	145200.001	164.597	49.592	21.971
3/15/2012 9:30	145800.001	164.575	49.601	21.967
3/15/2012 9:40	146400.001	164.563	49.606	21.97
3/15/2012 9:50	147000.001	164.58	49.599	21.971
3/15/2012 10:00	147600.001	164.508	49.63	21.989
3/15/2012 10:10	148200.001	164.542	49.615	21.975
3/15/2012 10:20	148800.001	164.522	49.624	21.97
3/15/2012 10:30	149400.001	164.48	49.642	21.969
3/15/2012 10:40	150000.001	164.487	49.639	21.97

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 10:50	150600.001	164.48	49.642	21.971
3/15/2012 11:00	151200.001	164.459	49.651	21.968
3/15/2012 11:10	151800.001	164.405	49.674	21.969
3/15/2012 11:20	152400.001	164.426	49.666	21.969
3/15/2012 11:30	153000.001	164.406	49.674	21.969
3/15/2012 11:40	153600.001	164.394	49.679	21.967
3/15/2012 11:50	154200.001	164.328	49.708	21.971
3/15/2012 12:00	154800.001	164.354	49.696	21.971
3/15/2012 12:10	155400.001	164.326	49.709	21.969
3/15/2012 12:20	156000.001	164.308	49.716	21.968
3/15/2012 12:30	156600.001	164.298	49.721	21.969
3/15/2012 12:40	157200.001	164.287	49.726	21.97
3/15/2012 12:50	157800.001	164.217	49.756	21.97
3/15/2012 13:00	158400.001	164.233	49.749	21.968
3/15/2012 13:10	159000.001	164.213	49.758	21.971
3/15/2012 13:20	159600.001	164.184	49.77	21.97
3/15/2012 13:30	160200.001	164.14	49.789	21.969
3/15/2012 13:40	160800.001	164.163	49.779	21.972
3/15/2012 13:50	161400.001	164.126	49.796	21.969
3/15/2012 14:00	162000.001	164.118	49.799	21.967
3/15/2012 14:10	162600.001	164.073	49.818	21.972
3/15/2012 14:20	163200.001	164.046	49.83	21.972
3/15/2012 14:30	163800.001	164.054	49.826	21.968
3/15/2012 14:40	164400.001	164.046	49.83	21.97
3/15/2012 14:50	165000.001	164.024	49.839	21.97
3/15/2012 15:00	165600.001	163.979	49.859	21.969
3/15/2012 15:10	166200.001	163.982	49.858	21.966
3/15/2012 15:20	166800.001	163.957	49.869	21.969
3/15/2012 15:30	167400.001	163.909	49.89	21.97
3/15/2012 15:40	168000.001	163.894	49.896	21.97
3/15/2012 15:50	168600.001	163.895	49.895	21.969
3/15/2012 16:00	169200.001	163.865	49.908	21.971
3/15/2012 16:10	169800.001	163.876	49.904	21.972
3/15/2012 16:20	170400.001	163.828	49.924	21.968
3/15/2012 16:30	171000.001	163.815	49.93	21.97
3/15/2012 16:40	171600.001	163.833	49.922	21.97
3/15/2012 16:50	172200.001	163.809	49.933	21.968
3/15/2012 17:00	172800.001	163.793	49.939	21.97
3/15/2012 17:10	173400.001	163.752	49.957	21.971
3/15/2012 17:20	174000.001	163.767	49.951	21.971
3/15/2012 17:30	174600.001	163.728	49.968	21.969
3/15/2012 17:40	175200.001	163.735	49.965	21.967
3/15/2012 17:50	175800.001	163.708	49.976	21.97
3/15/2012 18:00	176400.001	163.699	49.98	21.97
3/15/2012 18:10	177000.001	163.695	49.982	21.97
3/15/2012 18:20	177600.001	163.657	49.999	21.97
3/15/2012 18:30	178200.001	163.639	50.007	21.97
3/15/2012 18:40	178800.001	163.649	50.002	21.968
3/15/2012 18:50	179400.001	163.641	50.005	21.968
3/15/2012 19:00	180000.001	163.626	50.012	21.969
3/15/2012 19:10	180600.001	163.592	50.027	21.972
3/15/2012 19:20	181200.001	163.61	50.019	21.968
3/15/2012 19:30	181800.001	163.595	50.025	21.97
3/15/2012 19:40	182400.001	163.58	50.032	21.97

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 19:50	183000.001	163.572	50.035	21.969
3/15/2012 20:00	183600.001	163.522	50.057	21.971
3/15/2012 20:10	184200.001	163.551	50.044	21.97
3/15/2012 20:20	184800.001	163.539	50.049	21.968
3/15/2012 20:30	185400.001	163.51	50.062	21.967
3/15/2012 20:40	186000.001	163.503	50.065	21.972
3/15/2012 20:50	186600.001	163.506	50.064	21.973
3/15/2012 21:00	187200.001	163.449	50.088	21.971
3/15/2012 21:10	187800.001	163.465	50.082	21.971
3/15/2012 21:20	188400.001	163.463	50.082	21.968
3/15/2012 21:30	189000.001	163.448	50.089	21.97
3/15/2012 21:40	189600.001	163.446	50.09	21.967
3/15/2012 21:50	190200.001	163.416	50.103	21.969
3/15/2012 22:00	190800.001	163.374	50.121	21.968
3/15/2012 22:10	191400.001	163.374	50.121	21.969
3/15/2012 22:20	192000.001	163.379	50.119	21.967
3/15/2012 22:30	192600.001	163.329	50.14	21.97
3/15/2012 22:40	193200.001	163.358	50.128	21.971
3/15/2012 22:50	193800.001	163.31	50.149	21.972
3/15/2012 23:00	194400.001	163.291	50.157	21.969
3/15/2012 23:10	195000.001	163.277	50.163	21.969
3/15/2012 23:20	195600.001	163.289	50.158	21.975
3/15/2012 23:30	196200.001	163.253	50.173	21.971
3/15/2012 23:40	196800.001	163.259	50.171	21.969
3/15/2012 23:50	197400.001	163.237	50.181	21.969
3/16/2012 0:00	198000.001	163.199	50.197	21.969
3/16/2012 0:10	198600.001	163.175	50.207	21.969
3/16/2012 0:20	199200.001	163.194	50.199	21.969
3/16/2012 0:30	199800.001	163.141	50.222	21.966
3/16/2012 0:40	200400.001	163.131	50.227	21.967
3/16/2012 0:50	201000.001	163.133	50.225	21.97
3/16/2012 1:00	201600.001	163.116	50.233	21.97
3/16/2012 1:10	202200.001	163.069	50.253	21.968
3/16/2012 1:20	202800.001	163.086	50.246	21.971
3/16/2012 1:30	203400.001	163.034	50.268	21.972
3/16/2012 1:40	204000.001	163.049	50.262	21.971
3/16/2012 1:50	204600.012	163.003	50.282	21.991
3/16/2012 2:00	205200.001	163.02	50.275	21.974
3/16/2012 2:10	205800.001	163.005	50.281	21.971
3/16/2012 2:20	206400.001	162.961	50.3	21.971
3/16/2012 2:30	207000.001	162.937	50.31	21.967
3/16/2012 2:40	207600.001	162.926	50.315	21.972
3/16/2012 2:50	208200.001	162.905	50.324	21.971
3/16/2012 3:00	208800.001	162.895	50.328	21.97
3/16/2012 3:10	209400.001	162.866	50.341	21.968
3/16/2012 3:20	210000.001	162.89	50.331	21.966
3/16/2012 3:30	210600.001	162.879	50.335	21.969
3/16/2012 3:40	211200.001	162.829	50.357	21.972
3/16/2012 3:50	211800.001	162.81	50.365	21.97
3/16/2012 4:00	212400.001	162.833	50.356	21.971
3/16/2012 4:10	213000.001	162.833	50.355	21.97
3/16/2012 4:20	213600.001	162.771	50.382	21.973
3/16/2012 4:30	214200.001	162.761	50.387	21.969
3/16/2012 4:40	214800.001	162.766	50.384	21.968

CS-MW21-LGR Water Level Data
During TW-2 Pumping Test

3/16/2012 4:50	215400.001	162.734	50.398	21.968
3/16/2012 5:00	216000.001	162.724	50.403	21.971
3/16/2012 5:10	216600.001	162.71	50.409	21.971
3/16/2012 5:20	217200.001	162.72	50.404	21.97
3/16/2012 5:30	217800.001	162.714	50.407	21.968
3/16/2012 5:40	218400.001	162.696	50.415	21.97
3/16/2012 5:50	219000.001	162.688	50.418	21.967
3/16/2012 6:00	219600.001	162.692	50.416	21.969
3/16/2012 6:10	220200.001	162.672	50.425	21.971
3/16/2012 6:20	220800.001	162.622	50.447	21.969
3/16/2012 6:30	221400.001	162.613	50.451	21.972
3/16/2012 6:40	222000.001	162.612	50.451	21.969
3/16/2012 6:50	222600.001	162.59	50.46	21.97
3/16/2012 7:00	223200.001	162.591	50.46	21.966
3/16/2012 7:10	223800.001	162.581	50.464	21.967
3/16/2012 7:20	224400.001	162.597	50.458	21.971
3/16/2012 7:30	225000.001	162.589	50.461	21.97
3/16/2012 7:40	225600.001	162.55	50.478	21.968
3/16/2012 7:50	226200.001	162.56	50.474	21.97
3/16/2012 8:00	226800.001	162.506	50.497	21.969
3/16/2012 8:10	227400.001	162.504	50.498	21.969
3/16/2012 8:20	228000.001	162.523	50.49	21.968
3/16/2012 8:30	228600.001	162.512	50.495	21.967
3/16/2012 8:40	229200.001	162.514	50.493	21.969
3/16/2012 8:50	229800.001	162.5	50.5	21.968
3/16/2012 9:00	230400.001	162.471	50.512	21.969
3/16/2012 9:10	231000.001	162.454	50.519	21.969
3/16/2012 9:20	231600.001	162.453	50.52	21.971
3/16/2012 9:30	232200.001	162.462	50.516	21.968
3/16/2012 9:40	232800.001	162.434	50.528	21.969
3/16/2012 9:50	233400.001	162.413	50.537	21.971
3/16/2012 10:00	234000.001	162.443	50.524	21.97
3/16/2012 10:10	234600.001	162.402	50.542	22.009

Page 1 of 1

Missing 1.3' * Uncorrected Depth

TW-2 (CS-13 Test Well) Pumping Test

WELL MW22-LGR **Groundwater Level Measurements**

* Blue E-line (Subtract 1.3')

* Corrected Eline DTW

Date	Time	E-Line DTW * (ft BTOC)	Level Troll DTW (ft BTOC)	Pumping Well Flow Rate (GPM)	~~Free GI (ft BTOC)~~	Initials	Notes
3/14/12	10:57	283.65	282.43	—	282.35	SP	Test is Running Blue E-line
3/13/12		285.84	285.84		~~285.54~~ NA	SP	Set 10 min Linear test to start a 17:00
3/14/12	13:36	283.23	281.98		281.93	SP	
	1615	282.75	281.51		281.45	EN	
	1828	282.42	281.19		281.12	EN	
	2014	282.17	—		280.87	EN	
	2329	281.70	280.55		280.4	EN	
3/15/12	0136	281.52	—		280.22	SP	
	0425	281.45	279.88		279.85	SP	
	0544	280.99	279.75		279.69	SP	
	1006	280.56	279.30		279.26	JB	
	1245	280.24	279.00		278.94	EN	
	1355	280.05	278.84		278.75	EN	
	1745	279.61	278.36		278.31	EN	
	2038	279.38	278.12		278.08	EN	
	2310	279.08	277.91		277.78	EN	
3/16/12	0156	278.88	277.63		277.58	EN	
"	1027	278.23	276.97		276.93	SP	Slug Test. MW22 TW2 PT FILE

-1.3' Corrected

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

Report Date: 5/16/2012 6:14:38 PM
Report User Name: 49287
Report Computer Name: PF0XNDH1
Application: WinSitu.exe
Application Version: 5.6.21.0

Log File Properties:
File Name: MW22 TW2PT 2012-03-16 10.31.01.wsl
Create Date: 3/16/2012 10:30:46 AM

Device Properties:
Device: Level TROLL 700
Site: MW22LGR
Device Name:
Serial Number: 134221
Firmware Version: 2.08
Hardware Version:
Device Address:
Device Comm Cfg:
Used Memory(%):
Used Battery(%):

Log Configuration
Log Name: MW22 TW2PT
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.4.2.0
Create Date: 3/13/2012 4:05:25 PM Central Standard Time (Ignore DST)
Log Setup Time Zone: Unknown
Notes Size(bytes): 4096
Overwrite when full: Disabled
Scheduled Start Time: 3/13/2012 5:00:00 PM Central Standard Time (Ignore DST)
Scheduled Stop Time: No Stop Time
Type: Linear
Interval: Days: 0 hrs: 00 mins: 10 secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 285.84 (ft)
Level Reference Head Pressure: 12.4621 (PSI)

Other Log Settings
Depth of Probe: 28.775 (ft)
Head Pressure: 12.4623 (PSI)
Temperature: 21.6983 (C)

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

Log Notes:

Date and Time	Note
3/13/2012 4:05:31 PM	User Note: "Level reference initialized to: 285.84"
3/16/2012 10:29:20 AM	Manual Stop Command

Log Data:
Record Count: 393
Sensors: 1
1 - 134221: Pressure/Temp 30 PSIG (21m/69ft)
Time Zone: Central Standard Time (Ignore DST)

Date and Time	Elapsed Time Seconds	Sensor: Pres(G) 231ft SN#: 114866 Level Depth To Water (ft	Sensor: Pres(G) 231ft SN#: 114866 Pressure (PSI)	Sensor: Pres(G) 231ft SN#: 114866 Temperature (C)
3/13/2012 17:00	0	171.064	46.791	21.969
3/13/2012 17:10	600.001	171.004	46.816	21.971
3/13/2012 17:20	1200.001	170.951	46.84	21.969
3/13/2012 17:30	1800.001	170.93	46.849	21.971
3/13/2012 17:40	2400.001	170.878	46.871	21.968
3/13/2012 17:50	3000.001	170.855	46.881	21.97
3/13/2012 18:00	3600.001	170.826	46.894	21.969
3/13/2012 18:10	4200.001	170.795	46.907	21.971
3/13/2012 18:20	4800.001	170.754	46.925	21.974
3/13/2012 18:30	5400.001	170.691	46.952	21.97
3/13/2012 18:40	6000.001	170.679	46.957	21.97
3/13/2012 18:50	6600.001	170.621	46.982	21.972
3/13/2012 19:00	7200.001	170.601	46.991	21.972
3/13/2012 19:10	7800.001	170.539	47.018	21.97
3/13/2012 19:20	8400.001	170.503	47.034	21.972
3/13/2012 19:30	9000.001	170.49	47.039	21.971
3/13/2012 19:40	9600.001	170.455	47.055	21.97
3/13/2012 19:50	10200.001	170.387	47.084	21.97
3/13/2012 20:00	10800.001	170.363	47.094	21.968
3/13/2012 20:10	11400.001	170.353	47.098	21.97
3/13/2012 20:20	12000.001	170.293	47.124	21.968
3/13/2012 20:30	12600.001	170.248	47.144	21.971
3/13/2012 20:40	13200.001	170.222	47.155	21.97
3/13/2012 20:50	13800.001	170.193	47.168	21.971
3/13/2012 21:00	14400.001	170.151	47.186	21.972
3/13/2012 21:10	15000.001	170.141	47.19	21.968
3/13/2012 21:20	15600.001	170.088	47.213	21.97
3/13/2012 21:30	16200.001	170.072	47.22	21.97
3/13/2012 21:40	16800.001	170.017	47.244	21.97
3/13/2012 21:50	17400.001	169.989	47.256	21.969
3/13/2012 22:00	18000.001	169.965	47.267	21.969
3/13/2012 22:10	18600.001	169.92	47.286	21.973
3/13/2012 22:20	19200.001	169.881	47.303	21.968
3/13/2012 22:30	19800.001	169.873	47.306	21.968
3/13/2012 22:40	20400.001	169.809	47.334	21.971

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/13/2012 22:50	21000.001	169.813	47.332	21.972
3/13/2012 23:00	21600.001	169.744	47.362	21.969
3/13/2012 23:10	22200.001	169.727	47.37	21.971
3/13/2012 23:20	22800.001	169.672	47.394	21.971
3/13/2012 23:30	23400.001	169.668	47.395	21.968
3/13/2012 23:40	24000.001	169.639	47.408	21.969
3/13/2012 23:50	24600.001	169.563	47.441	21.968
3/14/2012 0:00	25200.001	169.544	47.449	21.968
3/14/2012 0:10	25800.001	169.529	47.455	21.971
3/14/2012 0:20	26400.001	169.494	47.471	21.969
3/14/2012 0:30	27000.001	169.435	47.496	21.971
3/14/2012 0:40	27600.001	169.398	47.512	21.97
3/14/2012 0:50	28200.001	169.359	47.529	21.971
3/14/2012 1:00	28800.001	169.335	47.539	21.97
3/14/2012 1:10	29400.001	169.293	47.558	21.972
3/14/2012 1:20	30000.001	169.247	47.578	21.971
3/14/2012 1:30	30600.001	169.218	47.59	21.968
3/14/2012 1:40	31200.001	169.177	47.608	21.971
3/14/2012 1:50	31800.001	169.166	47.613	21.967
3/14/2012 2:00	32400.001	169.111	47.637	21.97
3/14/2012 2:10	33000.001	169.077	47.651	21.969
3/14/2012 2:20	33600.001	169.059	47.659	21.969
3/14/2012 2:30	34200.001	169.03	47.672	21.971
3/14/2012 2:40	34800.001	168.971	47.697	21.969
3/14/2012 2:50	35400.001	168.973	47.696	21.971
3/14/2012 3:00	36000.001	168.92	47.719	21.973
3/14/2012 3:10	36600.001	168.911	47.723	21.971
3/14/2012 3:20	37200.001	168.876	47.738	21.97
3/14/2012 3:30	37800.001	168.842	47.753	21.971
3/14/2012 3:40	38400.001	168.805	47.769	21.97
3/14/2012 3:50	39000.001	168.775	47.782	21.968
3/14/2012 4:00	39600.001	168.746	47.794	21.97
3/14/2012 4:10	40200.001	168.697	47.816	21.972
3/14/2012 4:20	40800.001	168.664	47.83	21.966
3/14/2012 4:30	41400.001	168.625	47.847	21.972
3/14/2012 4:40	42000.001	168.595	47.86	21.968
3/14/2012 4:50	42600.001	168.591	47.862	21.971
3/14/2012 5:00	43200.001	168.525	47.89	21.97
3/14/2012 5:10	43800.001	168.492	47.904	21.971
3/14/2012 5:20	44400.001	168.471	47.913	21.97
3/14/2012 5:30	45000.001	168.465	47.916	21.971
3/14/2012 5:40	45600.001	168.408	47.941	21.972
3/14/2012 5:50	46200.001	168.381	47.953	21.971
3/14/2012 6:00	46800.001	168.348	47.967	21.972
3/14/2012 6:10	47400.001	168.337	47.972	21.97
3/14/2012 6:20	48000.001	168.317	47.98	21.973
3/14/2012 6:30	48600.001	168.288	47.993	21.97
3/14/2012 6:40	49200.001	168.238	48.014	21.969
3/14/2012 6:50	49800.001	168.238	48.014	21.969
3/14/2012 7:00	50400.001	168.174	48.042	21.97
3/14/2012 7:10	51000.001	168.182	48.039	21.967
3/14/2012 7:20	51600.001	168.127	48.063	21.969
3/14/2012 7:30	52200.001	168.133	48.06	21.974
3/14/2012 7:40	52800.001	168.065	48.089	21.97

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 7:50	53400.001	168.067	48.089	21.971
3/14/2012 8:00	54000.001	168.006	48.115	21.968
3/14/2012 8:10	54600.001	168.001	48.117	21.968
3/14/2012 8:20	55200.001	167.981	48.126	21.972
3/14/2012 8:30	55800.001	167.933	48.147	21.969
3/14/2012 8:40	56400.001	167.897	48.162	21.968
3/14/2012 8:50	57000.001	167.874	48.172	21.969
3/14/2012 9:00	57600.001	167.846	48.184	21.973
3/14/2012 9:10	58200.001	167.816	48.197	21.97
3/14/2012 9:20	58800.001	167.791	48.208	21.97
3/14/2012 9:30	59400.001	167.833	48.19	21.968
3/14/2012 9:40	60000.001	167.808	48.201	21.968
3/14/2012 9:50	60600.001	167.777	48.214	21.971
3/14/2012 10:00	61200.001	167.773	48.216	21.97
3/14/2012 10:10	61800.001	167.745	48.228	21.967
3/14/2012 10:20	62400.001	167.72	48.239	21.972
3/14/2012 10:30	63000.001	167.689	48.252	21.97
3/14/2012 10:40	63600.001	167.635	48.276	21.969
3/14/2012 10:50	64200.001	167.641	48.273	21.969
3/14/2012 11:00	64800.001	167.607	48.288	21.97
3/14/2012 11:10	65400.001	167.58	48.3	21.988
3/14/2012 11:20	66000.001	167.55	48.313	21.969
3/14/2012 11:30	66600.001	167.522	48.324	21.971
3/14/2012 11:40	67200.001	167.5	48.334	21.969
3/14/2012 11:50	67800.001	167.445	48.358	21.968
3/14/2012 12:00	68400.001	167.416	48.37	21.973
3/14/2012 12:10	69000.001	167.419	48.369	21.969
3/14/2012 12:20	69600.001	167.397	48.379	21.972
3/14/2012 12:30	70200.001	167.353	48.398	21.971
3/14/2012 12:40	70800.001	167.335	48.406	21.97
3/14/2012 12:50	71400.001	167.314	48.415	21.969
3/14/2012 13:00	72000.001	167.255	48.44	21.968
3/14/2012 13:10	72600.001	167.259	48.439	21.969
3/14/2012 13:20	73200.001	167.232	48.45	21.969
3/14/2012 13:30	73800.177	167.149	48.486	21.994
3/14/2012 13:40	74400.001	167.158	48.482	21.971
3/14/2012 13:50	75000.001	167.108	48.504	21.968
3/14/2012 14:00	75600.001	167.069	48.521	21.968
3/14/2012 14:10	76200.001	167.053	48.528	21.972
3/14/2012 14:20	76800.001	167.058	48.526	21.968
3/14/2012 14:30	77400.001	166.993	48.554	21.966
3/14/2012 14:40	78000.001	166.99	48.555	21.967
3/14/2012 14:50	78600.001	166.937	48.578	21.969
3/14/2012 15:00	79200.001	166.93	48.581	21.967
3/14/2012 15:10	79800.001	166.891	48.598	21.967
3/14/2012 15:20	80400.001	166.884	48.601	21.97
3/14/2012 15:30	81000.001	166.858	48.612	21.968
3/14/2012 15:40	81600.001	166.832	48.623	21.972
3/14/2012 15:50	82200.001	166.783	48.645	21.969
3/14/2012 16:00	82800.001	166.765	48.652	21.97
3/14/2012 16:10	83400.001	166.783	48.644	21.978
3/14/2012 16:20	84000.001	166.736	48.665	21.97
3/14/2012 16:30	84600.001	166.69	48.685	21.97
3/14/2012 16:40	85200.001	166.693	48.684	21.972

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/14/2012 16:50	85800.001	166.647	48.703	21.973
3/14/2012 17:00	86400.001	166.642	48.706	21.971
3/14/2012 17:10	87000.001	166.637	48.708	21.97
3/14/2012 17:20	87600.001	166.574	48.735	21.969
3/14/2012 17:30	88200.001	166.548	48.747	21.969
3/14/2012 17:40	88800.001	166.552	48.745	21.97
3/14/2012 17:50	89400.001	166.529	48.755	21.971
3/14/2012 18:00	90000.001	166.501	48.767	21.97
3/14/2012 18:10	90600.001	166.479	48.776	21.97
3/14/2012 18:20	91200.001	166.466	48.782	21.989
3/14/2012 18:30	91800.001	166.387	48.816	21.97
3/14/2012 18:40	92400.001	166.37	48.824	21.971
3/14/2012 18:50	93000.001	166.341	48.836	21.968
3/14/2012 19:00	93600.001	166.321	48.845	21.971
3/14/2012 19:10	94200.001	166.32	48.845	21.97
3/14/2012 19:20	94800.001	166.313	48.848	21.97
3/14/2012 19:30	95400.001	166.297	48.855	21.97
3/14/2012 19:40	96000.001	166.242	48.879	21.968
3/14/2012 19:50	96600.001	166.213	48.891	21.971
3/14/2012 20:00	97200.001	166.19	48.902	21.971
3/14/2012 20:10	97800.001	166.214	48.891	21.97
3/14/2012 20:20	98400.001	166.178	48.907	21.969
3/14/2012 20:30	99000.001	166.128	48.929	21.97
3/14/2012 20:40	99600.001	166.136	48.925	21.97
3/14/2012 20:50	100200.001	166.12	48.932	21.97
3/14/2012 21:00	100800.001	166.107	48.937	21.971
3/14/2012 21:10	101400.001	166.05	48.962	21.972
3/14/2012 21:20	102000.001	166.019	48.976	21.971
3/14/2012 21:30	102600.001	165.994	48.986	21.971
3/14/2012 21:40	103200.001	165.968	48.998	21.967
3/14/2012 21:50	103800.001	165.978	48.993	21.972
3/14/2012 22:00	104400.001	165.967	48.998	21.97
3/14/2012 22:10	105000.001	165.941	49.009	21.969
3/14/2012 22:20	105600.001	165.893	49.03	21.971
3/14/2012 22:30	106200.001	165.891	49.031	21.968
3/14/2012 22:40	106800.001	165.848	49.05	21.971
3/14/2012 22:50	107400.001	165.836	49.055	21.967
3/14/2012 23:00	108000.001	165.809	49.066	21.969
3/14/2012 23:10	108600.001	165.81	49.066	21.968
3/14/2012 23:20	109200.001	165.76	49.088	21.968
3/14/2012 23:30	109800.001	165.737	49.098	21.972
3/14/2012 23:40	110400.001	165.715	49.107	21.967
3/14/2012 23:50	111000.001	165.697	49.115	21.972
3/15/2012 0:00	111600.001	165.667	49.128	21.971
3/15/2012 0:10	112200.001	165.647	49.137	21.97
3/15/2012 0:20	112800.001	165.648	49.136	21.972
3/15/2012 0:30	113400.001	165.618	49.149	21.971
3/15/2012 0:40	114000.001	165.567	49.171	21.97
3/15/2012 0:50	114600.001	165.548	49.179	21.969
3/15/2012 1:00	115200.001	165.516	49.193	21.969
3/15/2012 1:10	115800.001	165.501	49.2	21.97
3/15/2012 1:20	116400.001	165.484	49.207	21.968
3/15/2012 1:30	117000.001	165.479	49.209	21.97
3/15/2012 1:40	117600.001	165.451	49.222	21.97

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 1:50	118200.001	165.417	49.236	21.971
3/15/2012 2:00	118800.001	165.389	49.248	21.968
3/15/2012 2:10	119400.001	165.365	49.259	21.967
3/15/2012 2:20	120000.001	165.376	49.254	21.969
3/15/2012 2:30	120600.001	165.32	49.278	21.967
3/15/2012 2:40	121200.001	165.297	49.288	21.967
3/15/2012 2:50	121800.001	165.278	49.296	21.97
3/15/2012 3:00	122400.001	165.263	49.303	21.969
3/15/2012 3:10	123000.001	165.262	49.304	21.971
3/15/2012 3:20	123600.001	165.22	49.322	21.969
3/15/2012 3:30	124200.001	165.219	49.322	21.97
3/15/2012 3:40	124800.001	165.199	49.331	21.973
3/15/2012 3:50	125400.001	165.143	49.355	21.969
3/15/2012 4:00	126000.001	165.151	49.352	21.969
3/15/2012 4:10	126600.001	165.112	49.368	21.967
3/15/2012 4:20	127200.001	165.111	49.369	21.969
3/15/2012 4:30	127800.001	165.088	49.379	21.971
3/15/2012 4:40	128400.001	165.049	49.395	21.967
3/15/2012 4:50	129000.001	165.036	49.401	21.97
3/15/2012 5:00	129600.001	165.033	49.403	21.967
3/15/2012 5:10	130200.001	164.992	49.42	21.967
3/15/2012 5:20	130800.001	164.996	49.418	21.967
3/15/2012 5:30	131400.001	164.979	49.426	21.971
3/15/2012 5:40	132000.001	164.975	49.428	21.97
3/15/2012 5:50	132600.001	164.926	49.449	21.968
3/15/2012 6:00	133200.001	164.916	49.453	21.97
3/15/2012 6:10	133800.001	164.915	49.454	21.968
3/15/2012 6:20	134400.001	164.895	49.462	21.971
3/15/2012 6:30	135000.001	164.875	49.471	21.968
3/15/2012 6:40	135600.001	164.864	49.476	21.968
3/15/2012 6:50	136200.001	164.859	49.478	21.97
3/15/2012 7:00	136800.001	164.794	49.506	21.968
3/15/2012 7:10	137400.001	164.816	49.496	21.968
3/15/2012 7:20	138000.001	164.778	49.513	21.969
3/15/2012 7:30	138600.001	164.797	49.505	21.97
3/15/2012 7:40	139200.001	164.738	49.53	21.969
3/15/2012 7:50	139800.001	164.739	49.53	21.97
3/15/2012 8:00	140400.001	164.746	49.527	21.969
3/15/2012 8:10	141000.001	164.735	49.532	21.971
3/15/2012 8:20	141600.001	164.699	49.547	21.968
3/15/2012 8:30	142200.001	164.67	49.56	21.969
3/15/2012 8:40	142800.001	164.648	49.569	21.969
3/15/2012 8:50	143400.001	164.672	49.559	21.97
3/15/2012 9:00	144000.001	164.623	49.58	21.968
3/15/2012 9:10	144600.001	164.609	49.586	21.968
3/15/2012 9:20	145200.001	164.597	49.592	21.971
3/15/2012 9:30	145800.001	164.575	49.601	21.967
3/15/2012 9:40	146400.001	164.563	49.606	21.97
3/15/2012 9:50	147000.001	164.58	49.599	21.971
3/15/2012 10:00	147600.001	164.508	49.63	21.989
3/15/2012 10:10	148200.001	164.542	49.615	21.975
3/15/2012 10:20	148800.001	164.522	49.624	21.97
3/15/2012 10:30	149400.001	164.48	49.642	21.969
3/15/2012 10:40	150000.001	164.487	49.639	21.97

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 10:50	150600.001	164.48	49.642	21.971
3/15/2012 11:00	151200.001	164.459	49.651	21.968
3/15/2012 11:10	151800.001	164.405	49.674	21.969
3/15/2012 11:20	152400.001	164.426	49.666	21.969
3/15/2012 11:30	153000.001	164.406	49.674	21.969
3/15/2012 11:40	153600.001	164.394	49.679	21.967
3/15/2012 11:50	154200.001	164.328	49.708	21.971
3/15/2012 12:00	154800.001	164.354	49.696	21.971
3/15/2012 12:10	155400.001	164.326	49.709	21.969
3/15/2012 12:20	156000.001	164.308	49.716	21.968
3/15/2012 12:30	156600.001	164.298	49.721	21.969
3/15/2012 12:40	157200.001	164.287	49.726	21.97
3/15/2012 12:50	157800.001	164.217	49.756	21.97
3/15/2012 13:00	158400.001	164.233	49.749	21.968
3/15/2012 13:10	159000.001	164.213	49.758	21.971
3/15/2012 13:20	159600.001	164.184	49.77	21.97
3/15/2012 13:30	160200.001	164.14	49.789	21.969
3/15/2012 13:40	160800.001	164.163	49.779	21.972
3/15/2012 13:50	161400.001	164.126	49.796	21.969
3/15/2012 14:00	162000.001	164.118	49.799	21.967
3/15/2012 14:10	162600.001	164.073	49.818	21.972
3/15/2012 14:20	163200.001	164.046	49.83	21.972
3/15/2012 14:30	163800.001	164.054	49.826	21.968
3/15/2012 14:40	164400.001	164.046	49.83	21.97
3/15/2012 14:50	165000.001	164.024	49.839	21.97
3/15/2012 15:00	165600.001	163.979	49.859	21.969
3/15/2012 15:10	166200.001	163.982	49.858	21.966
3/15/2012 15:20	166800.001	163.957	49.869	21.969
3/15/2012 15:30	167400.001	163.909	49.89	21.97
3/15/2012 15:40	168000.001	163.894	49.896	21.97
3/15/2012 15:50	168600.001	163.895	49.895	21.969
3/15/2012 16:00	169200.001	163.865	49.908	21.971
3/15/2012 16:10	169800.001	163.876	49.904	21.972
3/15/2012 16:20	170400.001	163.828	49.924	21.968
3/15/2012 16:30	171000.001	163.815	49.93	21.97
3/15/2012 16:40	171600.001	163.833	49.922	21.97
3/15/2012 16:50	172200.001	163.809	49.933	21.968
3/15/2012 17:00	172800.001	163.793	49.939	21.97
3/15/2012 17:10	173400.001	163.752	49.957	21.971
3/15/2012 17:20	174000.001	163.767	49.951	21.971
3/15/2012 17:30	174600.001	163.728	49.968	21.969
3/15/2012 17:40	175200.001	163.735	49.965	21.967
3/15/2012 17:50	175800.001	163.708	49.976	21.97
3/15/2012 18:00	176400.001	163.699	49.98	21.97
3/15/2012 18:10	177000.001	163.695	49.982	21.97
3/15/2012 18:20	177600.001	163.657	49.999	21.97
3/15/2012 18:30	178200.001	163.639	50.007	21.97
3/15/2012 18:40	178800.001	163.649	50.002	21.968
3/15/2012 18:50	179400.001	163.641	50.005	21.968
3/15/2012 19:00	180000.001	163.626	50.012	21.969
3/15/2012 19:10	180600.001	163.592	50.027	21.972
3/15/2012 19:20	181200.001	163.61	50.019	21.968
3/15/2012 19:30	181800.001	163.595	50.025	21.97
3/15/2012 19:40	182400.001	163.58	50.032	21.97

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/15/2012 19:50	183000.001	163.572	50.035	21.969
3/15/2012 20:00	183600.001	163.522	50.057	21.971
3/15/2012 20:10	184200.001	163.551	50.044	21.97
3/15/2012 20:20	184800.001	163.539	50.049	21.968
3/15/2012 20:30	185400.001	163.51	50.062	21.967
3/15/2012 20:40	186000.001	163.503	50.065	21.972
3/15/2012 20:50	186600.001	163.506	50.064	21.973
3/15/2012 21:00	187200.001	163.449	50.088	21.971
3/15/2012 21:10	187800.001	163.465	50.082	21.971
3/15/2012 21:20	188400.001	163.463	50.082	21.968
3/15/2012 21:30	189000.001	163.448	50.089	21.97
3/15/2012 21:40	189600.001	163.446	50.09	21.967
3/15/2012 21:50	190200.001	163.416	50.103	21.969
3/15/2012 22:00	190800.001	163.374	50.121	21.968
3/15/2012 22:10	191400.001	163.374	50.121	21.969
3/15/2012 22:20	192000.001	163.379	50.119	21.967
3/15/2012 22:30	192600.001	163.329	50.14	21.97
3/15/2012 22:40	193200.001	163.358	50.128	21.971
3/15/2012 22:50	193800.001	163.31	50.149	21.972
3/15/2012 23:00	194400.001	163.291	50.157	21.969
3/15/2012 23:10	195000.001	163.277	50.163	21.969
3/15/2012 23:20	195600.001	163.289	50.158	21.975
3/15/2012 23:30	196200.001	163.253	50.173	21.971
3/15/2012 23:40	196800.001	163.259	50.171	21.969
3/15/2012 23:50	197400.001	163.237	50.181	21.969
3/16/2012 0:00	198000.001	163.199	50.197	21.969
3/16/2012 0:10	198600.001	163.175	50.207	21.969
3/16/2012 0:20	199200.001	163.194	50.199	21.969
3/16/2012 0:30	199800.001	163.141	50.222	21.966
3/16/2012 0:40	200400.001	163.131	50.227	21.967
3/16/2012 0:50	201000.001	163.133	50.225	21.97
3/16/2012 1:00	201600.001	163.116	50.233	21.97
3/16/2012 1:10	202200.001	163.069	50.253	21.968
3/16/2012 1:20	202800.001	163.086	50.246	21.971
3/16/2012 1:30	203400.001	163.034	50.268	21.972
3/16/2012 1:40	204000.001	163.049	50.262	21.971
3/16/2012 1:50	204600.012	163.003	50.282	21.991
3/16/2012 2:00	205200.001	163.02	50.275	21.974
3/16/2012 2:10	205800.001	163.005	50.281	21.971
3/16/2012 2:20	206400.001	162.961	50.3	21.971
3/16/2012 2:30	207000.001	162.937	50.31	21.967
3/16/2012 2:40	207600.001	162.926	50.315	21.972
3/16/2012 2:50	208200.001	162.905	50.324	21.971
3/16/2012 3:00	208800.001	162.895	50.328	21.97
3/16/2012 3:10	209400.001	162.866	50.341	21.968
3/16/2012 3:20	210000.001	162.89	50.331	21.966
3/16/2012 3:30	210600.001	162.879	50.335	21.969
3/16/2012 3:40	211200.001	162.829	50.357	21.972
3/16/2012 3:50	211800.001	162.81	50.365	21.97
3/16/2012 4:00	212400.001	162.833	50.356	21.971
3/16/2012 4:10	213000.001	162.833	50.355	21.97
3/16/2012 4:20	213600.001	162.771	50.382	21.973
3/16/2012 4:30	214200.001	162.761	50.387	21.969
3/16/2012 4:40	214800.001	162.766	50.384	21.968

CS-MW22-LGR Water Level Data
During TW-2 Pumping Test

3/16/2012 4:50	215400.001	162.734	50.398	21.968
3/16/2012 5:00	216000.001	162.724	50.403	21.971
3/16/2012 5:10	216600.001	162.71	50.409	21.971
3/16/2012 5:20	217200.001	162.72	50.404	21.97
3/16/2012 5:30	217800.001	162.714	50.407	21.968
3/16/2012 5:40	218400.001	162.696	50.415	21.97
3/16/2012 5:50	219000.001	162.688	50.418	21.967
3/16/2012 6:00	219600.001	162.692	50.416	21.969
3/16/2012 6:10	220200.001	162.672	50.425	21.971
3/16/2012 6:20	220800.001	162.622	50.447	21.969
3/16/2012 6:30	221400.001	162.613	50.451	21.972
3/16/2012 6:40	222000.001	162.612	50.451	21.969
3/16/2012 6:50	222600.001	162.59	50.46	21.97
3/16/2012 7:00	223200.001	162.591	50.46	21.966
3/16/2012 7:10	223800.001	162.581	50.464	21.967
3/16/2012 7:20	224400.001	162.597	50.458	21.971
3/16/2012 7:30	225000.001	162.589	50.461	21.97
3/16/2012 7:40	225600.001	162.55	50.478	21.968
3/16/2012 7:50	226200.001	162.56	50.474	21.97
3/16/2012 8:00	226800.001	162.506	50.497	21.969
3/16/2012 8:10	227400.001	162.504	50.498	21.969
3/16/2012 8:20	228000.001	162.523	50.49	21.968
3/16/2012 8:30	228600.001	162.512	50.495	21.967
3/16/2012 8:40	229200.001	162.514	50.493	21.969
3/16/2012 8:50	229800.001	162.5	50.5	21.968
3/16/2012 9:00	230400.001	162.471	50.512	21.969
3/16/2012 9:10	231000.001	162.454	50.519	21.969
3/16/2012 9:20	231600.001	162.453	50.52	21.971
3/16/2012 9:30	232200.001	162.462	50.516	21.968
3/16/2012 9:40	232800.001	162.434	50.528	21.969
3/16/2012 9:50	233400.001	162.413	50.537	21.971
3/16/2012 10:00	234000.001	162.443	50.524	21.97
3/16/2012 10:10	234600.001	162.402	50.542	22.009

APPENDIX D

ANALYTICAL SUMMARIES

SAN ANTONIO TESTING LABORATORY
AGRICULTURAL PRIORITY POLLUTANTS LABORATORY

VOCS
SAN ANTONIO TESTING LABORATORY
MARCH 1, 2012

SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (1910)

Sampling Method: Grab

Lab Sample ID #: 1203011-01

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 19:10

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 03/02/12 11:05/End 03/03/12 11:20			SM9222D	SM	
Volatile Organic Compounds by GC/MS									
Acetone *	0.016	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Acrolein *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Acrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Allyl Chloride (3-Chloropropylene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Benzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Tetrachloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromodichloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromoform *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromomethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Trichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
sec-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
tert-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Carbon disulfide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Carbon Tetrachloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
2-Chloroethyl Vinyl Ether *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloroform *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
2-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
4-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dibromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dibromo-3-chloropropane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dibromoethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dibromomethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,3-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,4-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
trans-1,4-Dichloro-2-butene *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
cis-1,4-Dichloro-2-butene	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dichlorodifluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (1910)

Sampling Method: Grab

Lab Sample ID #: 1203011-01

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 19:10

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Volatile Organic Compounds by GC/MS									
1,2-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1-Dichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
cis-1,2-Dichloroethylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
trans-1,2-Dichloroethylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,3-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
2,2-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
cis-1,3-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
trans-1,3-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Ethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Ethyl Methacrylate *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Hexachlorobutadiene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 10:55	8260B	HH	
Isopropylbenzene (Cumene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Isopropyl alcohol	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
4-Isopropyltoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Methacrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl Butyl Ketone (2-Hexanone) *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl Ethyl Ketone (2-Butanone) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Acetonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl Iodide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl Isobutyl Ketone *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl Methacrylate *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Methyl-tert-Butyl Ether *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Methylene Chloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Naphthalene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 10:55	8260B	HH	
Propylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Styrene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1,1,2-Tetrachloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1,2,2-Tetrachloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Toluene *	0.026	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2,3-Trichlorobenzene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2,4-Trichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1,1-Trichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1,2-Trichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Trichlorofluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2,3-Trichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2,4-Trimethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,3,5-Trimethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (1910)

Sampling Method: Grab

Lab Sample ID #: 1203011-01

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 19:10

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Volatile Organic Compounds by GC/MS									
Vinyl acetate *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Vinyl chloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
m,p-Xylenes *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
o-Xylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Surrogate: Toluene-d8	*115 %*		*76-138*	*5030B*	*B209112*	*03/02/12 10:55*	*8260B*	*HH*	
Surrogate: 4-Bromofluorobenzene	*103 %*		*79-125*	*5030B*	*B209112*	*03/02/12 10:55*	*8260B*	*HH*	
Surrogate: Dibromofluoromethane	*109 %*		*88-134*	*5030B*	*B209112*	*03/02/12 10:55*	*8260B*	*HH*	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (2330)

Sampling Method: Grab

Lab Sample ID #: 1203011-02

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 23:30

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 03/02/12 11:05/End 03/03/12 11:20			SM9222D	SM	
Volatile Organic Compounds by GC/MS									
Acetone *	0.011	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Acrolein *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Acrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Allyl Chloride (3-Chloropropylene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Benzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Tetrachloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromodichloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromoform *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromomethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Trichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
sec-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
tert-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Carbon disulfide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Carbon Tetrachloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
2-Chloroethyl Vinyl Ether *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloroform *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
2-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
4-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dibromochloromethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dibromo-3-chloropropane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dibromoethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dibromomethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,3-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,4-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
trans-1,4-Dichloro-2-butene *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
cis-1,4-Dichloro-2-butene	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dichlorodifluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (2330)

Sampling Method: Grab

Lab Sample ID #: 1203011-02

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 23:30

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Volatile Organic Compounds by GC/MS									
1,2-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1-Dichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
cis-1,2-Dichloroethylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
trans-1,2-Dichloroethylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,3-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
2,2-Dichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
cis-1,3-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
trans-1,3-Dichloropropylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Ethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Ethyl Methacrylate *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Hexachlorobutadiene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 11:24	8260B	HH	
Isopropylbenzene (Cumene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Isopropyl alcohol	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
4-Isopropyltoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Methacrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl Butyl Ketone (2-Hexanone) *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl Ethyl Ketone (2-Butanone) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Acetonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl Iodide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl Isobutyl Ketone *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl Methacrylate *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Methyl-tert-Butyl Ether *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Methylene Chloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Naphthalene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 11:24	8260B	HH	
Propylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Styrene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1,1,2-Tetrachloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1,2,2-Tetrachloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Toluene *	0.005	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2,3-Trichlorobenzene *	<0.010	mg/L	0.010	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2,4-Trichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1,1-Trichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1,2-Trichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Trichlorofluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2,3-Trichloropropane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2,4-Trimethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,3,5-Trimethylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (2330)

Sampling Method: Grab

Lab Sample ID #: 1203011-02

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 23:30

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Volatile Organic Compounds by GC/MS									
Vinyl acetate *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Vinyl chloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
m,p-Xylenes *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
o-Xylene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Surrogate: Toluene-d8	*117 %*		*76-138*	*5030B*	*B209112*	*03/02/12 11:24*	*8260B*	*HH*	
Surrogate: 4-Bromofluorobenzene	*103 %*		*79-125*	*5030B*	*B209112*	*03/02/12 11:24*	*8260B*	*HH*	
Surrogate: Dibromofluoromethane	*113 %*		*88-134*	*5030B*	*B209112*	*03/02/12 11:24*	*8260B*	*HH*	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209124 - NO PREP									
Blank (B209124-BLK1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B209124-BS1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B209125 - NO PREP									
Blank (B209125-BLK1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B209125-BS1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B209125-BSD1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209112 - 5030B									
Blank (B209112-BLK1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 10:24					
Acetone	<0.001	0.001	mg/L						
Acrolein	<0.001	0.001	mg/L						
Acrylonitrile	<0.001	0.001	mg/L						
Allyl Chloride (3-Chloropropylene)	<0.001	0.001	mg/L						
Benzene	<0.001	0.001	mg/L						
Bromobenzene	<0.001	0.001	mg/L						
Bromochloromethane	<0.001	0.001	mg/L						
Tetrachloroethene	<0.001	0.001	mg/L						
Bromodichloromethane	<0.001	0.001	mg/L						
Bromoform	<0.001	0.001	mg/L						
Bromomethane	<0.001	0.001	mg/L						
Trichloroethene	<0.001	0.001	mg/L						
Butylbenzene	<0.001	0.001	mg/L						

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209112 - 5030B									
Blank (B209112-BLK1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 10:24					
sec-Butylbenzene	<0.001	0.001	mg/L						
tert-Butylbenzene	<0.001	0.001	mg/L						
Carbon disulfide	<0.001	0.001	mg/L						
Carbon Tetrachloride	<0.001	0.001	mg/L						
Chlorobenzene	<0.001	0.001	mg/L						
Chloroethane	<0.001	0.001	mg/L						
2-Chloroethyl Vinyl Ether	<0.001	0.001	mg/L						
Chloroform	<0.001	0.001	mg/L						
Chloromethane	<0.001	0.001	mg/L						
2-Chlorotoluene	<0.001	0.001	mg/L						
4-Chlorotoluene	<0.001	0.001	mg/L						
Dibromochloromethane	<0.001	0.001	mg/L						
1,2-Dibromo-3-chloropropane	<0.001	0.001	mg/L						
1,2-Dibromoethane	<0.001	0.001	mg/L						
Dibromomethane	<0.001	0.001	mg/L						
1,2-Dichlorobenzene	<0.001	0.001	mg/L						
1,3-Dichlorobenzene	<0.001	0.001	mg/L						
1,4-Dichlorobenzene	<0.001	0.001	mg/L						
trans-1,4-Dichloro-2-butene	<0.001	0.001	mg/L						
cis-1,4-Dichloro-2-butene	<0.001	0.001	mg/L						
Dichlorodifluoromethane	<0.001	0.001	mg/L						
1,1-Dichloroethane	<0.001	0.001	mg/L						
1,2-Dichloroethane	<0.001	0.001	mg/L						
1,1-Dichloroethene	<0.001	0.001	mg/L						
cis-1,2-Dichloroethylene	<0.001	0.001	mg/L						
trans-1,2-Dichloroethylene	<0.001	0.001	mg/L						
1,2-Dichloropropane	<0.001	0.001	mg/L						
1,3-Dichloropropane	<0.001	0.001	mg/L						
2,2-Dichloropropane	<0.001	0.001	mg/L						
1,1-Dichloropropylene	<0.001	0.001	mg/L						
cis-1,3-Dichloropropylene	<0.001	0.001	mg/L						
trans-1,3-Dichloropropylene	<0.001	0.001	mg/L						
Ethylbenzene	<0.001	0.001	mg/L						
Ethyl Methacrylate	<0.001	0.001	mg/L						
Hexachlorobutadiene	<0.001	0.001	mg/L						
Isopropylbenzene (Cumene)	<0.001	0.001	mg/L						
Isopropyl alcohol	<0.001	0.001	mg/L						
4-Isopropyltoluene	<0.001	0.001	mg/L						

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209112 - 5030B									
Blank (B209112-BLK1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 10:24					
Methacrylonitrile	<0.001	0.001	mg/L						
Methyl Butyl Ketone (2-Hexanone)	<0.001	0.001	mg/L						
Methyl Ethyl Ketone (2-Butanone)	<0.001	0.001	mg/L						
Acetonitrile	<0.001	0.001	mg/L						
Methyl Iodide	<0.001	0.001	mg/L						
Methyl Isobutyl Ketone	<0.001	0.001	mg/L						
Methyl Methacrylate	<0.001	0.001	mg/L						
Methyl-tert-Butyl Ether	<0.001	0.001	mg/L						
Methylene Chloride	<0.001	0.001	mg/L						
Naphthalene	<0.001	0.001	mg/L						
Propylbenzene	<0.001	0.001	mg/L						
Styrene	<0.001	0.001	mg/L						
1,1,1,2-Tetrachloroethane	<0.001	0.001	mg/L						
1,1,2,2-Tetrachloroethane	<0.001	0.001	mg/L						
Toluene	<0.001	0.001	mg/L						
1,2,3-Trichlorobenzene	<0.001	0.001	mg/L						
1,2,4-Trichlorobenzene	<0.001	0.001	mg/L						
1,1,1-Trichloroethane	<0.001	0.001	mg/L						
1,1,2-Trichloroethane	<0.001	0.001	mg/L						
Trichlorofluoromethane	<0.001	0.001	mg/L						
1,2,3-Trichloropropane	<0.001	0.001	mg/L						
1,2,4-Trimethylbenzene	<0.001	0.001	mg/L						
1,3,5-Trimethylbenzene	<0.001	0.001	mg/L						
Vinyl acetate	<0.001	0.001	mg/L						
Vinyl chloride	<0.001	0.001	mg/L						
m,p-Xylenes	<0.001	0.001	mg/L						
o-Xylene	<0.001	0.001	mg/L						
Surrogate: Toluene-d8	*0.0555*		*mg/L*	*0.0500*		*111*	*76-138*		
Surrogate: 4-Bromofluorobenzene	*0.0515*		*mg/L*	*0.0500*		*103*	*79-125*		
Surrogate: Dibromofluoromethane	*0.0543*		*mg/L*	*0.0500*		*109*	*88-134*		
LCS (B209112-BS1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:27					
Acetone	0.0430	0.001	mg/L	0.0500		86	75-129		
Acrolein	0.0450	0.001	mg/L	0.0500		90	73-110		
Acrylonitrile	0.0416	0.001	mg/L	0.0500		83	81-124		
Allyl Chloride (3-Chloropropylene)	0.0484	0.001	mg/L	0.0500		97	89-115		
Benzene	0.0503	0.001	mg/L	0.0500		101	89-117		
Bromobenzene	0.0520	0.001	mg/L	0.0500		104	80-115		

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
LCS (B209112-BS1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:27						
Bromochloromethane	0.0467	0.001	mg/L	0.0500		93	86-116			
Tetrachloroethene	0.0507	0.001	mg/L	0.0500		101	81-155			
Bromodichloromethane	0.0514	0.001	mg/L	0.0500		103	80-117			
Bromoform	0.0536	0.001	mg/L	0.0500		107	80-110			
Bromomethane	0.0467	0.001	mg/L	0.0500		93	82-163			
Trichloroethene	0.0517	0.001	mg/L	0.0500		103	80-115			
Butylbenzene	0.0552	0.001	mg/L	0.0500		110	91-115			
sec-Butylbenzene	0.0559	0.001	mg/L	0.0500		112	80-121			
tert-Butylbenzene	0.0552	0.001	mg/L	0.0500		110	80-121			
Carbon disulfide	0.0493	0.001	mg/L	0.0500		99	85-116			
Carbon Tetrachloride	0.0491	0.001	mg/L	0.0500		98	88-127			
Chlorobenzene	0.0516	0.001	mg/L	0.0500		103	80-111			
Chloroethane	0.0461	0.001	mg/L	0.0500		92	87-111			
2-Chloroethyl Vinyl Ether	0.0639	0.001	mg/L	0.0500		128	91-108			LCSH
Chloroform	0.0491	0.001	mg/L	0.0500		98	84-118			
Chloromethane	0.0454	0.001	mg/L	0.0500		91	75-130			
2-Chlorotoluene	0.0523	0.001	mg/L	0.0500		105	80-118			
4-Chlorotoluene	0.0542	0.001	mg/L	0.0500		108	80-112			
Dibromochloromethane	0.0525	0.001	mg/L	0.0500		105	80-117			
1,2-Dibromo-3-chloropropane	0.0552	0.001	mg/L	0.0500		110	80-120			
1,2-Dibromoethane	0.0527	0.001	mg/L	0.0500		105	80-110			
Dibromomethane	0.0503	0.001	mg/L	0.0500		101	93-112			
1,2-Dichlorobenzene	0.0514	0.001	mg/L	0.0500		103	80-112			
1,3-Dichlorobenzene	0.0519	0.001	mg/L	0.0500		104	80-111			
1,4-Dichlorobenzene	0.0500	0.001	mg/L	0.0500		100	80-110			
trans-1,4-Dichloro-2-butene	0.0611	0.001	mg/L	0.0500		122	80-122			LCSH
cis-1,4-Dichloro-2-butene	0.0702	0.001	mg/L				65-115			LCSH
Dichlorodifluoromethane	0.0412	0.001	mg/L	0.0500		82	91-115			LCSL
1,1-Dichloroethane	0.0491	0.001	mg/L	0.0500		98	84-121			
1,2-Dichloroethane	0.0468	0.001	mg/L	0.0500		94	81-120			
1,1-Dichloroethene	0.0454	0.001	mg/L	0.0500		91	85-122			
cis-1,2-Dichloroethylene	0.0503	0.001	mg/L	0.0500		101	82-121			
trans-1,2-Dichloroethylene	0.0488	0.001	mg/L	0.0500		98	85-121			
1,2-Dichloropropane	0.0522	0.001	mg/L	0.0500		104	94-116			
1,3-Dichloropropane	0.0498	0.001	mg/L	0.0500		100	92-112			
2,2-Dichloropropane	0.0541	0.001	mg/L	0.0500		108	78-113			
1,1-Dichloropropylene	0.0525	0.001	mg/L	0.0500		105	87-120			
cis-1,3-Dichloropropylene	0.0576	0.001	mg/L	0.0500		115	80-116			

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
LCS (B209112-BS1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:27						
trans-1,3-Dichloropropylene	0.0560	0.001	mg/L	0.0500		112	80-117			
Ethylbenzene	0.0534	0.001	mg/L	0.0500		107	80-115			
Ethyl Methacrylate	0.0524	0.001	mg/L	0.0500		105	91-124			
Hexachlorobutadiene	0.0638	0.001	mg/L	0.0500		128	80-120			LCSH
Isopropylbenzene (Cumene)	0.0560	0.001	mg/L	0.0500		112	80-118			
4-Isopropyltoluene	0.0569	0.001	mg/L	0.0500		114	80-115			
Methacrylonitrile	0.0478	0.001	mg/L	0.0500		96	72-124			
Methyl Butyl Ketone (2-Hexanone)	0.0516	0.001	mg/L	0.0500		103	83-123			
Methyl Ethyl Ketone (2-Butanone)	0.0498	0.001	mg/L	0.0500		100	67-128			
Acetonitrile	0.0451	0.001	mg/L	0.0500		90	70-130			
Methyl Iodide	0.0449	0.001	mg/L	0.0500		90	87-131			
Methyl Isobutyl Ketone	0.0532	0.001	mg/L	0.0500		106	90-118			
Methyl Methacrylate	0.0536	0.001	mg/L	0.0500		107	91-122			
Methyl-tert-Butyl Ether	0.0528	0.001	mg/L	0.0500		106	82-122			
Methylene Chloride	0.0497	0.001	mg/L	0.0500		99	81-122			
Naphthalene	0.0746	0.001	mg/L	0.0500		149	80-130			LCSH
Propylbenzene	0.0563	0.001	mg/L	0.0500		113	80-118			
Styrene	0.0596	0.001	mg/L	0.0500		119	80-114			LCSH
1,1,1,2-Tetrachloroethane	0.0511	0.001	mg/L	0.0500		102	80-114			
1,1,2,2-Tetrachloroethane	0.0535	0.001	mg/L	0.0500		107	90-112			
Toluene	0.0548	0.001	mg/L	0.0500		110	80-114			
1,2,3-Trichlorobenzene	0.0667	0.001	mg/L	0.0500		133	80-130			LCSH
1,2,4-Trichlorobenzene	0.0608	0.001	mg/L	0.0500		122	80-120			LCSH
1,1,1-Trichloroethane	0.0490	0.001	mg/L	0.0500		98	84-119			
1,1,2-Trichloroethane	0.0519	0.001	mg/L	0.0500		104	93-117			
Trichlorofluoromethane	0.0462	0.001	mg/L	0.0500		92	80-120			
1,2,3-Trichloropropane	0.0545	0.001	mg/L	0.0500		109	91-120			
1,2,4-Trimethylbenzene	0.0528	0.001	mg/L	0.0500		106	80-120			
1,3,5-Trimethylbenzene	0.0543	0.001	mg/L	0.0500		109	80-120			
Vinyl acetate	0.0507	0.001	mg/L	0.0500		101	63-108			
Vinyl chloride	0.0416	0.001	mg/L	0.0500		83	89-116			LCSL
m,p-Xylenes	0.110	0.001	mg/L	0.100		110	87-126			
o-Xylene	0.0560	0.001	mg/L	0.0500		112	80-116			
Surrogate: Toluene-d8	*0.0573*		*mg/L*	*0.0500*		*115*	*76-138*			
Surrogate: 4-Bromofluorobenzene	*0.0562*		*mg/L*	*0.0500*		*112*	*79-125*			
Surrogate: Dibromofluoromethane	*0.0509*		*mg/L*	*0.0500*		*102*	*88-134*			
LCS Dup (B209112-BSD1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:56						

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
LCS Dup (B209112-BSD1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:56						
Acetone	0.0449	0.001	mg/L	0.0500		90	75-129	4	20	
Acrolein	0.0454	0.001	mg/L	0.0500		91	73-110	0.8	20	
Acrylonitrile	0.0486	0.001	mg/L	0.0500		97	81-124	16	20	
Allyl Chloride (3-Chloropropylene)	0.0527	0.001	mg/L	0.0500		105	89-115	8	20	
Benzene	0.0520	0.001	mg/L	0.0500		104	89-117	3	20	
Bromobenzene	0.0535	0.001	mg/L	0.0500		107	80-115	3	20	
Bromochloromethane	0.0504	0.001	mg/L	0.0500		101	86-116	8	20	
Tetrachloroethene	0.0502	0.001	mg/L	0.0500		100	81-155	0.9	20	
Bromodichloromethane	0.0514	0.001	mg/L	0.0500		103	80-117	0.1	20	
Bromoform	0.0546	0.001	mg/L	0.0500		109	80-110	2	20	
Bromomethane	0.0477	0.001	mg/L	0.0500		95	82-163	2	20	
Trichloroethene	0.0521	0.001	mg/L	0.0500		104	80-115	0.8	20	
Butylbenzene	0.0564	0.001	mg/L	0.0500		113	91-115	2	20	
sec-Butylbenzene	0.0560	0.001	mg/L	0.0500		112	80-121	0.07	20	
tert-Butylbenzene	0.0563	0.001	mg/L	0.0500		113	80-121	2	20	
Carbon disulfide	0.0511	0.001	mg/L	0.0500		102	85-116	4	20	
Carbon Tetrachloride	0.0498	0.001	mg/L	0.0500		100	88-127	1	20	
Chlorobenzene	0.0520	0.001	mg/L	0.0500		104	80-111	0.8	20	
Chloroethane	0.0488	0.001	mg/L	0.0500		98	87-111	6	20	
2-Chloroethyl Vinyl Ether	0.0650	0.001	mg/L	0.0500		130	91-108	2	20	LCSDH
Chloroform	0.0500	0.001	mg/L	0.0500		100	84-118	2	20	
Chloromethane	0.0458	0.001	mg/L	0.0500		92	75-130	0.7	20	
2-Chlorotoluene	0.0528	0.001	mg/L	0.0500		106	80-118	0.9	20	
4-Chlorotoluene	0.0543	0.001	mg/L	0.0500		109	80-112	0.04	20	
Dibromochloromethane	0.0527	0.001	mg/L	0.0500		105	80-117	0.4	20	
1,2-Dibromo-3-chloropropane	0.0539	0.001	mg/L	0.0500		108	80-120	2	20	
1,2-Dibromoethane	0.0525	0.001	mg/L	0.0500		105	80-110	0.4	20	
Dibromomethane	0.0506	0.001	mg/L	0.0500		101	93-112	0.6	20	
1,2-Dichlorobenzene	0.0520	0.001	mg/L	0.0500		104	80-112	1	20	
1,3-Dichlorobenzene	0.0529	0.001	mg/L	0.0500		106	80-111	2	20	
1,4-Dichlorobenzene	0.0506	0.001	mg/L	0.0500		101	80-110	1	20	
trans-1,4-Dichloro-2-butene	0.0611	0.001	mg/L	0.0500		122	80-122	0.05	20	LCSDH
cis-1,4-Dichloro-2-butene	0.0732	0.001	mg/L				65-115	4	20	LCSDH
Dichlorodifluoromethane	0.0402	0.001	mg/L	0.0500		80	91-115	2	20	LCSDL
1,1-Dichloroethane	0.0505	0.001	mg/L	0.0500		101	84-121	3	20	
1,2-Dichloroethane	0.0471	0.001	mg/L	0.0500		94	81-120	0.7	20	
1,1-Dichloroethene	0.0466	0.001	mg/L	0.0500		93	85-122	3	20	
cis-1,2-Dichloroethylene	0.0519	0.001	mg/L	0.0500		104	82-121	3	20	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
LCS Dup (B209112-BSD1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 09:56						
trans-1,2-Dichloroethylene	0.0502	0.001	mg/L	0.0500		100	85-121	3	20	
1,2-Dichloropropane	0.0517	0.001	mg/L	0.0500		103	94-116	0.9	20	
1,3-Dichloropropane	0.0496	0.001	mg/L	0.0500		99	92-112	0.4	20	
2,2-Dichloropropane	0.0547	0.001	mg/L	0.0500		109	78-113	1	20	
1,1-Dichloropropylene	0.0537	0.001	mg/L	0.0500		107	87-120	2	20	
cis-1,3-Dichloropropylene	0.0577	0.001	mg/L	0.0500		115	80-116	0.3	20	
trans-1,3-Dichloropropylene	0.0560	0.001	mg/L	0.0500		112	80-117	0.02	20	
Ethylbenzene	0.0544	0.001	mg/L	0.0500		109	80-115	2	20	
Ethyl Methacrylate	0.0524	0.001	mg/L	0.0500		105	91-124	0	20	
Hexachlorobutadiene	0.0679	0.001	mg/L	0.0500		136	80-120	6	20	LCSDH
Isopropylbenzene (Cumene)	0.0567	0.001	mg/L	0.0500		113	80-118	1	20	
4-Isopropyltoluene	0.0574	0.001	mg/L	0.0500		115	80-115	0.8	20	
Methacrylonitrile	0.0511	0.001	mg/L	0.0500		102	72-124	7	20	
Methyl Butyl Ketone (2-Hexanone)	0.0502	0.001	mg/L	0.0500		100	83-123	3	20	
Acetonitrile	0.0503	0.001	mg/L	0.0500		101	70-130	11	20	
Methyl Ethyl Ketone (2-Butanone)	0.0470	0.001	mg/L	0.0500		94	67-128	6	20	
Methyl Iodide	0.0461	0.001	mg/L	0.0500		92	87-131	3	20	
Methyl Isobutyl Ketone	0.0518	0.001	mg/L	0.0500		104	90-118	3	20	
Methyl Methacrylate	0.0537	0.001	mg/L	0.0500		107	91-122	0.2	20	
Methyl-tert-Butyl Ether	0.0548	0.001	mg/L	0.0500		110	82-122	4	20	
Methylene Chloride	0.0476	0.001	mg/L	0.0500		95	81-122	4	20	
Naphthalene	0.0721	0.001	mg/L	0.0500		144	80-130	3	20	LCSDH
Propylbenzene	0.0567	0.001	mg/L	0.0500		113	80-118	0.7	20	
Styrene	0.0614	0.001	mg/L	0.0500		123	80-114	3	20	LCSDH
1,1,1,2-Tetrachloroethane	0.0505	0.001	mg/L	0.0500		101	80-114	1	20	
1,1,2,2-Tetrachloroethane	0.0528	0.001	mg/L	0.0500		106	90-112	1	20	
Toluene	0.0540	0.001	mg/L	0.0500		108	80-114	2	20	
1,2,3-Trichlorobenzene	0.0764	0.001	mg/L	0.0500		153	80-130	14	20	LCSDH
1,2,4-Trichlorobenzene	0.0632	0.001	mg/L	0.0500		126	80-120	4	20	LCSDH
1,1,1-Trichloroethane	0.0491	0.001	mg/L	0.0500		98	84-119	0.2	20	
1,1,2-Trichloroethane	0.0514	0.001	mg/L	0.0500		103	93-117	0.8	20	
Trichlorofluoromethane	0.0469	0.001	mg/L	0.0500		94	80-120	2	20	
1,2,3-Trichloropropane	0.0543	0.001	mg/L	0.0500		109	91-120	0.3	20	
1,2,4-Trimethylbenzene	0.0542	0.001	mg/L	0.0500		108	80-120	3	20	
1,3,5-Trimethylbenzene	0.0548	0.001	mg/L	0.0500		110	80-120	0.9	20	
Vinyl acetate	0.0534	0.001	mg/L	0.0500		107	63-108	5	20	
Vinyl chloride	0.0410	0.001	mg/L	0.0500		82	89-116	1	20	LCSDL
m,p-Xylenes	0.111	0.001	mg/L	0.100		111	87-126	1	20	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
LCS Dup (B209112-BSD1)				Prepared: 03/02/12 08:30		Analyzed: 03/02/12 09:56				
o-Xylene	0.0568	0.001	mg/L	0.0500		114	80-116	1	20	
Surrogate: Toluene-d8	*0.0560*		*mg/L*	*0.0500*		*112*	*76-138*			
Surrogate: 4-Bromofluorobenzene	*0.0565*		*mg/L*	*0.0500*		*113*	*79-125*			
Surrogate: Dibromofluoromethane	*0.0525*		*mg/L*	*0.0500*		*105*	*88-134*			
Matrix Spike (B209112-MS1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30		Analyzed: 03/02/12 11:52				
Acetone	0.0607	0.001	mg/L	0.0500	0.0155	90	75-129			
Acrolein	0.0584	0.001	mg/L	0.0500	<0.001	117	73-110			MSH
Acrylonitrile	0.0562	0.001	mg/L	0.0500	<0.001	112	81-124			
Allyl Chloride (3-Chloropropylene)	0.0492	0.001	mg/L	0.0500	<0.001	98	89-115			
Benzene	0.0502	0.001	mg/L	0.0500	<0.001	100	89-117			
Bromobenzene	0.0529	0.001	mg/L	0.0500	<0.001	106	80-115			
Bromochloromethane	0.0504	0.001	mg/L	0.0500	<0.001	101	86-116			
Tetrachloroethene	0.0515	0.001	mg/L	0.0500	<0.001	103	81-155			
Bromodichloromethane	0.0514	0.001	mg/L	0.0500	<0.001	103	80-107			
Bromoform	0.0538	0.001	mg/L	0.0500	<0.001	108	80-110			
Bromomethane	0.0451	0.001	mg/L	0.0500	<0.001	90	82-163			
Trichloroethene	0.0505	0.001	mg/L	0.0500	<0.001	101	80-115			
Butylbenzene	0.0544	0.001	mg/L	0.0500	<0.001	109	91-115			
sec-Butylbenzene	0.0568	0.001	mg/L	0.0500	<0.001	114	80-121			
tert-Butylbenzene	0.0565	0.001	mg/L	0.0500	<0.001	113	80-121			
Carbon disulfide	0.0495	0.001	mg/L	0.0500	<0.001	99	85-116			
Carbon Tetrachloride	0.0487	0.001	mg/L	0.0500	<0.001	97	88-127			
Chlorobenzene	0.0512	0.001	mg/L	0.0500	<0.001	102	80-111			
Chloroethane	0.0498	0.001	mg/L	0.0500	<0.001	100	87-111			
2-Chloroethyl Vinyl Ether	0.00146	0.001	mg/L	0.0500	<0.001	3	91-108			MSL
Chloroform	0.0502	0.001	mg/L	0.0500	<0.001	100	84-118			
Chloromethane	0.0474	0.001	mg/L	0.0500	<0.001	95	90-110			
2-Chlorotoluene	0.0517	0.001	mg/L	0.0500	<0.001	103	80-118			
4-Chlorotoluene	0.0538	0.001	mg/L	0.0500	<0.001	108	80-112			
Dibromochloromethane	0.0536	0.001	mg/L	0.0500	<0.001	107	80-117			
1,2-Dibromo-3-chloropropane	0.0484	0.001	mg/L	0.0500	<0.001	97	80-120			
1,2-Dibromoethane	0.0525	0.001	mg/L	0.0500	<0.001	105	80-110			
Dibromomethane	0.0516	0.001	mg/L	0.0500	<0.001	103	93-112			
1,2-Dichlorobenzene	0.0516	0.001	mg/L	0.0500	<0.001	103	80-112			
1,3-Dichlorobenzene	0.0523	0.001	mg/L	0.0500	<0.001	105	80-111			
1,4-Dichlorobenzene	0.0505	0.001	mg/L	0.0500	<0.001	101	80-110			
trans-1,4-Dichloro-2-butene	0.0659	0.001	mg/L	0.0500	<0.001	132	80-122			MSH

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
Matrix Spike (B209112-MS1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30 Analyzed: 03/02/12 11:52						
cis-1,4-Dichloro-2-butene	0.0738	0.001	mg/L		<0.001		65-120			MSH
Dichlorodifluoromethane	0.0392	0.001	mg/L	0.0500	<0.001	78	91-115			MSL
1,1-Dichloroethane	0.0500	0.001	mg/L	0.0500	<0.001	100	84-121			
1,2-Dichloroethane	0.0485	0.001	mg/L	0.0500	<0.001	97	81-120			
1,1-Dichloroethene	0.0467	0.001	mg/L	0.0500	<0.001	93	85-122			
cis-1,2-Dichloroethylene	0.0521	0.001	mg/L	0.0500	<0.001	104	82-121			
trans-1,2-Dichloroethylene	0.0497	0.001	mg/L	0.0500	<0.001	99	85-121			
1,2-Dichloropropane	0.0520	0.001	mg/L	0.0500	<0.001	104	94-116			
1,3-Dichloropropane	0.0501	0.001	mg/L	0.0500	<0.001	100	92-112			
2,2-Dichloropropane	0.0561	0.001	mg/L	0.0500	<0.001	112	78-113			
1,1-Dichloropropylene	0.0522	0.001	mg/L	0.0500	<0.001	104	87-120			
cis-1,3-Dichloropropylene	0.0563	0.001	mg/L	0.0500	<0.001	113	80-116			
trans-1,3-Dichloropropylene	0.0562	0.001	mg/L	0.0500	<0.001	112	80-117			
Ethylbenzene	0.0528	0.001	mg/L	0.0500	<0.001	106	80-115			
Ethyl Methacrylate	0.0578	0.001	mg/L	0.0500	<0.001	116	91-124			
Hexachlorobutadiene	0.0307	0.001	mg/L	0.0500	<0.001	61	80-120			MSL
Isopropylbenzene (Cumene)	0.0554	0.001	mg/L	0.0500	<0.001	111	80-118			
4-Isopropyltoluene	0.0565	0.001	mg/L	0.0500	<0.001	113	80-115			
Methacrylonitrile	0.0568	0.001	mg/L	0.0500	<0.001	114	72-124			
Methyl Butyl Ketone (2-Hexanone)	0.0565	0.001	mg/L	0.0500	<0.001	113	83-123			
Acetonitrile	0.0473	0.001	mg/L	0.0500	<0.001	95	70-130			
Methyl Ethyl Ketone (2-Butanone)	0.0580	0.001	mg/L	0.0500	<0.001	116	67-128			
Methyl Iodide	0.0478	0.001	mg/L	0.0500	<0.001	96	87-131			
Methyl Isobutyl Ketone	0.0587	0.001	mg/L	0.0500	<0.001	117	90-118			
Methyl Methacrylate	0.0584	0.001	mg/L	0.0500	<0.001	117	91-122			
Methyl-tert-Butyl Ether	0.0531	0.001	mg/L	0.0500	<0.001	106	82-122			
Methylene Chloride	0.0483	0.001	mg/L	0.0500	<0.001	97	81-122			
Naphthalene	0.0304	0.001	mg/L	0.0500	<0.001	61	80-130			MSL
Propylbenzene	0.0560	0.001	mg/L	0.0500	<0.001	112	80-118			
Styrene	0.0595	0.001	mg/L	0.0500	<0.001	119	80-114			MSH
1,1,1,2-Tetrachloroethane	0.0521	0.001	mg/L	0.0500	<0.001	104	80-114			
1,1,2,2-Tetrachloroethane	0.0534	0.001	mg/L	0.0500	<0.001	107	90-112			
Toluene	0.0784	0.001	mg/L	0.0500	0.0256	106	80-114			
1,2,3-Trichlorobenzene	0.0244	0.001	mg/L	0.0500	<0.001	49	80-130			MSL
1,2,4-Trichlorobenzene	0.0377	0.001	mg/L	0.0500	<0.001	75	80-120			MSL
1,1,1-Trichloroethane	0.0488	0.001	mg/L	0.0500	<0.001	98	84-119			
1,1,2-Trichloroethane	0.0520	0.001	mg/L	0.0500	<0.001	104	93-117			
Trichlorofluoromethane	0.0464	0.001	mg/L	0.0500	<0.001	93	80-120			

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
Matrix Spike (B209112-MS1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30		Analyzed: 03/02/12 11:52				
1,2,3-Trichloropropane	0.0556	0.001	mg/L	0.0500	<0.001	111	91-120			
1,2,4-Trimethylbenzene	0.0536	0.001	mg/L	0.0500	<0.001	107	80-120			
1,3,5-Trimethylbenzene	0.0539	0.001	mg/L	0.0500	<0.001	108	80-120			
Vinyl acetate	0.0560	0.001	mg/L	0.0500	<0.001	112	63-108			MSH
Vinyl chloride	0.0418	0.001	mg/L	0.0500	<0.001	84	89-116			MSL
m,p-Xylenes	0.109	0.001	mg/L	0.100	<0.001	109	87-126			
o-Xylene	0.0546	0.001	mg/L	0.0500	<0.001	109	80-116			
Surrogate: Toluene-d8	*0.0566*		*mg/L*	*0.0500*		*113*	*76-138*			
Surrogate: 4-Bromofluorobenzene	*0.0552*		*mg/L*	*0.0500*		*110*	*79-125*			
Surrogate: Dibromofluoromethane	*0.0520*		*mg/L*	*0.0500*		*104*	*88-134*			
Matrix Spike Dup (B209112-MSD1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30		Analyzed: 03/02/12 12:21				
Acetone	0.0504	0.001	mg/L	0.0500	0.0155	70	75-129	19	20	MSDL
Acrolein	0.0522	0.001	mg/L	0.0500	<0.001	104	73-110	11	20	
Acrylonitrile	0.0507	0.001	mg/L	0.0500	<0.001	101	81-124	10	20	
Allyl Chloride (3-Chloropropylene)	0.0512	0.001	mg/L	0.0500	<0.001	102	89-115	4	20	
Benzene	0.0507	0.001	mg/L	0.0500	<0.001	101	89-117	0.9	20	
Bromobenzene	0.0527	0.001	mg/L	0.0500	<0.001	105	80-115	0.4	20	
Bromochloromethane	0.0507	0.001	mg/L	0.0500	<0.001	101	86-116	0.6	20	
Tetrachloroethene	0.0512	0.001	mg/L	0.0500	<0.001	102	81-155	0.6	20	
Bromodichloromethane	0.0509	0.001	mg/L	0.0500	<0.001	102	80-107	1	20	
Bromoform	0.0523	0.001	mg/L	0.0500	<0.001	105	80-110	3	20	
Bromomethane	0.0480	0.001	mg/L	0.0500	<0.001	96	82-163	6	20	
Trichloroethene	0.0506	0.001	mg/L	0.0500	<0.001	101	80-115	0.1	20	
Butylbenzene	0.0537	0.001	mg/L	0.0500	<0.001	107	91-115	1	20	
sec-Butylbenzene	0.0558	0.001	mg/L	0.0500	<0.001	112	80-121	2	20	
tert-Butylbenzene	0.0554	0.001	mg/L	0.0500	<0.001	111	80-121	2	20	
Carbon disulfide	0.0503	0.001	mg/L	0.0500	<0.001	101	85-116	2	20	
Carbon Tetrachloride	0.0494	0.001	mg/L	0.0500	<0.001	99	88-127	1	20	
Chlorobenzene	0.0517	0.001	mg/L	0.0500	<0.001	103	80-111	0.9	20	
Chloroethane	0.0511	0.001	mg/L	0.0500	<0.001	102	87-111	3	20	
2-Chloroethyl Vinyl Ether	<0.001	0.001	mg/L	0.0500	<0.001		91-108		20	MSDL
Chloroform	0.0500	0.001	mg/L	0.0500	<0.001	100	84-118	0.4	20	
Chloromethane	0.0493	0.001	mg/L	0.0500	<0.001	99	90-110	4	20	
2-Chlorotoluene	0.0516	0.001	mg/L	0.0500	<0.001	103	80-118	0.3	20	
4-Chlorotoluene	0.0530	0.001	mg/L	0.0500	<0.001	106	80-112	1	20	
Dibromochloromethane	0.0530	0.001	mg/L	0.0500	<0.001	106	80-117	1	20	
1,2-Dibromo-3-chloropropane	0.0534	0.001	mg/L	0.0500	<0.001	107	80-120	10	20	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
Matrix Spike Dup (B209112-MSD1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30		Analyzed: 03/02/12 12:21				
1,2-Dibromoethane	0.0512	0.001	mg/L	0.0500	<0.001	102	80-110	2	20	
Dibromomethane	0.0502	0.001	mg/L	0.0500	<0.001	100	93-112	3	20	
1,2-Dichlorobenzene	0.0518	0.001	mg/L	0.0500	<0.001	104	80-112	0.4	20	
1,3-Dichlorobenzene	0.0526	0.001	mg/L	0.0500	<0.001	105	80-111	0.7	20	
1,4-Dichlorobenzene	0.0508	0.001	mg/L	0.0500	<0.001	102	80-110	0.6	20	
trans-1,4-Dichloro-2-butene	0.0617	0.001	mg/L	0.0500	<0.001	123	80-122	7	20	MSDH
cis-1,4-Dichloro-2-butene	0.0675	0.001	mg/L		<0.001		65-120	9	20	MSDH
Dichlorodifluoromethane	0.0408	0.001	mg/L	0.0500	<0.001	82	91-115	4	20	MSDL
1,1-Dichloroethane	0.0504	0.001	mg/L	0.0500	<0.001	101	84-121	0.7	20	
1,2-Dichloroethane	0.0475	0.001	mg/L	0.0500	<0.001	95	81-120	2	20	
1,1-Dichloroethene	0.0466	0.001	mg/L	0.0500	<0.001	93	85-122	0.2	20	
cis-1,2-Dichloroethylene	0.0524	0.001	mg/L	0.0500	<0.001	105	82-121	0.6	20	
trans-1,2-Dichloroethylene	0.0500	0.001	mg/L	0.0500	<0.001	100	85-121	0.6	20	
1,2-Dichloropropane	0.0519	0.001	mg/L	0.0500	<0.001	104	94-116	0.06	20	
1,3-Dichloropropane	0.0500	0.001	mg/L	0.0500	<0.001	100	92-112	0.2	20	
2,2-Dichloropropane	0.0551	0.001	mg/L	0.0500	<0.001	110	78-113	2	20	
1,1-Dichloropropylene	0.0527	0.001	mg/L	0.0500	<0.001	105	87-120	0.9	20	
cis-1,3-Dichloropropylene	0.0554	0.001	mg/L	0.0500	<0.001	111	80-116	2	20	
trans-1,3-Dichloropropylene	0.0561	0.001	mg/L	0.0500	<0.001	112	80-117	0.05	20	
Ethylbenzene	0.0521	0.001	mg/L	0.0500	<0.001	104	80-115	1	20	
Ethyl Methacrylate	0.0562	0.001	mg/L	0.0500	<0.001	112	91-124	3	20	
Hexachlorobutadiene	0.0575	0.001	mg/L	0.0500	<0.001	115	80-120	61	20	MSDH
Isopropylbenzene (Cumene)	0.0554	0.001	mg/L	0.0500	<0.001	111	80-118	0.07	20	
4-Isopropyltoluene	0.0560	0.001	mg/L	0.0500	<0.001	112	80-115	1	20	
Methacrylonitrile	0.0535	0.001	mg/L	0.0500	<0.001	107	72-124	6	20	
Methyl Butyl Ketone (2-Hexanone)	0.0547	0.001	mg/L	0.0500	<0.001	109	83-123	3	20	
Acetonitrile	0.0503	0.001	mg/L	0.0500	<0.001	101	70-130	6	20	
Methyl Ethyl Ketone (2-Butanone)	0.0572	0.001	mg/L	0.0500	<0.001	114	67-128	1	20	
Methyl Iodide	0.0488	0.001	mg/L	0.0500	<0.001	97	87-131	2	20	
Methyl Isobutyl Ketone	0.0564	0.001	mg/L	0.0500	<0.001	113	90-118	4	20	
Methyl Methacrylate	0.0562	0.001	mg/L	0.0500	<0.001	112	91-122	4	20	
Methyl-tert-Butyl Ether	0.0530	0.001	mg/L	0.0500	<0.001	106	82-122	0.2	20	
Methylene Chloride	0.0480	0.001	mg/L	0.0500	<0.001	96	81-122	0.7	20	
Naphthalene	0.0677	0.001	mg/L	0.0500	<0.001	135	80-130	76	20	MSDH
Propylbenzene	0.0553	0.001	mg/L	0.0500	<0.001	111	80-118	1	20	
Styrene	0.0597	0.001	mg/L	0.0500	<0.001	119	80-114	0.3	20	
1,1,1,2-Tetrachloroethane	0.0519	0.001	mg/L	0.0500	<0.001	104	80-114	0.5	20	
1,1,2,2-Tetrachloroethane	0.0529	0.001	mg/L	0.0500	<0.001	106	90-112	1	20	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B209112 - 5030B										
Matrix Spike Dup (B209112-MSD1)		**Source: 1203011-01**		Prepared: 03/02/12 08:30		Analyzed: 03/02/12 12:21				
Toluene	0.0813	0.001	mg/L	0.0500	0.0256	111	80-114	4	20	
1,2,3-Trichlorobenzene	0.0593	0.001	mg/L	0.0500	<0.001	119	80-130	83	20	MSDH
1,2,4-Trichlorobenzene	0.0556	0.001	mg/L	0.0500	<0.001	111	80-120	38	20	MSDH
1,1,1-Trichloroethane	0.0486	0.001	mg/L	0.0500	<0.001	97	84-119	0.6	20	
1,1,2-Trichloroethane	0.0508	0.001	mg/L	0.0500	<0.001	102	93-117	2	20	
Trichlorofluoromethane	0.0467	0.001	mg/L	0.0500	<0.001	93	80-120	0.6	20	
1,2,3-Trichloropropane	0.0541	0.001	mg/L	0.0500	<0.001	108	91-120	3	20	
1,2,4-Trimethylbenzene	0.0533	0.001	mg/L	0.0500	<0.001	107	80-120	0.5	20	
1,3,5-Trimethylbenzene	0.0535	0.001	mg/L	0.0500	<0.001	107	80-120	0.7	20	
Vinyl acetate	0.0558	0.001	mg/L	0.0500	<0.001	112	63-108	0.3	20	MSDH
Vinyl chloride	0.0429	0.001	mg/L	0.0500	<0.001	86	89-116	3	20	MSDL
m,p-Xylenes	0.108	0.001	mg/L	0.100	<0.001	108	87-126	0.6	20	
o-Xylene	0.0552	0.001	mg/L	0.0500	<0.001	110	80-116	1	20	
Surrogate: Toluene-d8	*0.0563*		*mg/L*	*0.0500*		*113*	*76-138*			
Surrogate: 4-Bromofluorobenzene	*0.0550*		*mg/L*	*0.0500*		*110*	*79-125*			
Surrogate: Dibromofluoromethane	*0.0519*		*mg/L*	*0.0500*		*104*	*88-134*			

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

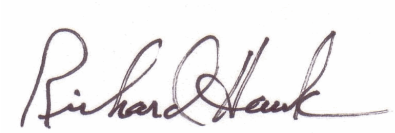
Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

MSL	MS recovery is outside QC limits, the results may have a slight low bias due to possible matrix interferences.
MSH	MS recovery is outside QC limits, the results may have a slight high bias due to possible matrix interferences.
MSDL	MSD recovery is outside QC limits, the results may have a slight low bias due to possible matrix interferences.
MSDH	MSD recovery is outside QC limits, the results may have a slight high bias due to possible matrix interferences.
LCSL	LCS recovery is outside QC limits, the results may have a slight low bias.
LCSH	LCS recovery is outside QC limits, the results may have a slight high bias.
LCSDL	LCSD recovery is outside QC limits, the results may have a slight low bias.
LCSDH	LCSD recovery is outside QC limits, the results may have a slight high bias.
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level

Test Methods: Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For



Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY Camp Stanley	COMPANY Same	REPORT NUMBER 1203011
ADDRESS 25800 Ralph Fair Rd	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Environmental PHONE # 210-295-7320	ATTN: PHONE #	E-MAIL william.scott.pearson@parsons.com

PROJECT NAME/LOCATION/SITE

PROJECT NO.

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☐ Next Business Day ☒ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS: Verbal reporting to Gabe Moreno 295-7320 or Julie Bench 210-374-0809

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO

PROPER CONTAINERS ☒ YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS _____

SAMPLED BY JNB/FWR

TEMP. ON RECPT. 0.2°C

COND. OF SAMPLE Iced

ANALYSIS REQUESTED

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	MATRIX: LIQUID	MATRIX: PAINT CHIPS	MATRIX: OIL	MATRIX: SOLID	MATRIX: SLUDGE	MATRIX: OTHER	SAMPLING METHOD: COMPOSITE	SAMPLING METHOD: GRAB	SAMPLING METHOD: CORE	SAMPLING METHOD: OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP/ SPLP)	VOC / (8260 / 624 / TCLP/ SPLP)	Cd / Cr / Pb - ToT / TCLP / SPLP	RT. MINERALS	CBL	PRESERVED WITH: HCl	PRESERVED WITH: HNO3	PRESERVED WITH: NaOH	PRESERVED WITH: H2SO4	PRESERVED WITH: NaOH+ZN	PRESERVED WITH: MeOH	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	3-1-12	1910		X							X			TW-2 (1910)	4	40mL				X						X							Report to 1 ppb
2	3-1-12	1910		X							X			TW-2 (1910)	2	100mL						X							X				
3	3-1-12	2330		X							X			TW-2 (2330)	4	40mL				X						X							Report to 1 ppb
4	3-1-12	2330		X							X			TW-2 (2330)	2	100mL						X							X				

03-02-12 07:54 IN

*These samples are not for compliance purposes

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (PRINT NAME) Julie Bench		RECEIVED BY (PRINT NAME) SANDRA Felix	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT hand		TO BE SENT OUT ☐ YES ☒ NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES ☒ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley — Report Number: 1203011

Project Name: — Date Received: 3-2-12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☑Hand Delivered ☐DHL ☐SATL ☐Other — Date Due: 3-2-12

Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A] — Same Day

	Yes	No	NA	If NA–reason:
1. Custody Seals present?		✓		
2. Custody Seals intact?		✓		
3. Air Bill included in folder, if received?		✓		
4. Is COC included with samples?	✓			
5. Is COC signed and dated by client?	✓			
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)				Temp: 0.2 °C
7. Samples received with ice ☑ ice packs ☐ other cooling ☐				
8. Is the COC filled out correctly, and completely?	✓			
9. Information on the COC matches the samples?	✓			
10. Samples received within holding time?	✓			
11. Samples properly labeled?	✓			
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	✓			
13. Proper sample containers used?	✓			
14. All samples received intact, containers not damaged or leaking?	✓			
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	✓			
16. Sample volume sufficient for requested analysis?	✓			
17. Subcontracted Samples: [if Yes, complete the next section]		✓		

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: BT — Date: 3-2-12

Labeled By: _____ Date: _____

Logged into LIMS By: _____ Date: _____

Logged into RF By: _____ Date: _____

1610 S. Laredo Street, San Antonio, Texas 78207-7029 • (210) 229-9920 • Fax (210) 229-9921

VOCS, SVOCS, METALS, NATURAL
WATER QUALITY PARAMETERS, AND RADIONUCLIDES

AGRICULTURAL PRIORITY POLLUTANT LABORATORIES
MARCH 15, 2012
MAY 2, 2012

CAMP STANLEY STORAGE ACTIVITY
SUMMARY OF VALIDATED ANALYTICAL RESULTS FOR SUPPLY WELL CS-13
WATER SAMPLES COLLECTED IN MARCH AND MAY 2012

SAMPLE ID:		TW-2		TW-2*(Duplicate)		TW-2		TW-2*(Duplicate)		CS-13	
DATE SAMPLED:		3/15/2012		3/15/2012		3/15/2012		3/15/2012		5/2/2012	
LAB SAMPLE ID:		APPL: AY57079 Paragon: 1203225-1		APPL: AY57080		APPL: AY57294 Paragon: 1203225-2		Paragon: 1203225-3		APPL: AY60406	
SAMPLE COLLECTION TIME:		830		830		2330		2330		1530	
	Units										
Volatile Organics - SW8260B											
1,1,1,2-Tetrachloroethane	µg/L	0.090	U	0.090	U	0.090	U			0.090	U
1,1,1-Trichloroethane	µg/L	0.030	U	0.030	U	0.030	U			0.030	U
1,1,2,2-Tetrachloroethane	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
1,1,2-Trichloroethane	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
1,1-Dichloroethane	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
1,1-Dichloroethene	µg/L	0.12	U	0.12	U	0.12	U			0.12	U
1,1-Dichloropropene	µg/L	0.10	U	0.10	U	0.10	U			0.10	U
1,2,3-Trichlorobenzene	µg/L	0.24	U	0.24	U	0.24	U			0.24	U
1,2,3-Trichloropropane	µg/L	0.17	U	0.17	U	0.17	U			0.17	U
1,2,4-Trichlorobenzene	µg/L	0.16	U	0.16	U	0.16	U			0.16	U
1,2,4-Trimethylbenzene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
1,2-Dibromo-3-chloropropane	µg/L	0.76	U	0.76	U	0.76	U			0.76	U
1,2-Dibromoethane (EDB)	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
1,2-Dichlorobenzene	µg/L	0.020	U	0.020	U	0.020	U			0.020	U
1,2-Dichloroethane	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
1,2-Dichloropropane	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
1,3,5-Trimethylbenzene (Mesitylene)	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
1,3-Dichlorobenzene	µg/L	0.030	U	0.030	U	0.030	U			0.030	U
1,3-Dichloropropane	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
1,4-Dichlorobenzene	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
1-Chlorohexane	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
2,2-Dichloropropane	µg/L	0.10	U	0.10	U	0.10	U			0.10	U
2-Chlorotoluene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
4-Chlorotoluene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
Benzene	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
Bromobenzene	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Bromochloromethane	µg/L	0.11	U	0.11	U	0.11	U			0.11	U
Bromodichloromethane	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Bromoform	µg/L	0.13	U	0.13	U	0.13	U			0.13	U
Bromomethane	µg/L	0.080	U	0.080	U	0.080	U			0.080	U
Carbon tetrachloride	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Chlorobenzene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
Chloroethane	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
Chloroform	µg/L	**0.37**		**0.35**		**0.21**	F			**3.5**	
Chloromethane	µg/L	0.16	U	0.16	U	0.16	U			0.16	U
cis-1,2-Dichloroethene	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
cis-1,3-Dichloropropene	µg/L	0.030	U	0.030	U	0.030	U			0.030	U
Dibromochloromethane	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Dibromomethane	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Dichlorodifluoromethane	µg/L	0.11	U	0.11	U	0.11	U			0.11	U
Ethylbenzene	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
Hexachlorobutadiene	µg/L	0.17	U	0.17	U	0.17	U			0.17	U
Isopropylbenzene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
m,p-Xylene	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
Methylene chloride	µg/L	0.35	U	0.35	U	0.35	U			0.35	U
Naphthalene	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
n-Butylbenzene	µg/L	0.17	U	0.17	U	0.17	U			0.17	U
n-Propylbenzene	µg/L	0.030	U	0.030	U	0.030	U			0.030	U
o-Xylene	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
p-Cymene (p-Isopropyltoluene)	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
sec-Butylbenzene	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
Styrene	µg/L	0.080	U	0.080	U	0.080	U			0.080	U
tert-Butylbenzene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
Tetrachloroethene (PCE)	µg/L	0.060	U	0.060	U	0.060	U			0.060	U
Toluene	µg/L	**2.3**		**2.3**		**1.6**				**3.6**	
trans-1,2-Dichloroethene	µg/L	0.080	U	0.080	U	0.080	U			0.080	U
trans-1,3-Dichloropropene	µg/L	0.040	U	0.040	U	0.040	U			0.040	U
Trichloroethene (TCE)	µg/L	0.050	U	0.050	U	0.050	U			0.050	U
Trichlorofluoromethane	µg/L	0.070	U	0.070	U	0.070	U			0.070	U
Vinyl chloride	µg/L	0.080	U	0.080	U	0.080	U			0.080	U

CAMP STANLEY STORAGE ACTIVITY
SUMMARY OF VALIDATED ANALYTICAL RESULTS FOR SUPPLY WELL CS-13
WATER SAMPLES COLLECTED IN MARCH AND MAY 2012

SAMPLE ID:		TW-2		TW-2*(Duplicate)		TW-2		TW-2*(Duplicate)		CS-13	
DATE SAMPLED:		3/15/2012		3/15/2012		3/15/2012		3/15/2012		5/2/2012	
LAB SAMPLE ID:		APPL: AY57079 Paragon: 1203225-1		APPL: AY57080		APPL: AY57294 Paragon: 1203225-2		Paragon: 1203225-3		APPL: AY60406	
SAMPLE COLLECTION TIME:		830		830		2330		2330		1530	
	Units										
Semi-Volatile Organics - SW8270C											
1,2,4-Trichlorobenzene	µg/L	1.5	U	1.5	U	1.5	U			1.5	U
1,2-Dichlorobenzene	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
1,3-Dichlorobenzene	µg/L	1.2	U	1.2	U	1.2	U			1.2	U
1,4-Dichlorobenzene	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
2,4,5-Trichlorophenol	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
2,4,6-Trichlorophenol	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
2,4-Dichlorophenol	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
2,4-Dimethylphenol	µg/L	1.2	U	1.2	U	1.2	U			1.2	U
2,4-Dinitrophenol	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
2,4-Dinitrotoluene	µg/L	1.7	U	1.7	U	1.7	U			1.7	U
2,6-Dinitrotoluene	µg/L	2.1	U	2.1	U	2.1	U			2.1	U
2-Chloronaphthalene	µg/L	2.0	U	2.0	U	2.0	U			2.0	U
2-Chlorophenol	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
2-Methyl-4,6-dinitrophenol	µg/L	2.0	U	2.0	U	2.0	U			2.0	U
2-Methylnaphthalene	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
2-Methylphenol	µg/L	1.4	U	1.4	U	1.4	U			1.4	U
2-Nitroaniline	µg/L	2.0	U	2.0	U	2.0	U			2.0	U
2-Nitrophenol	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
3,3'-Dichlorobenzidine	µg/L	2.6	U	2.6	U	2.6	U			2.6	U
3-Nitroaniline	µg/L	2.4	U	2.4	U	2.4	U			2.4	U
4-Bromophenyl phenyl ether	µg/L	2.0	U	2.0	U	2.0	U			2.0	U
4-Chloro-3-methyl phenol	µg/L	1.4	U	1.4	U	1.4	U			1.4	U
4-Chloroaniline	µg/L	3.0	U	3.0	U	3.0	U			3.0	U
4-Chlorophenyl phenyl ether	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
4-Methylphenol (p-cresol)	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
4-Nitroaniline	µg/L	2.4	U	2.4	U	2.4	U			2.4	U
4-Nitrophenol	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
Acenaphthene	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
Acenaphthylene	µg/L	1.4	U	1.4	U	1.4	U			1.4	U
Anthracene	µg/L	2.2	U	2.2	U	2.2	U			2.2	U
Benzo(a)anthracene	µg/L	1.7	U	1.7	U	1.7	U			1.7	U
Benzo(a)pyrene	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
Benzo(b)fluoranthene	µg/L	3.1	U	3.1	U	3.1	U			3.1	U
Benzo(g,h,i)perylene	µg/L	2.5	U	2.5	U	2.5	U			2.5	U
Benzoic acid	µg/L	2.4	U	2.4	U	2.4	U			2.4	U
Benzyl alcohol	µg/L	1.2	U	1.2	U	1.2	U			1.2	U
Benzyl butyl phthalate	µg/L	1.7	U	1.7	U	1.7	U			1.7	U
bis(2-Chloroethoxy)methane	µg/L	1.3	U	1.3	U	1.3	U			1.3	U
bis(2-Chloroethyl)ether	µg/L	1.4	U	1.4	U	1.4	U			1.4	U
bis(2-Chloroisopropyl)ether	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
bis(2-Ethylhexyl) phthalate	µg/L	1.7	U	1.7	U	1.7	U			1.7	U
Chrysene	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
Dibenzo(a,h)anthracene	µg/L	2.5	U	2.5	U	2.5	U			2.5	U
Dibenzofuran	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
Diethyl phthalate	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
Dimethyl phthalate	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
Di-n-butyl phthalate	µg/L	2.2	U	2.2	U	2.2	U			2.2	U
Di-n-octyl phthalate	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
Fluoranthene	µg/L	2.3	U	2.3	U	2.3	U			2.3	U
Fluorene	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
Hexachlorobenzene	µg/L	1.8	U	1.8	U	1.8	U			1.8	U
Hexachlorobutadiene	µg/L	1.7	U	1.7	U	1.7	U			1.7	U
Hexachlorocyclopentadiene	µg/L	1.1	U	1.1	U	1.1	U			1.1	U
Hexachloroethane	µg/L	1.5	U	1.5	U	1.5	U			1.5	U
Indeno(1,2,3-cd)pyrene	µg/L	2.4	U	2.4	U	2.4	U			2.4	U
Isophorone	µg/L	1.3	U	1.3	U	1.3	U			1.3	U
Naphthalene	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
Nitrobenzene	µg/L	1.6	U	1.6	U	1.6	U			1.6	U
n-Nitrosodi-n-propylamine	µg/L	1.9	U	1.9	U	1.9	U			1.9	U
n-Nitrosodiphenylamine	µg/L	5.2	U	5.2	U	5.2	U			5.2	U
Pentachlorophenol	µg/L	2.7	U	2.7	U	2.7	U			2.7	U
Phenanthrene	µg/L	2.0	U	2.0	U	2.0	U			2.0	U
Phenol	µg/L	0.79	U	0.79	U	0.79	U			0.79	U
Pyrene	µg/L	1.5	U	1.5	U	1.5	U			1.5	U

CAMP STANLEY STORAGE ACTIVITY
SUMMARY OF VALIDATED ANALYTICAL RESULTS FOR SUPPLY WELL CS-13
WATER SAMPLES COLLECTED IN MARCH AND MAY 2012

SAMPLE ID:		TW-2		TW-2*(Duplicate)		TW-2		TW-2*(Duplicate)		CS-13	
DATE SAMPLED:		3/15/2012		3/15/2012		3/15/2012		3/15/2012		5/2/2012	
LAB SAMPLE ID:		APPL: AY57079 Paragon: 1203225-1		APPL: AY57080		APPL: AY57294 Paragon: 1203225-2		Paragon: 1203225-3		APPL: AY60406	
SAMPLE COLLECTION TIME:		830		830		2330		2330		1530	
	Units										
Total Metals - SW6010B/SW7470A											
Aluminum	mg/L	0.020	U	0.020	U	0.020	U			**0.19**	F
Arsenic	mg/L	**0.0036**	F	0.00020	U	**0.0013**	F			**0.0082**	F
Barium	mg/L	**0.032**		**0.032**		**0.034**				**0.032**	
Cadmium	mg/L	0.00050	U	0.00050	U	0.00050	U			0.00050	U
Calcium	mg/L	**70**		**72**		**78**				**63**	
Chromium	mg/L	0.0010	U	0.0010	U	0.0010	U			0.0010	U
Copper	mg/L	**0.0050**	F	**0.0050**	F	**0.0050**	F			0.0030	U
Iron	mg/L	0.030	U	0.030	U	0.030	U			**0.15**	F
Lead	mg/L	**0.010**	F	**0.010**	F	**0.0050**	F			0.0019	U
Magnesium	mg/L	**44**		**44**		**49**				**43**	
Manganese	mg/L	0.0010	U	0.0010	U	0.0010	U			**0.0060**	
Mercury	mg/L	0.00010	U	0.00010	U	0.00010	U			0.00010	U
Nickel	mg/L	**0.011**		**0.010**		**0.0080**	F			**0.0090**	F
Phosphorus	mg/L	**0.20**	B	**0.16**	B	**0.22**				**0.17**	B
Potassium	mg/L	**5.2**		**5.3**		**6.0**				**5.3**	
Sodium	mg/L	**18**		**19**		**19**				**17**	
Zinc	mg/L	**0.12**		**0.12**		**0.11**				**0.34**	
Hardness - A2340B											
Hardness (As CaCO3)	mg/L	**360**		**360**		**400**				**330**	
Alkalinity - A2320											
Alkalinity, Bicarbonate	mg/L	**267**		**266**		**270**				**274**	
Alkalinity, Carbonate	mg/L	0.85	U	0.85	U	0.85	U			0.85	U
Alkalinity, Total	mg/L	**267**		**266**		**270**				**274**	
Total Dissolved Solids - E 160.1											
Total Dissolved Solids	mg/L	**385**		**387**		**403**				**407**	
Anion Chromatography - SW9056											
Bromide	mg/L	**0.38**	F	0.070	U	**0.29**	F			0.070	U
Chloride	mg/L	**15**		**15**		**15**				**16**	
Fluoride	mg/L	**1.2**		**1.2**		**1.2**				**1.2**	
Nitrogen, Nitrate (as N)	mg/L	**0.93**		**0.79**	F	**0.87**				**4.3**	
Nitrogen, Nitrite	mg/L	0.040	U	0.040	U	0.040	U			0.040	U
Orthophosphate (as P)	mg/L	0.070	U	0.070	U	0.070	U			0.070	U
Sulfate (as SO4)	mg/L	**71**		**81**		**77**				**81**	
Radionuclides - SW900/SW904.0											
Gross Alpha	PCI/L	**1.9 +/- 1.2**	LT			**3.0 +/- 1.7**	LT	**2.2 +/- 1.3**			LT
Gross Beta	PCI/L	**6.9 +/- 1.9**				**5.7 +/- 18**		**4.5 +/- 1.7**			
Radium-228	PCI/L	0.23 +/- 0.35	U			0.25 +/- 0.36	U	-0.18 +/- 0.35	U		
pH - E150.1											
pH	pH units	**7.5**		**7.7**		**7.8**				**7.3**	

QA NOTES AND DATA QUALIFIERS:

(NO CODE) - Confirmed identification.
U - Analyte was not detected above the indicated Method Detection Limit (MDL). For Radionuclides: Analyte was not detected above the sample specific Minimum Detectable Concentration (MDC).
F - Analyte was positively identified, but the quantitation is an estimation above the MDL and below the Reporting Limit (RL).
B - Blank contamination: The analyte was found in an associated blank above one half the RL, as well as in the sample.
LT - Result is less than the Requested MDC, greater than the sample specific MDC.
Detections are bolded.
* - Field duplicate of sample on left.

APPENDIX E

BACTERIOLOGICAL TESTING RESULTS

SAN ANTONIO TESTING LABORATORY

TOTAL COLIFORM, FECAL COLIFORM, E. COLI
MARCH 1, 2012

SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (1910)

Sampling Method: Grab

Lab Sample ID #: 1203011-01

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 19:10

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 03/02/12 11:05/End 03/03/12 11:20			SM9222D	SM	
Volatile Organic Compounds by GC/MS									
Acetone *	0.016	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Acrolein *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Acrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Allyl Chloride (3-Chloropropylene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Benzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Tetrachloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromodichloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromoform *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Bromomethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Trichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
sec-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
tert-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Carbon disulfide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Carbon Tetrachloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
2-Chloroethyl Vinyl Ether *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloroform *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Chloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
2-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
4-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dibromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dibromo-3-chloropropane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dibromoethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dibromomethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,2-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,3-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,4-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
trans-1,4-Dichloro-2-butene *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 10:55	8260B	HH	
cis-1,4-Dichloro-2-butene	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
Dichlorodifluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	
1,1-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 10:55	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Sample ID #: TW-2 (2330)

Sampling Method: Grab

Lab Sample ID #: 1203011-02

Sample Matrix: Liquid

Date/Time Collected: 03/01/12 23:30

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/02/12 11:05/End 03/03/12 11:20			SM9223	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 03/02/12 11:05/End 03/03/12 11:20			SM9222D	SM	
Volatile Organic Compounds by GC/MS									
Acetone *	0.011	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Acrolein *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Acrylonitrile *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Allyl Chloride (3-Chloropropylene) *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Benzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromochloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Tetrachloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromodichloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromoform *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Bromomethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Trichloroethene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
sec-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
tert-Butylbenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Carbon disulfide *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Carbon Tetrachloride *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
2-Chloroethyl Vinyl Ether *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloroform *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Chloromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
2-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
4-Chlorotoluene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dibromochloromethane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dibromo-3-chloropropane *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dibromoethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dibromomethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,2-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,3-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,4-Dichlorobenzene *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
trans-1,4-Dichloro-2-butene *	<0.005	mg/L	0.005	5030B	B209112	03/02/12 11:24	8260B	HH	
cis-1,4-Dichloro-2-butene	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
Dichlorodifluoromethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	
1,1-Dichloroethane *	<0.001	mg/L	0.001	5030B	B209112	03/02/12 11:24	8260B	HH	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209124 - NO PREP									
Blank (B209124-BLK1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B209124-BS1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B209125 - NO PREP									
Blank (B209125-BLK1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B209125-BS1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B209125-BSD1)				Prepared: 03/02/12 11:05 Analyzed: 03/03/12 11:20					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B209112 - 5030B									
Blank (B209112-BLK1)				Prepared: 03/02/12 08:30 Analyzed: 03/02/12 10:24					
Acetone	<0.001	0.001	mg/L						
Acrolein	<0.001	0.001	mg/L						
Acrylonitrile	<0.001	0.001	mg/L						
Allyl Chloride (3-Chloropropylene)	<0.001	0.001	mg/L						
Benzene	<0.001	0.001	mg/L						
Bromobenzene	<0.001	0.001	mg/L						
Bromochloromethane	<0.001	0.001	mg/L						
Tetrachloroethene	<0.001	0.001	mg/L						
Bromodichloromethane	<0.001	0.001	mg/L						
Bromoform	<0.001	0.001	mg/L						
Bromomethane	<0.001	0.001	mg/L						
Trichloroethene	<0.001	0.001	mg/L						
Butylbenzene	<0.001	0.001	mg/L						

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: TW-2 (1910), (2330)

Project Number: [none]
Project Manager: Brenda

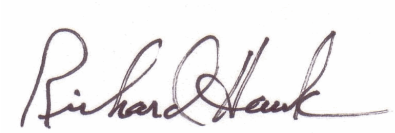
Reported:
03/05/12 11:01
Received:
03/02/12 07:54

Report No. 1203011

MSL	MS recovery is outside QC limits, the results may have a slight low bias due to possible matrix interferences.
MSH	MS recovery is outside QC limits, the results may have a slight high bias due to possible matrix interferences.
MSDL	MSD recovery is outside QC limits, the results may have a slight low bias due to possible matrix interferences.
MSDH	MSD recovery is outside QC limits, the results may have a slight high bias due to possible matrix interferences.
LCSL	LCS recovery is outside QC limits, the results may have a slight low bias.
LCSH	LCS recovery is outside QC limits, the results may have a slight high bias.
LCSDL	LCSD recovery is outside QC limits, the results may have a slight low bias.
LCSDH	LCSD recovery is outside QC limits, the results may have a slight high bias.
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level

Test Methods: Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For



Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY Camp Stanley	COMPANY Same	REPORT NUMBER 1203011
ADDRESS 25800 Ralph Fair Rd	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Environmental PHONE # 210-295-7320	ATTN: PHONE #	E-MAIL william.scott.pearson@parsons.com

PROJECT NAME/LOCATION/SITE

PROJECT NO.

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☐ Next Business Day ☒ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS: Verbal reporting to Gabe Moreno 295-7320 or Julie Bench 210-374-0809

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO

PROPER CONTAINERS ☒ YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS _____

SAMPLED BY JNB/FWR

TEMP. ON RECPT. 0.2°C

COND. OF SAMPLE Iced

ANALYSIS REQUESTED

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	MATRIX: LIQUID	MATRIX: PAINT CHIPS	MATRIX: OIL	MATRIX: SOLID	MATRIX: SLUDGE	MATRIX: OTHER	SAMPLING METHOD: COMPOSITE	SAMPLING METHOD: GRAB	SAMPLING METHOD: CORE	SAMPLING METHOD: OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP/ SPLP)	VOC / (8260 / 624 / TCLP/ SPLP)	Cd / Cr / Pb - ToT / TCLP / SPLP	RT. MINERALS	CBL	PRESERVED WITH: HCl	PRESERVED WITH: HNO3	PRESERVED WITH: NaOH	PRESERVED WITH: H2SO4	PRESERVED WITH: NaOH+ZN	PRESERVED WITH: MeOH	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	3-1-12	1910		X							X			TW-2 (1910)	4	40mL				X						X							Report to 1 ppb
2	3-1-12	1910		X							X			TW-2 (1910)	2	100mL						X							X				
3	3-1-12	2330		X							X			TW-2 (2330)	4	40mL				X						X							Report to 1 ppb
4	3-1-12	2330		X							X			TW-2 (2330)	2	100mL						X							X				

03-02-12 07:54 IN

*These samples are not for compliance purposes

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (PRINT NAME) Julie Bench		RECEIVED BY (PRINT NAME) SANDRA Felix	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT hand		TO BE SENT OUT ☐ YES ☒ NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES ☒ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley — Report Number: 1203011

Project Name: — Date Received: 3-2-12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☑Hand Delivered ☐DHL ☐SATL ☐Other — Date Due: 3-2-12

Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A] — Same Day

	Yes	No	NA	If NA–reason:
1. Custody Seals present?		✓		
2. Custody Seals intact?		✓		
3. Air Bill included in folder, if received?		✓		
4. Is COC included with samples?	✓			
5. Is COC signed and dated by client?	✓			
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)				Temp: 0.2 °C
7. Samples received with ice ☑ ice packs ☐ other cooling ☐				
8. Is the COC filled out correctly, and completely?	✓			
9. Information on the COC matches the samples?	✓			
10. Samples received within holding time?	✓			
11. Samples properly labeled?	✓			
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	✓			
13. Proper sample containers used?	✓			
14. All samples received intact, containers not damaged or leaking?	✓			
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	✓			
16. Sample volume sufficient for requested analysis?	✓			
17. Subcontracted Samples: [if Yes, complete the next section]		✓		

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: BT — Date: 3-2-12

Labeled By: _____ Date: _____

Logged into LIMS By: _____ Date: _____

Logged into RF By: _____ Date: _____

1610 S. Laredo Street, San Antonio, Texas 78207-7029 • (210) 229-9920 • Fax (210) 229-9921

TOTAL COLIFORM, FECAL COLIFORM, E. COLI
MARCH 15, 2012

SAN ANTONIO TESTING LABORATORY, INC.

NELAP ACCREDITED TNI LABORATORY

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA - TW-2 (0600)

Project Number: [none]
Project Manager: Env. Office

Reported:
03/20/12 12:53
Received:
03/15/12 07:35

Report No. 1203174

Sample ID #: TW-2 (0600)

Sampling Method: Grab

Lab Sample ID #: 1203174-01

Sample Matrix: Liquid

Date/Time Collected: 03/15/12 06:00

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/15/12 10:54/End 03/16/12 09:48			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/15/12 10:54/End 03/16/12 09:48			SM9223	SM	
Heterotrophic Plate Count	62.0	MPN/mL	1.00	Start 03/15/12 10:54/End 03/17/12 10:55			SimPlate	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 03/15/12 10:54/End 03/16/12 09:45			SM9222D	SM	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA - TW-2 (0600)

Project Number: [none]
Project Manager: Env. Office

Reported:
03/20/12 12:53
Received:
03/15/12 07:35

Report No. 1203174

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B211114 - NO PREP									
Blank (B211114-BLK1)				Prepared: 03/15/12 10:54 Analyzed: 03/16/12 09:48					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B211114-BS1)				Prepared: 03/15/12 10:54 Analyzed: 03/16/12 09:48					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B211115 - NO PREP									
Blank (B211115-BLK1)				Prepared: 03/15/12 10:54 Analyzed: 03/16/12 09:45					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B211115-BS1)				Prepared: 03/15/12 10:54 Analyzed: 03/16/12 09:45					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B211115-BSD1)				Prepared: 03/15/12 10:54 Analyzed: 03/16/12 09:45					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200
Batch B212031 - NO PREP									
Blank (B212031-BLK1)				Prepared: 03/15/12 10:54 Analyzed: 03/17/12 10:55					
Heterotrophic Plate Count	<1	1.00	MPN/mL						
Positive Control (B212031-BS1)				Prepared: 03/15/12 10:54 Analyzed: 03/17/12 10:55					
Heterotrophic Plate Count	>74	1.00	MPN/mL				0-200		

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA - TW-2 (0600)

Project Number: [none]
Project Manager: Env. Office

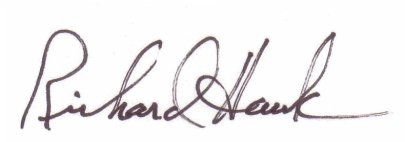
Reported:
03/20/12 12:53
Received:
03/15/12 07:35

Report No. 1203174

PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level

Test Methods Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For



Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY: Camp Stanley	COMPANY: Same	REPORT NUMBER: 1203174
ADDRESS: 25800 Ralph Fair Road	ADDRESS:	
CITY: Boerne STATE: TX ZIP: 78015	CITY: STATE: ZIP:	FAX #
ATTN: Environmental PHONE #: 210-295-7320	ATTN: PHONE #:	E-MAIL

PROJECT NAME/LOCATION/SITE: CSSA

PROJECT NO.:

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days (X) Next Business Day (X) SAME DAY WHEN POSSIBLE 8:30 3:57

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS: Verbal Reporting to Gabe Moreno 295-7320 or Julie Bosch 821 or 210-376-0809

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) (X) YES ☐ NO

PROPER CONTAINERS..... (X) YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS _____

SAMPLED BY: JDB/SP

TEMP. ON RECPT.: 18.0°C

COND. OF SAMPLE: Iced

SAMPLE NUMBER	COLLECTED: DATE	COLLECTED: TIME	MATRIX: DRINKING WATER	MATRIX: LIQUID	MATRIX: PAINT CHIPS	MATRIX: OIL	MATRIX: SOLID	MATRIX: SLUDGE	MATRIX: OTHER	SAMPLING METHOD: COMPOSITE	SAMPLING METHOD: GRAB	SAMPLING METHOD: CORE	SAMPLING METHOD: OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	ANALYSIS REQUESTED: BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP / SPLP)	VOC / (8260 / 624 / TCLP / SPLP)	Cd / Cr / Pb - TOT / TCLP / SPLP	RT. MINERALS	COLL. TC for MPC	PRESERVED WITH: HCl	HNO3	NaOH	H2SO4	NaOH+ZnAc	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	3/15/12	0600	X								X			TW-2 (0600)	3	100 ml							X								X	Not for Compliance Purposes

03-15-12 07:35 IN

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
[signature]	3-15-12	[signature]			
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME): SANDRA Felix	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT: hand		TO BE SENT OUT ☐ YES (X) NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES (X) NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley Report Number: 1203174

Project Name: Date Received: 3-15-12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☑Hand Delivered ☐DHL ☐SATL ☐Other Date Due: 3-16-12

Rush: ☐ Specify: ☐3-5 ☐2 ☒1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No	✓	NA		If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No	✓	NA		If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes		No		NA		Temp: 18.0 °C	
7. Samples received with ice ✓ ☐ ice packs ☐ other cooling ☐	Yes		No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No	✓	NA		If NA–reason:	
16. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
17. Subcontracted Samples: [if Yes, complete the next section]	Yes		No	✓	NA		If NA–reason:	

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

_____

_____

_____

Received By: BT Date: 3-15-12

Labeled By: ✓ Date: ✓

Logged into LIMS By: ✓ Date: ✓

Logged into RF By: _____ Date: _____

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SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA

Project Number: [none]
Project Manager: Brenda

Reported:
03/20/12 12:55
Received:
03/16/12 08:49

Report No. 1203188

Sample ID #: TW-2 (1130)

Sampling Method: Grab

Lab Sample ID #: 1203188-01

Sample Matrix: Liquid

Date/Time Collected: 03/15/12 11:30

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms	Found	F/NF		Start 03/16/12 09:39/End 03/17/12 10:00			SM9223	SM	
E. Coli	Not Found	F/NF		Start 03/16/12 09:39/End 03/17/12 10:00			SM9223	SM	
Heterotrophic Plate Count	74.0	MPN/mL	1.00	Start 03/16/12 09:39/End 03/18/12 10:01			SimPlate	SM	
Fecal Coliform *	1.00	CFU/100 ml	1.00	Start 03/16/12 09:39/End 03/17/12 10:00			SM9222D	SM	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA

Project Number: [none]
Project Manager: Brenda

Reported:
03/20/12 12:55
Received:
03/16/12 08:49

Report No. 1203188

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B212028 - NO PREP									
Blank (B212028-BLK1)				Prepared: 03/16/12 09:39 Analyzed: 03/17/12 10:00					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B212028-BS1)				Prepared: 03/16/12 09:39 Analyzed: 03/17/12 10:00					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B212029 - NO PREP									
Blank (B212029-BLK1)				Prepared: 03/16/12 09:39 Analyzed: 03/17/12 10:00					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B212029-BS1)				Prepared: 03/16/12 09:39 Analyzed: 03/17/12 10:00					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B212029-BSD1)				Prepared: 03/16/12 09:39 Analyzed: 03/17/12 10:00					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200
Batch B212030 - NO PREP									
Blank (B212030-BLK1)				Prepared: 03/16/12 09:39 Analyzed: 03/18/12 10:01					
Heterotrophic Plate Count	<1	1.00	MPN/mL						
Positive Control (B212030-BS1)				Prepared: 03/16/12 09:39 Analyzed: 03/18/12 10:01					
Heterotrophic Plate Count	>74	1.00	MPN/mL				0-200		

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: CSSA

Project Number: [none]
Project Manager: Brenda

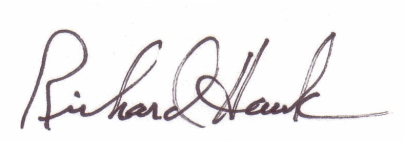
Reported:
03/20/12 12:55
Received:
03/16/12 08:49

Report No. 1203188

PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level

Test Methods Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For



Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY Camp Stanley	COMPANY SAME	REPORT NUMBER 1203189
ADDRESS 25800 Ralph Fair Road	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Environmental PHONE # 210-295-7320	ATTN: PHONE #	E-MAIL

PROJECT NAME/LOCATION/SITE: CSSA

PROJECT NO.:

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☒ Next Business Day ☐ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS: Verbal to Gabe Moreno (295-7320), Julie Bosin (376-0809)

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO
PROPER CONTAINERS ☐ YES ☐ NO
IF NO, SIGN HERE TO AUTHORIZE ANALYSIS _____

SAMPLED BY JDB/SP

TEMP. ON RECPT. ~~T.6~~ 2.7 °C

COND. OF SAMPLE Iced

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	LIQUID	PAINT CHIPS	OIL	SOLID	SLUDGE	OTHER	SAMPLING METHOD: COMPOSITE	GRAB	CORE	OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	ANALYSIS REQUESTED: BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP / SPLP)	VOC / (8260 / 624 / TCLP / SPLP)	Cd / Cr / Pb - ToT / TCLP / SPLP	RT. MINERALS	COLI TC FC HPC	PRESERVED WITH: HCl	H2SO4	NaOH	HNO3	NaHSO4	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	3/15/12	1130		X							X			TW-2 (1130)	3	100 ml							X								X	Not for Compliance Purposes

03-16-12 08:43 IN

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (PRINT NAME) Eric North		RECEIVED BY (PRINT NAME) Aimee Landon	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT Hand		TO BE SENT OUT ☐ YES ☐ NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES ☐ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley — Report Number: 1203188

Project Name: CSS1 — Date Received: 3/16/12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☒Hand Delivered ☐DHL ☐SATL ☐Other — Date Due: 3/19/13

Rush: ☐ Specify: ☐3-5 ☐2 ☒1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No		NA	✓	If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes		No	✓	NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 2.7 T-6#4 °C	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes		No	✓	NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes		No	✓	NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	NOVA Vials
16. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
17. Subcontracted Samples: [if Yes, complete the next section]	Yes		No		NA	✓	If NA–reason:	

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: [signature] Date: 3/16/12

Labeled By: _____ Date: _____

Logged into LIMS By: [signature] Date: [signature]

Logged into RF By: [signature] Date: [signature]

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TOTAL COLIFORM, FECAL COLIFORM, E. COLI
APRIL 30, 2012
MAY 1, 2012
MAY 2, 2012

SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/02/12 15:28
Received:
04/30/12 09:40

Report No. 1204367

Sample ID #: CS-13

Sampling Method: Grab

Lab Sample ID #: 1204367-01

Sample Matrix: Drinking Water

Date/Time Collected: 04/30/12 07:05

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms *	Not Found	F/NF		Start 04/30/12 10:36/End 05/01/12 10:54			SM9223	SM	
E. Coli *	Not Found	F/NF		Start 04/30/12 10:36/End 05/01/12 10:54			SM9223	SM	
Heterotrophic Plate Count *	74.0	MPN/mL	1.00	Start 04/30/12 10:36/End 05/02/12 10:38			SimPlate	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 04/30/12 10:36/End 05/01/12 10:54			SM9222D	SM	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/02/12 15:28
Received:
04/30/12 09:40

Report No. 1204367

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B218039 - NO PREP									
Blank (B218039-BLK1)				Prepared: 04/30/12 10:36 Analyzed: 05/01/12 10:54					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B218039-BS1)				Prepared: 04/30/12 10:36 Analyzed: 05/01/12 10:54					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B218040 - NO PREP									
Blank (B218040-BLK1)				Prepared: 04/30/12 10:36 Analyzed: 05/01/12 10:54					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B218040-BS1)				Prepared: 04/30/12 10:36 Analyzed: 05/01/12 10:54					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B218040-BSD1)				Prepared: 04/30/12 10:36 Analyzed: 05/01/12 10:54					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200
Batch B218065 - NO PREP									
Blank (B218065-BLK1)				Prepared: 04/30/12 10:36 Analyzed: 05/02/12 10:38					
Heterotrophic Plate Count	<1	1.00	MPN/mL						
Positive Control (B218065-BS1)				Prepared: 04/30/12 10:36 Analyzed: 05/02/12 10:38					
Heterotrophic Plate Count	>74	1.00	MPN/mL				0-200		

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

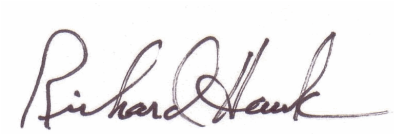
Reported:
05/02/12 15:28
Received:
04/30/12 09:40

Report No. 1204367

PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)

Test Methods: Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For



Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY CSSA	COMPANY SAME	REPORT NUMBER 1204367
ADDRESS 25800 Ralph Fair Rd	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Brenda Shirley PHONE # 295-7014	ATTN: Chet Gray PHONE # 295-7496	E-MAIL Shirleyb@cssamma.com

PROJECT NAME/LOCATION/SITE: Camp Stanley Storage Activity

PROJECT NO. 748402.02

SAMPLED BY SE

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☒ Next Business Day ☐ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS:

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO

PROPER CONTAINERS ☒ YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS Just Taken

TEMP. ON RECPT. 6.5C 1.6#4

COND. OF SAMPLE Iced

ANALYSIS REQUESTED

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	LIQUID	PAINT CHIPS	OIL	SOLID	SLUDGE	OTHER	SAMPLING METHOD: COMPOSITE	GRAB	CORE	OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP/ SPLP)	VOC / (8260 / 624 / TCLP/ SPLP)	Cd / Cr / Pb - ToT / TCLP / SPLP	RT. MINERALS (COL) TC (FC) HPC	PRESERVED WITH: HCL	HNO3	H2SO4	NaOH	NaOH ZnAc	HCL MeOH	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	4.30.12	0705	X								X			CS-13	2	200ml						X									X	

Client aware that lab will use less sample amount than method requires to complete all three tests.

04-30-12 09:40 IN

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
Samantha Elliott	4/30/12				
RELINQUISHED BY (PRINT NAME) Samantha Elliott	RECEIVED BY (PRINT NAME) Aimee Landon		RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)	RECEIVED BY (SIGNATURE)		METHOD OF SHIPMENT Hand		TO BE SENT OUT ☐ YES ☒ NO
RELINQUISHED BY (PRINT NAME)	RECEIVED BY (PRINT NAME)				CUSTODY SEAL IN PLACE & INTACT ☐ YES ☐ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley — Report Number: 1204367

Project Name: Camp Stanley Storage Activity — Date Received: 4/30/12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☒Hand Delivered ☑DHL ☐SATL ☐Other — Date Due: 5/1/12

Rush: ☐ Specify: ☐3-5 ☐2 ☒1

Items to be checked upon Receipt: [Yes, No, N/A]

	Yes	No	NA	If NA–reason:
1. Custody Seals present?			✓	
2. Custody Seals intact?				✓
3. Air Bill included in folder, if received?				✓
4. Is COC included with samples?	✓			
5. Is COC signed and dated by client?	✓			
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	✓			Temp: 0.5 °C T-6#4
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	✓			Just Taken
8. Is the COC filled out correctly, and completely?	✓			
9. Information on the COC matches the samples?	✓			
10. Samples received within holding time?	✓			
11. Samples properly labeled?	✓			
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	✓			
13. Proper sample containers used?	✓			
14. All samples received intact, containers not damaged or leaking?	✓			
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.				✓
16. Sample volume sufficient for requested analysis?		✓		
17. Subcontracted Samples: [if Yes, complete the next section]			✓	

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: [signature] Date: 4/30/12

Labeled By: _____ Date: _____

Logged into LIMS By: _____ Date: _____

Logged into RF By: _____ Date: _____

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SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/03/12 13:15
Received:
05/01/12 11:20

Report No. 1205009

Sample ID #: CS-13

Sampling Method: Grab

Lab Sample ID #: 1205009-01

Sample Matrix: Drinking Water

Date/Time Collected: 05/01/12 07:05

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms *	Not Found	F/NF		Start 05/01/12 12:21/End 05/02/12 12:24			SM9223	SM	
E. Coli *	Not Found	F/NF		Start 05/01/12 12:21/End 05/02/12 12:24			SM9223	SM	
Heterotrophic Plate Count *	7.00	MPN/mL	1.00	Start 05/01/12 12:21/End 05/03/12 11:53			SimPlate	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 05/01/12 12:21/End 05/02/12 12:24			SM9222D	SM	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/03/12 13:15
Received:
05/01/12 11:20

Report No. 1205009

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B218066 - NO PREP									
Blank (B218066-BLK1)				Prepared: 05/01/12 12:21 Analyzed: 05/02/12 12:24					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B218066-BS1)				Prepared: 05/01/12 12:21 Analyzed: 05/02/12 12:24					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B218067 - NO PREP									
Blank (B218067-BLK1)				Prepared: 05/01/12 12:21 Analyzed: 05/02/12 12:24					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B218067-BS1)				Prepared: 05/01/12 12:21 Analyzed: 05/02/12 12:24					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B218067-BSD1)				Prepared: 05/01/12 12:21 Analyzed: 05/02/12 12:24					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200
Batch B218090 - NO PREP									
Blank (B218090-BLK1)				Prepared: 05/01/12 12:21 Analyzed: 05/03/12 11:53					
Heterotrophic Plate Count	<1	1.00	MPN/mL						
Positive Control (B218090-BS1)				Prepared: 05/01/12 12:21 Analyzed: 05/03/12 11:53					
Heterotrophic Plate Count	>74	1.00	MPN/mL				0-200		

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/03/12 13:15
Received:
05/01/12 11:20

Report No. 1205009

PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)

Test Methods: Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Aimee Landon For Marcela Gracia Hawk, President For

Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY CSSA	COMPANY SAME	REPORT NUMBER 1205009
ADDRESS 25800 Ralph Fair Rd	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Brenda Shirley PHONE # 295-7014	ATTN: Chet Gray PHONE # 295-7446	E-MAIL Shirleyb@cssammm4.com

PROJECT NAME/LOCATION/SITE: Camp Stanley Storage Activity

PROJECT NO. 748402.02

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☒ Next Business Day ☐ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS:

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO

PROPER CONTAINERS ☒ YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS Just Take

SAMPLED BY SE

TEMP. ON RECPT. T-Blk 8.9°C

COND. OF SAMPLE Iced

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	LIQUID	PAINT CHIPS	OIL	SOLID	SLUDGE	OTHER	SAMPLING METHOD: COMPOSITE	GRAB	CORE	OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	ANALYSIS REQUESTED: BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP/ SPLP)	VOC / (8260 / 624 / TCLP/ SPLP)	Cd / Cr / Pb - TCT / TCLP / SPLP	RT. MINERALS	COLLY TC (FC APC)	PRESERVED WITH: HCl	H2SO4	HNO3	NaOH	NaOH ZnAc	MeOH	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	5-1-12	0705	X								X			CS-13	3	300ml						X								X		
														05-01-12 11:20 IN																		

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
Samantha Elliott	5/1/12	[signature]			
RELINQUISHED BY (PRINT NAME): Samantha Elliott		RECEIVED BY (PRINT NAME): Emily Landon	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT: Hand		TO BE SENT OUT ☐ YES ☐ NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES ☒ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp St. Report Number: 1205009

Project Name: Camp Stanley Storage Activity Date Received: 5/1/12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☒Hand Delivered ☐DHL ☐SATL ☐Other Date Due: 5/2/12

Rush: ☒ Specify: ☐3-5 ☐2 ☒1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No		NA	✓	If NA–reason:		
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:		
3. Air Bill included in folder, if received?	Yes		No	✓	NA		If NA–reason:		
4. Is COC included with samples?	Yes		No	✓	NA		If NA–reason:		
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:		
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 8.9 °C	T-6#4	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	TNSTAK	
8. Is the COC filled out correctly, and completely?	Yes	✓	No	✓	NA		If NA–reason:		
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:		
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:		
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:		
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:		
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:		
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:		
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	NOVA vials	
16. Sample volume sufficient for requested analysis?	Yes	✓	No		NA	✓	If NA–reason:		
17. Subcontracted Samples: [if Yes, complete the next section]	Yes		No		NA		If NA–reason:		

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: [signature] Date: 5/1/12

Labeled By: _____ Date: _____

Logged into LIMS By: _____ Date: _____

Logged into RF By: _____ Date: _____

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SAN ANTONIO TESTING LABORATORY, INC.

Cert. No. T104704360-11-5

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/04/12 13:29
Received:
05/02/12 08:57

Report No. 1205024

Sample ID #: CS-13

Sampling Method: Grab

Lab Sample ID #: 1205024-01

Sample Matrix: Drinking Water

Date/Time Collected: 05/02/12 07:25

Analyte	Result	Units	PQL	Prep Method	Batch	Analyzed	Method	Analyst	Notes
Microbiological Parameters									
Total Coliforms *	Not Found	F/NF		Start 05/02/12 09:27/End 05/03/12 12:19			SM9223	SM	
E. Coli *	Not Found	F/NF		Start 05/02/12 09:27/End 05/03/12 12:19			SM9223	SM	
Heterotrophic Plate Count *	62.0	MPN/mL	1.00	Start 05/02/12 09:27/End 05/04/12 09:29			SimPlate	SM	
Fecal Coliform *	<1	CFU/100 ml	1.00	Start 05/02/12 09:27/End 05/03/12 12:20			SM9222D	SM	

Camp Stanley Storage Activity
25800 Ralph Fair Rd.
Boerne TX, 78015-4800

Project: Camp Stanley Storage Activity

Project Number: 748402.02
Project Manager: Brenda

Reported:
05/04/12 13:29
Received:
05/02/12 08:57

Report No. 1205024

Microbiological Parameters - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B218091 - NO PREP									
Blank (B218091-BLK1)				Prepared: 05/02/12 09:27 Analyzed: 05/03/12 12:19					
Total Coliforms	Not Found		F/NF						
E. Coli	Not Found		F/NF						
Positive Control (B218091-BS1)				Prepared: 05/02/12 09:27 Analyzed: 05/03/12 12:19					
Total Coliforms	Found		F/NF				0-200		
E. Coli	Found		F/NF				0-200		
Batch B218092 - NO PREP									
Blank (B218092-BLK1)				Prepared: 05/02/12 09:27 Analyzed: 05/03/12 12:20					
Fecal Coliform	<1	1.00	CFU/100 ml						
Positive Control (B218092-BS1)				Prepared: 05/02/12 09:27 Analyzed: 05/03/12 12:20					
Fecal Coliform	>60	1.00	CFU/100 ml				0-200		
Negative Control (B218092-BSD1)				Prepared: 05/02/12 09:27 Analyzed: 05/03/12 12:20					
Fecal Coliform	<1	1.00	CFU/100 ml				0-200		200
Batch B218109 - NO PREP									
Blank (B218109-BLK1)				Prepared: 05/02/12 09:27 Analyzed: 05/04/12 09:29					
Heterotrophic Plate Count	<1	1.00	MPN/mL						
Positive Control (B218109-BS1)				Prepared: 05/02/12 09:27 Analyzed: 05/04/12 09:29					
Heterotrophic Plate Count	>74	1.00	MPN/mL				0-200		

Definitions and Notes

All quality control samples and checks are within acceptance limits unless otherwise indicated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

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PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
F/NF	Found / Not Found
*	TNI / NELAC accredited analyte
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)

Test Methods: Standard Methods for the Examination of Water and Wastewater, 20th Edition 1998
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

Sandra Felix For Marcela Gracia Hawk, President For

Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN-OF-CUSTODY RECORD

SAN ANTONIO TESTING LABORATORY, INC.

1610 S. Laredo Street, San Antonio, Texas 78207
(210) 229-9920 • Fax (210) 229-9921
www.satestinglab.com

REPORT TO:	INVOICE TO:	P.O. #
COMPANY CSSA	COMPANY SAME	REPORT NUMBER 1205024
ADDRESS 25800 Ralph Fair Rd.	ADDRESS	
CITY Boerne STATE TX ZIP 78015	CITY STATE ZIP	FAX #
ATTN: Brenda Shirley PHONE # 295-7014	ATTN: Chet Gray PHONE # 295-7496	E-MAIL shirleyb@cssamm4.com

PROJECT NAME/LOCATION/SITE: Camp Stanley Storage Activity

PROJECT NO. 748402.02

REQUESTED TURNAROUND TIME (begins at Log-In): ☐ 7-10 Business Days ☐ 3-5 Business Days ☐ 2 Business Days ☒ Next Business Day ☐ SAME DAY WHEN POSSIBLE

TRRP 13 REQUEST ☐ YES ☐ NO

COMMENTS/SPECIAL REQUESTS:

SAMPLE TEMPERATURE WITHIN COMPLIANCE (> 0°C ≤ 6°C) ☒ YES ☐ NO

PROPER CONTAINERS ☒ YES ☐ NO

IF NO, SIGN HERE TO AUTHORIZE ANALYSIS Just Taken

SAMPLED BY SE

TEMP ON RECPT TC#4 10.0°C

COND. OF SAMPLE Acceptable

ANALYSIS REQUESTED

SAMPLE NUMBER	COLLECTED DATE	COLLECTED TIME	MATRIX: DRINKING WATER	LIQUID	PAINT CHIPS	OIL	SOLID	SLUDGE	OTHER	SAMPLING METHOD: COMPOSITE	GRAB	CORE	OTHER	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	SAMPLE AMOUNT	BTEX / MTBE (8260)	TPH (TX1005 / TX1006)	METALS 8 / 11 / 12 / 13 / TCLP / SPLP	PAH / SVOC / (8270 / 625 / TCLP / SPLP)	VOC / (8260 / 624 / TCLP/ SPLP)	Cd / Cr / Pb - ToT / TCLP / SPLP	RT. MINERALS (COLI) TC FC HPC	PRESERVED WITH: HCl	H2SO4	HNO3	NaOH	NaOH+ZnAc	MeOH	NaHSO4	PRESERVED IN THE LAB	COMPOSITED IN THE LAB	REMARKS
1	5.2.12	0725	X								X			CS-13	3	300 ml							X									X	

05-02-12 08:57 IN

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
Santa Elliott	5.2.12	Aimee J. Fox			
RELINQUISHED BY (PRINT NAME) Samantha Elliott		RECEIVED BY (PRINT NAME) Aimee Landon	RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)
RELINQUISHED BY (SIGNATURE)		RECEIVED BY (SIGNATURE)	METHOD OF SHIPMENT Hand		TO BE SENT OUT ☐ YES ☐ NO
RELINQUISHED BY (PRINT NAME)		RECEIVED BY (PRINT NAME)			CUSTODY SEAL IN PLACE & INTACT ☐ YES ☒ NO

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: Camp Stanley — Report Number: 1205024

Project Name: Camp Stanley Storage Activity — Date Received: 5/2/12

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☑Hand Delivered ☐DHL ☐SATL ☐Other — Date Due: 5/3/12

Rush: ☐ Specify: ☐3-5 ☐2 ☒1

Items to be checked upon Receipt: [Yes, No, N/A]

	Yes	No	NA	If NA–reason:
1. Custody Seals present?		✓		
2. Custody Seals intact?			✓	
3. Air Bill included in folder, if received?			✓	
4. Is COC included with samples?	✓			
5. Is COC signed and dated by client?	✓			
6. Sample temperature: Thermal preservation between >0° - 6° C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	✓	✓		Temp: 10.0 °C T. Cath
7. Samples received with ice ☑ ice packs ☐ other cooling ☐	✓			Just Taken
8. Is the COC filled out correctly, and completely?	✓			
9. Information on the COC matches the samples?	✓			
10. Samples received within holding time?	✓			
11. Samples properly labeled?	✓			
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	✓			
13. Proper sample containers used?	✓			
14. All samples received intact, containers not damaged or leaking?	✓			
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.			✓	now a vials
16. Sample volume sufficient for requested analysis?	✓			
17. Subcontracted Samples: [if Yes, complete the next section]		✓		

Analyses Subcontracted Out: _____ No. of Samples _____

Samples sent to: _____ Sent By: _____

Date samples sent: _____ Samples shipped via: _____

TAT Requested: _____

Tracking number [if any]: _____

Comments:

Received By: [signature] Date: 5/2/12

Labeled By: _____ Date: _____

Logged into LIMS By: [signature] Date: [signature]

Logged into RF By: [signature] Date: [signature]

1610 S. Laredo Street, San Antonio, Texas 78207-7029 • (210) 229-9920 • Fax (210) 229-9921

APPENDIX F

SUBMERSIBLE PUMP INFORMATION

GOULDS PUMPS 120L30
FRANKLIN ELECTRIC MOTORS
SERVICE WIRE COMPANY (PUMP CABLE)
MOTOR CONTROL PANEL
SYMCOM 777 PUMP PROTECTION

B65-320L

ITT

Residential Water Systems

Goulds Pumps

65L, 95L, 120L, 160L, 250L, 320L
6" Stainless Steel Submersible Pumps

60 Hz High Capacity

For 6" and larger wells

GOULDS PUMPS

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

FEATURES

- **Powered for Continuous Operation:** All ratings are within the working limits of the motor. Pump can be operated continuously.
- **New Design Features:** Cast 304 SS discharge head and motor adapter.
- **Field Serviceable:** Easy to install and service. All parts easily dismantled if field service is ever necessary.
- **Diverse Application:** Designed for commercial, municipal and agricultural water needs.
- **Stainless Steel Construction:** Durable in most waters.
- **Bearings:** Replaceable, silicon carbide bearings allow excellent abrasives handling and wear resistance.
- **Built-in Check Valve:** Positive sealing, stainless steel check valve assembly incorporated into discharge head.
- **Impellers:** New stainless steel impeller design provides improved efficiency.
- **Maximum Temperature:** 140ºF (60ºC) for pump.
- **Four-Fluted Shaft Design:** Four sided stainless steel shaft eliminates impeller keys and provides positive drive.
- **Coupling:** Removable heavy duty stainless steel, splined coupling for maximum load-carrying capability.
- **Suction Strainer:** Stainless steel strainer restricts gravel and other debris from entering the pump.
- **Cable Guard:** Stainless steel cable guard surrounds and protects motor leads.
- **Fasteners:** All fasteners are stainless steel.
- **NEMA Design Motors:** Stainless steel casing resists corrosion. Water filled design provides a constant supply of lubrication. Hermetically sealed stator assures moisture free windings. Durable Kingsbury type thrust bearing absorbs all thrust. Replaceable motor lead assembly.

SPECIFICATIONS

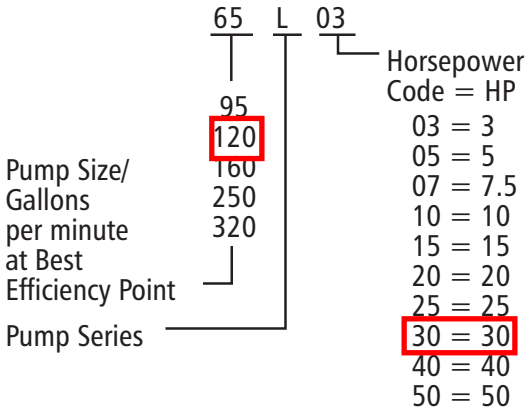
Model	Horsepower Range	Discharge Connection	Recommended GPM Operating Range	GPM at Best Efficiency	Minimum* Well Size	Rotation at Disch. End
65L	3 - 40		20 - 90	65	6" / 8" *	
95L	5 - 40		25 - 130	90	6" / 8" *	
120L	5 - 50	3" NPT	40 - 170	120	6" / 8" *	CCW
160L	5 - 50		50 - 240	160	6"	
250L	7.5 - 50		70 - 300	250	6"	
320L	7.5 - 50	4" NPT	100 - 400	320	6"	

* Minimum well size refers only to dimensional fit in a well, the specifier or installer must determine the minimum required well diameter that will insure an adequate supply of water to the pump and also properly cool the motor. See Water End Data Chart for specific diameter by model number.

"L" SERIES MATERIALS OF CONSTRUCTION

Ref. No.	Part Name	Material	Material Code
1	Discharge Head	Stainless steel	ASTM CF-8 (AISI 304 cast)
2	Check Valve Support	Stainless steel	ASTM CF-8 (AISI 304 cast)
3	Check Valve	Stainless steel	AISI 304 SS
4	Elastomers	EPDM	
5	Bolts and Screws	Stainless steel	AISI 304 SS
6	Shaft Sleeve and Bushing	Tungsten carbide	
7	Thrust Bearing	PTFE+Graphite	
8	Impeller	Stainless steel	AISI 304 SS
9	Diffuser	Stainless steel	AISI 304 SS
10	Spacer	Stainless steel	AISI 431 SS
11	Tie Rod	Stainless steel	AISI 304 SS
12	Cable Guard	Stainless steel	AISI 304 SS
13	Wear Rings	Technopolymer PPO	
14	Strainer	Stainless steel	AISI 304 SS
15	Shaft	Stainless steel	AISI 431 SS
16	Shaft Coupling	Stainless steel	AISI 431 SS
17	Motor Adapter	Stainless steel	ASTM CF-8 (AISI 304 cast)

ORDER NUMBER CODE



SYSTEM COMPONENTS

- **Pump/Water End:**
  - 6" Pump with 3" NPT discharge.
  - 4" Motor Adapter on 3 and 5 HP models.
  - 6" Motor Adapter on 7.5 HP and larger models.
- **Motor:**
  - 4" motor required for 3 HP and 5 HP pumps.
  - 6" motor required for 7.5 HP and larger pumps.
- **Control Box:** Required for all single phase motors.
- **Magnetic Starter:** A magnetic starter with Class 10 overloads is required for all three phase units.

WATER ENDS AND MOTORS MUST BE ORDERED SEPARATELY AND ARE PACKAGED SEPARATELY.

Goulds Pumps is ISO 9001 Registered.

WATER END (PUMP) DATA

Model	Order No.	No. Stages	Min. HP Required	Required Motor Dia.	Dimensions & Weights					
					Length		Diameter		Weight	
					In.	mm	In.	mm	Lbs.	kg.
65L	65L03	3	3	4	18.6	472	5.59	142	26	12
	65L05	5	5		22.2	564		142	31	14
	65L07	7	7.5	6	25.8	656	5.67	144	35	16
	65L10	10	10		31.3	794		144	44	20
	65L15	16	15		42.1	1070		144	60	27
	65L20	21	20		53.0	1346		144	75	34
	65L25	27	25		63.9	1622		144	90	41
	65L30 *	32	30		98.7	2508	6.97*	177	220	100
	65L40 *	41	40		115.0	2922		177	253	115
95L	95L05	3	5	4	18.6	472	5.59	142	26	12
	95L07	5	7.5	6	22.2	564	5.67	144	31	14
	95L10	7	10		25.8	656		144	35	16
	95L15	10	15		31.3	794		144	44	20
	95L20	14	20		38.5	978		144	53	24
	95L25	17	25		43.9	1116		144	62	28
	95L30	21	30		53.0	1346		144	75	34
	95L40 *	28	40		67.3	1710	6.97*	177	156	71
120L	120L05	2	5	4	16.8	426	5.59	142	22	10
	120L07	3	7.5	6	19.5	495	5.67	144	26	12
	120L10	5	10		24.9	633		144	33	15
	120L15	7	15		30.4	771		144	40	18
	120L20	10	20		38.5	978		144	51	23
	120L25	12	25		43.9	1116		144	57	26
	120L30	15	30		52.1	1323		144	68	31
	120L40	20	40		65.7	1668		144	86	39
	120L50 *	24	50		80.9	2055	6.97*	177	179	81
160L	160L05	2	5	4	17.2	436	5.59	142	22	10
	160L07	3	7.5	6	19.9	505	5.67	144	26	12
	160L10	4	10		22.6	574		144	31	14
	160L15	6	15		28.0	712		144	37	17
	160L20	8	20		33.5	850		144	44	20
	160L25	9	25		36.2	919		144	46	21
	160L30	11	30		41.6	1057		144	53	24
	160L40	15	40		52.5	1333		144	68	31
	160L50	18	50		60.6	1540		144	77	35
250L	250L07	2	7.5	6	20.8	528	5.67	144	26	12
	250L10	3	10		25.3	643		144	33	15
	250L15	5	15		34.4	873		144	44	20
	250L20	7	20		43.4	1103		144	55	25
	250L25	8	25		48.0	1218		144	60	27
	250L30	9	30		52.5	1333		144	66	30
	250L40	13	40		70.6	1793		144	88	40
	250L50	16	50		84.2	2138		144	104	47
320L	320L07	2	7.5	6	21.8	553	5.67	144	27	12
	320L15	4	15		30.8	783		144	38	17
	320L20	5	20		35.4	898		144	45	20
	320L25	6	25		39.9	1013		144	50	22
	320L30	8	30		49.0	1243		144	61	27
	320L40	11	40		62.5	1588		144	78	35
	320L50	13	50		71.6	1818		144	89	40

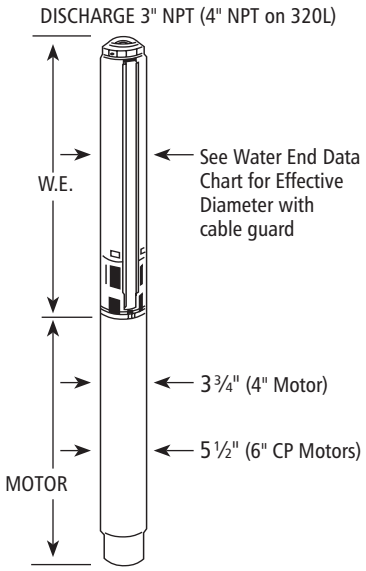
* Note pump diameter – high pressure models have an exterior casing and larger diameters, verify they will fit your well.

MOTOR DATA

NOTE: 4" Diameter motors are required for 3 and 5 HP "L" Series pumps
6" Diameter motors are required for 7.5 HP and larger "L" Series pumps.

CentriPro 4" Motors

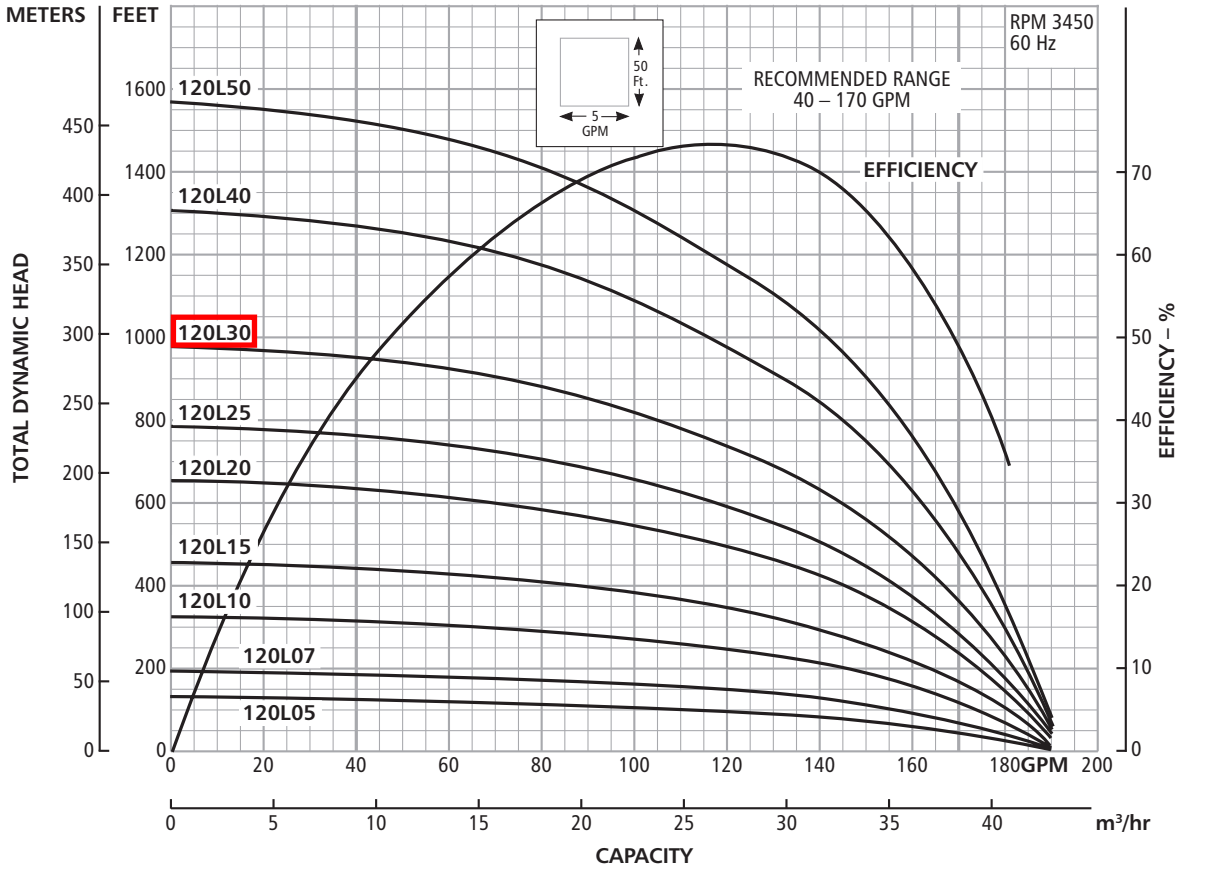
Single Phase Motors – Dimensions and Weights					
Motor Order No.	**HP**	**Motor Dia.**	**Volts**	**Length in. (mm)**	**Weight lbs. (Kg)**
M30412	3	4"	230	18.3 (466)	40 (18.1)
M50412	5			27.7 (703)	70 (31.8)
Three Phase Motors – Dimensions and Weights					
M30430	3	4"	200	15.3 (389)	32 (14.5)
M30432			230		
M30434			460		
M50430	5	4"	200	21.7 (550)	55 (24.9)
M50432			230		
M50434			460		



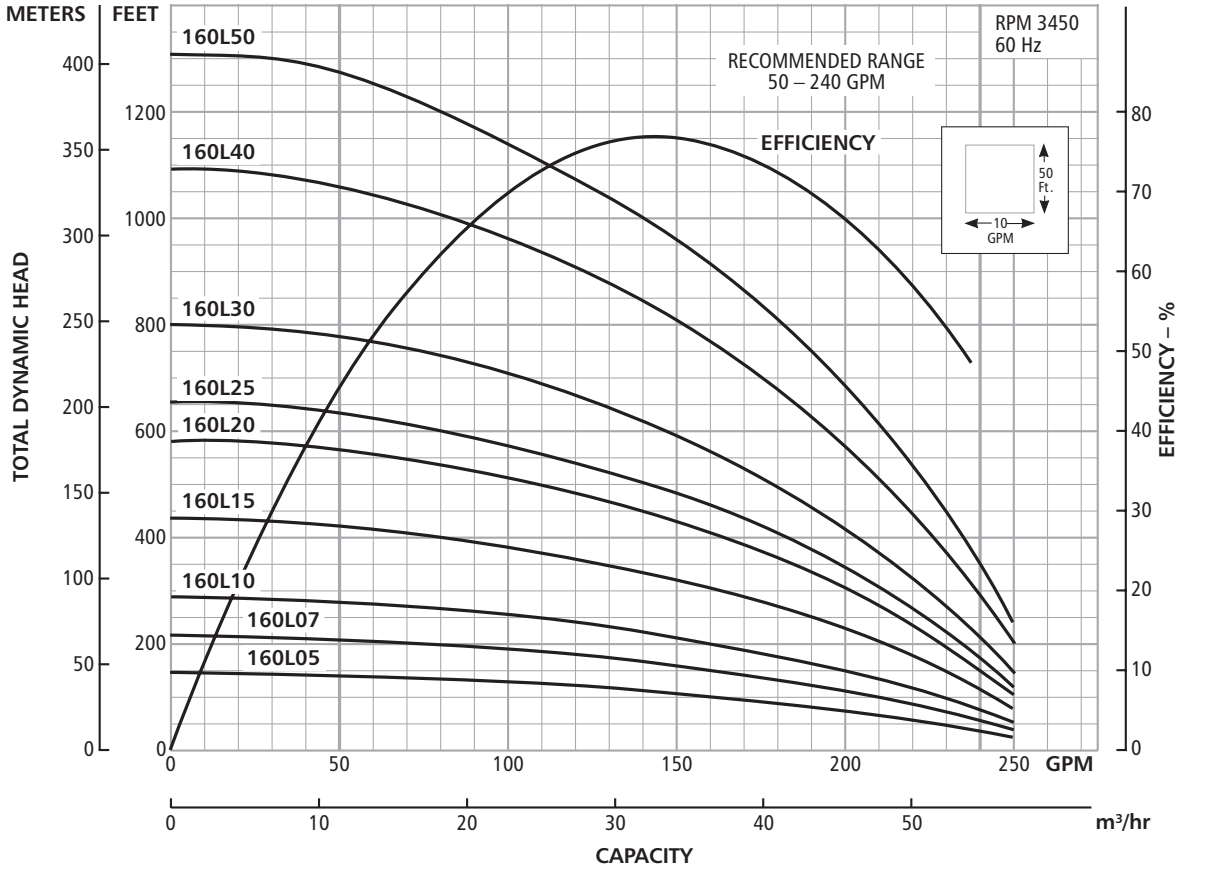
CentriPro 6" Motors

Single Phase Motors – Dimensions and Weights					
Motor Order No.	**HP**	**Motor Dia.**	**Volts**	**Length (inches)**	**Weight (lbs)**
6M071	7.5	6"	230	29.9	128
6M101	10	6"	230		
6M151	15	6"	230	33.5	148
Three Phase Motors – Dimensions and Weights					
6M078	7.5	6"	200	24.8	99
6M072			230		
6M074			460		
6M108	10		200	27.0	110
6M102			230		
6M104			460		
6M158	15		200	29.9	128
6M152			230		
6M154			460		
6M208	20		200	31.5	137
6M202			230		
6M204			460		
6M258	25		200	36.2	161
6M252			230		
6M254			460		
6M308	30		200	38.2	176
6M302			230		
6M304			460		
6M404	40			40.6	187
66M504	50			41.7	198
86M504	50	6" x 8"		46.4	353

Model 120L



Model 160L



Model 120L

SELECTION CHART

Horsepower Range 5 – 50, Recommended Range 40 – 170 GPM, 60 Hz, 3450 RPM

Pump Model	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																																
	HP	PSI	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750
120L05 2 Stages	5	0		166	146	108	40																									
		20	150	116	59																											
		30	120	65																												
		40	70																													
		50																														
		60																														
120L07 3 Stages	7.5	0			167	156	142	120	75																							
		20	169	158	144	125	87																									
		30	159	145	127	92																										
		40	147	128	96																											
		50	130	101																												
		60	104																													
120L10 5 Stages	10	0					168	162	155	146	134	118	95	68																		
		20			169	163	156	147	136	121	99	73																				
		30		170	164	157	148	137	122	101	75																					
		40	170	164	157	149	138	124	103	78	44																					
		50	164	158	150	139	125	105	79	46																						
		60	158	150	140	126	107	81	50																							
120L15 7 Stages	15	0							168	163	158	152	145	137	129	118	105	88	65													
		20					169	164	159	153	146	139	130	120	108	92	69																
		30				169	164	159	153	146	139	131	121	109	93	72																	
		40			169	165	159	154	147	140	132	122	110	94	73	41																
		50		170	165	160	154	148	141	134	123	111	96	76	42																	
		60		165	160	155	148	141	133	123	112	97	78	47																		
120L20 10 Stages	20	0										168	165	162	158	154	149	144	139	133	126	118	109	99	87	72						
		20								169	166	162	158	154	150	145	140	134	126	120	111	101	89	75	56							
		30							169	166	162	159	155	150	146	141	135	128	120	111	101	90	76	58								
		40						169	166	163	159	155	150	146	141	135	129	121	112	102	91	77	60									
		50					170	166	163	159	155	151	147	142	136	130	122	113	103	92	78	61										
		60				170	167	163	160	156	152	147	142	136	129	122	114	104	93	80	63											
120L25 12 Stages	25	0												168	165	162	159	156	153	149	145	141	136	131	125	118	111	103	93	83	70	56
		20										168	166	163	160	159	155	151	146	142	138	133	128	120	112	104	95	84	73	59		
		30									169	166	163	160	157	154	150	146	142	138	134	129	121	113	104	96	85	74	60	40		
		40								169	166	163	161	157	154	150	146	142	138	133	128	122	114	106	96	86	75	61	41			
		50							169	166	164	161	158	154	150	146	142	138	133	128	123	116	105	97	87	76	62	43				
		60						169	167	164	161	158	155	151	147	143	139	134	128	122	115	107	98	88	77	64	45					

Pump Model	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																									
	HP	PSI	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1100	1200	1300	1400	1500
120L30 15 Stages	30	0				167	162	157	151	144	137	128	118	106	91	73	44							
		20			167	163	158	152	145	136	129	119	107	93	74	47								
		30		170	165	160	155	149	142	134	124	114	101	84	64									
		40		168	163	158	151	145	138	129	120	108	94	76	50									
		50	170	166	161	155	148	141	134	125	114	102	86	65										
		60	168	163	158	152	146	138	130	121	109	95	77	52										
120L40 20 Stages	40	0						168	165	162	158	154	149	144	138	132	125	116	98	72				
		20					169	165	162	158	154	150	145	139	133	126	118	109	87	54				
		30					167	164	160	156	152	147	141	136	130	123	113	103	81	40				
		40				169	166	162	158	154	150	145	139	133	126	118	110	99	75					
		50				168	164	161	157	153	148	143	137	130	123	115	106	94	67					
		60			169	166	163	159	155	150	145	140	134	127	119	111	100	89	59					
120L50 24 Stages	50	0								169	3166	163	160	157	153	150	145	141	131	118	102	83	56	
		20							169	166	163	160	157	154	150	146	141	137	125	111	93	72		
		30							168	165	162	159	155	151	147	144	139	134	123	107	89	66		
		40						169	166	164	161	158	154	150	146	142	137	132	120	103	84	58		
		50						168	165	162	129	156	152	149	145	140	135	129	116	100	79	51		
		60					169	167	164	161	158	154	150	147	142	138	132	126	112	95	74			

FRANKLIN ELECTRIC

2011 AIM MANUAL

SUBMERSIBLE MOTORS

Application • Installation • Maintenance

60 Hz, Single-Phase and Three-Phase Motors

System Solutions

Franklin Electric

ATTENTION!
IMPORTANT INFORMATION FOR INSTALLERS OF THIS EQUIPMENT!

THIS EQUIPMENT IS INTENDED FOR INSTALLATION BY TECHNICALLY QUALIFIED PERSONNEL. FAILURE TO INSTALL IT IN COMPLIANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES, AND WITHIN FRANKLIN ELECTRIC RECOMMENDATIONS, MAY RESULT IN ELECTRICAL SHOCK OR FIRE HAZARD, UNSATISFACTORY PERFORMANCE, AND EQUIPMENT FAILURE. FRANKLIN INSTALLATION INFORMATION IS AVAILABLE FROM PUMP MANUFACTURERS AND DISTRIBUTORS, AND DIRECTLY FROM FRANKLIN ELECTRIC. CALL FRANKLIN TOLL FREE 800-348-2420 FOR INFORMATION.

WARNING

SERIOUS OR FATAL ELECTRICAL SHOCK MAY RESULT FROM FAILURE TO CONNECT THE MOTOR, CONTROL ENCLOSURES, METAL PLUMBING, AND ALL OTHER METAL NEAR THE MOTOR OR CABLE, TO THE POWER SUPPLY GROUND TERMINAL USING WIRE NO SMALLER THAN MOTOR CABLE WIRES. TO REDUCE RISK OF ELECTRICAL SHOCK, DISCONNECT POWER BEFORE WORKING ON OR AROUND THE WATER SYSTEM. DO NOT USE MOTOR IN SWIMMING AREAS.

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ATENCION!
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PARA LA INSTALACION DE ESTE EQUIPO, SE REQUIERE DE PERSONAL TECNICO CALIFICADO. EL NO CUMPLIR CON LAS NORMAS ELECTRICAS NACIONALES Y LOCALES, ASI COMO CON LAS RECOMENDACIONES DE FRANKLIN ELECTRIC DURANTE SU INSTALACION, PUEDE OCASIONAR, UN CHOQUE ELECTRICO, PELIGRO DE UN INCENDIO, OPERACION DEFECTUOSA E INCLUSO LA DESCOMPOSTURA DEL EQUIPO. LOS MANUALES DE INSTALACION Y PUESTA EN MARCHA DE LOS EQUIPOS, ESTAN DISPONIBLES CON LOS DISTRIBUIDORES, FABRICANTES DE BOMBAS O DIRECTAMENTE CON FRANKLIN ELECTRIC. PUEDE LLAMAR GRATUITAMENTE PARA MAYOR INFORMACION AL TELEFONO 800-348-2420.

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PUEDE OCURRIR UN CHOQUE ELECTRICO, SERIO O FATAL DEBIDO A UNA ERRONEA CONECCION DEL MOTOR, DE LOS TABLEROS ELECTRICOS, DE LA TUBERIA, DE CUALQUIER OTRA PARTE METALICA QUE ESTA CERCA DEL MOTOR O POR NO UTILIZAR UN CABLE PARA TIERRA DE CALIBRE IGUAL O MAYOR AL DE LA ALIMENTACION. PARA REDUCIR EL RIESGO DE CHOQUE ELECTRIC, DESCONECTAR LA ALIMENTACION ELECTRICA ANTES DE INICIAR A TRABAJAR EN EL SISTEMA HIDRAULICO. NO UTILIZAR ESTE MOTOR EN ALBERCAS O AREAS EN DONDE SE PRACTIQUE NATACION.

Commitment to Quality

Franklin Electric is committed to provide customers with defect free products through our program of continuous improvement. Quality shall, in every case, take precedence over quantity.

Franklin Electric

SUBMERSIBLE MOTORS

60 Hz, Single-Phase and Three-Phase

Application • Installation • Maintenance Manual

The submersible motor is a reliable, efficient and trouble-free means of powering a pump. Its needs for a long operational life are simple. They are:

1. A suitable operating environment
2. An adequate supply of electricity
3. An adequate flow of cooling water over the motor
4. An appropriate pump load

All considerations of application, installation, and maintenance of submersible motors relating to these four areas are presented in this manual. Franklin Electric's web page, www.franklin-electric.com, should be checked for the latest updates.

Contents

Storage

Franklin Electric submersible motors are a water-lubricated design. The fill solution consists of a mixture of deionized water and Propylene Glycol (a non-toxic antifreeze). The solution will prevent damage from freezing in temperatures to -40 °F (-40 °C); motors should be stored in areas that do not go below this temperature. The solution will partially freeze below 27 °F (-3 °C), but no damage occurs. Repeated freezing and thawing should be avoided to prevent possible loss of fill solution.

There may be an interchange of fill solution with well water during operation. Care must be taken with motors removed from wells during freezing conditions to prevent damage.

When the storage temperature does not exceed 100 °F (37 °C), storage time should be limited to two years. Where temperatures reach 100° to 130 °F, storage time should be limited to one year.

Loss of a few drops of liquid will not damage the motor as an excess amount is provided, and the filter check valve will allow lost liquid to be replaced by filtered well water upon installation. If there is reason to believe there has been a considerable amount of leakage, consult the factory for checking procedures.

Frequency of Starts

The average number of starts per day over a period of months or years influences the life of a submersible pumping system. Excessive cycling affects the life of control components such as pressure switches, starters, relays and capacitors. Rapid cycling can also cause motor spline damage, bearing damage, and motor overheating. All these conditions can lead to reduced motor life.

The pump size, tank size and other controls should be selected to keep the starts per day as low as practical for longest life. The maximum number of starts per 24-hour period is shown in table 3.

Motors should run a minimum of one minute to dissipate heat build up from starting current. Six inch and larger motors should have a minimum of 15 minutes between starts or starting attempts.

Table 3 Number of Starts

MOTOR RATING		MAXIMUM STARTS PER 24 HR PERIOD	
HP	KW	SINGLE-PHASE	THREE-PHASE
Up to 0.75	Up to 0.55	300	300
1 thru 5.5	0.75 thru 4	100	300
7.5 thru 30	5.5 thru 22	50	100*
40 and over	30 and over	-	100

* Keeping starts per day within the recommended numbers provides the best system life. However, when used with a properly configured Reduced Voltage Starter (RVS) or Variable Frequency Drive (VFD), 7.5 thru 30 hp three-phase motors can be started up to 200 times per 24 hour period.

Mounting Position

Franklin submersible motors are designed primarily for operation in the vertical, shaft-up position.

During acceleration, the pump thrust increases as its output head increases. In cases where the pump head stays below its normal operating range during startup and full speed condition, the pump may create upward thrust. This creates upward thrust on the motor upthrust bearing. This is an acceptable operation for short periods at each start, but running continuously with upthrust will cause excessive wear on the upthrust bearing.

With certain additional restrictions as listed in this section and the Inline Booster Pump Systems sections of this manual, motors are also suitable for operation in positions from shaft-up to shaft-horizontal. As the mounting position becomes further from vertical and closer to horizontal, the probability of shortened thrust bearing life increases. For normal motor life expectancy with motor positions other than shaft-up, follow these recommendations:

1. Minimize the frequency of starts, preferably to fewer than **10** per 24-hour period. Six and eight inch motors should have a minimum of 20 minutes between starts or starting attempts
2. Do not use in systems which can run even for short periods at full speed without thrust toward the motor.

Transformer Capacity - Single-Phase or Three-Phase

Distribution transformers must be adequately sized to satisfy the kVA requirements of the submersible motor. When transformers are too small to supply the load, there is a reduction in voltage to the motor.

Table 4 references the motor horsepower rating, single-phase and three-phase, total effective kVA required, and the smallest transformer required for open or closed three-phase systems. Open systems require larger transformers since only two transformers are used.

Other loads would add directly to the kVA sizing requirements of the transformer bank.

Table 4 Transformer Capacity

MOTOR RATING		TOTAL EFFECTIVE KVA REQUIRED	SMALLEST KVA RATING-EACH TRANSFORMER	
HP	KW		OPEN WYE OR DELTA 2- TRANSFORMERS	CLOSED WYE OR DELTA 3- TRANSFORMERS
1.5	1.1	3	2	1
2	1.5	4	2	1.5
3	2.2	5	3	2
5	3.7	7.5	5	3
7.5	5.5	10	7.5	5
10	7.5	15	10	5
15	11	20	15	7.5
20	15	25	15	10
25	18.5	30	20	10
30	22	40	25	15
40	30	50	30	20
50	37	60	35	20
60	45	75	40	25
75	55	90	50	30
100	75	120	65	40
125	93	150	85	50
150	110	175	100	60
175	130	200	115	70
200	150	230	130	75

NOTE: Standard kVA ratings are shown. If power company experience and practice allows transformer loading higher than standard, higher loading values may be used to meet total effective kVA required, provided correct voltage and balance is maintained.

Effects of Torque

During starting of a submersible pump, the torque developed by the motor must be supported through the pump, delivery pipe or other supports. Most pumps rotate in the direction which causes unscrewing torque on right-handed threaded pipe or pump stages. All threaded joints, pumps and other parts of the pump support system must be capable of withstanding the maximum torque repeatedly without loosening or breaking. Unscrewing joints will break electrical cable and may cause loss of the pump-motor unit.

To safely withstand maximum unscrewing torques with a minimum safety factor of 1.5, tightening all threaded joints to at least 10 lb-ft per motor horsepower is recommended (table 4A). It may be necessary to tack or strap weld pipe joints on high horsepower pumps, especially at shallower settings.

Table 4A Torque Required (Examples)

MOTOR RATING		MINIMUM SAFE TORQUE-LOAD
HP	KW	
1 hp & Less	0.75 kW & Less	10 lb-ft
20 hp	15 kW	200 lb-ft
75 hp	55 kW	750 lb-ft
200 hp	150 kW	2000 lb-ft

Use of Engine Driven Generators - Single-Phase or Three-Phase

Table 5 lists minimum generator sizes based on typical 80 °C rise continuous duty generators, with 35% maximum voltage dip during starting, for Franklin's three-wire motors, single- or three-phase.

This is a general chart. The generator manufacturer should be consulted whenever possible, especially on larger sizes.

There are two types of generators available: externally and internally regulated. Most are externally regulated. They use an external voltage regulator that senses the output voltage. As the voltage dips at motor start-up, the regulator increases the output voltage of the generator.

Internally regulated (self-excited) generators have an extra winding in the generator stator. The extra winding senses the output current to automatically adjust the output voltage.

Generators must be sized to deliver at least 65% of the rated voltage during starting to ensure adequate starting torque. Besides sizing, generator frequency is important as the motor speed varies with the frequency (Hz). Due to pump affinity laws, a pump running at 1 to 2 Hz below motor nameplate frequency design will not meet its performance curve. Conversely, a pump running at 1 to 2 Hz above may trip overloads.

Generator Operation

Always start the generator before the motor is started and always stop the motor before the generator is shut down. The motor thrust bearing may be damaged if the generator is allowed to coast down with the motor running. This same condition occurs when the generator is allowed to run out of fuel.

Follow generator manufacturer's recommendations for de-rating at higher elevations or using natural gas.

Table 5 Engine Driven Generators

NOTE: This chart applies to 3-wire or 3-phase motors. For best starting of 2-wire motors, the minimum generator rating is 50% higher than shown.

MOTOR RATING		MINIMUM RATING OF GENERATOR			
		EXTERNALLY REGULATED		INTERNALLY REGULATED	
HP	KW	KW	KVA	KW	KVA
1/3	0.25	1.5	1.9	1.2	1.5
1/2	0.37	2	2.5	1.5	1.9
3/4	0.55	3	3.8	2	2.5
1	0.75	4	5.0	2.5	3.13
1.5	1.1	5	6.25	3	3.8
2	1.5	7.5	9.4	4	5
3	2.2	10	12.5	5	6.25
5	3.7	15	18.75	7.5	9.4
7.5	5.5	20	25.0	10	12.5
10	7.5	30	37.5	15	18.75
15	11	40	50	20	25
20	15	60	75	25	31
25	18.5	75	94	30	37.50
30	22	100	125	40	50
40	30	100	125	50	62.5
50	37	150	188	60	75
60	45	175	220	75	94
75	55	250	313	100	125
100	75	300	375	150	188
125	93	375	469	175	219
150	110	450	563	200	250
175	130	525	656	250	313
200	150	600	750	275	344

WARNING: To prevent accidental electrocution, automatic or manual transfer switches must be used any time a generator is used as standby or back up on power lines. Contact power company for use and approval.

Use of Check Valves

It is recommended that one or more check valves always be used in submersible pump installations. If the pump does not have a built-in check valve, a line check valve should be installed in the discharge line within 25 feet of the pump and below the draw down level of the water supply. For deeper settings, check valves should be installed per the manufacturer's recommendations. More than one check valve may be required, but more than the recommended number of check valves should not be used.

Swing type check valves are **not** acceptable and should never be used with submersible motors/pumps. Swing type check valves have a slower reaction time which can cause water hammer (see next page). Internal pump check valves or spring loaded check valves close quickly and help eliminate water hammer.

Check valves are used to hold pressure in the system when the pump stops. They also prevent backspin, water hammer and upthrust. Any of these can lead to early pump or motor failure.

NOTE: Only positive sealing check valves should be used in submersible installations. Although drilling the check valves or using drain-back check valves may prevent back spinning, they create upthrust and water hammer problems.

A. Backspin - With no check valve or a failed check valve, the water in the drop pipe and the water in the system can flow down the discharge pipe when the motor stops. This can cause the pump to rotate in a reverse direction. If the motor is started while it is backspinning, an excessive force is placed across the pump-motor assembly that can cause impeller damage, motor or pump shaft breakage, excessive bearing wear, etc.

B. Upthrust - With no check valve, a leaking check valve, or drilled check valve, the unit starts under

a zero head condition. This causes an uplifting or upthrust on the impeller-shaft assembly in the pump. This upward movement carries across the pump-motor coupling and creates an upthrust condition in the motor. Repeated upthrust can cause premature failure of both the pump and the motor.

C. **Water Hammer -** If the lowest check valve is more than 30 feet above the standing (lowest static) water level, or a lower check valve leaks and the check valve above holds, a vacuum is created in the discharge piping. On the next pump start, water moving at very high velocity fills the void and strikes the closed check valve and the stationary water in the pipe above it, causing a hydraulic shock. This shock can split pipes, break joints and damage the pump and/or motor. Water hammer can often be heard or felt. When discovered, the system should be shut down and the pump installer contacted to correct the problem.

Wells – Large Diameter, Uncased, Top Feeding and Screened Sections

Franklin Electric submersible motors are designed to operate with a cooling flow of water over and around the full length of the motor.

If the pump installation does not provide the minimum flow shown in table 6, a flow inducer sleeve (flow sleeve) must be used. The conditions requiring a flow sleeve are:

- Well diameter is too large to meet table 6 flow requirements.
- Pump is in an open body of water.
- Pump is in a rock well or below the well casing.
- The well is “top-feeding” (a.k.a. cascading)
- Pump is set in or below screens or perforations.

Water Temperature and Flow

Franklin Electric’s standard submersible motors, except Hi-Temp designs (see note below), are designed to operate up to maximum service factor horsepower in water up to 86 °F (30 °C). A flow of 0.25 ft/s for 4" motors rated 3 hp and higher, and 0.5 ft/s for 6" and 8" motors is required for proper cooling. Table 6 shows minimum flow rates, in gpm, for various well diameters and motor sizes.

If a standard motor is operated in water over 86 °F (30 °C), water flow past the motor must be increased to maintain safe motor operating temperatures. See HOT WATER APPLICATIONS on page 7.

NOTE: Franklin Electric offers a line of Hi-Temp motors designed to operate in water at higher temperatures or lower flow conditions. Consult factory for details.

Table 6 Required Cooling Flow

MINIMUM GPM REQUIRED FOR MOTOR COOLING IN WATER UP TO 86 °F (30 °C).			
CASING OR SLEEVE ID INCHES (MM)	4" MOTOR (3-10 HP) 0.25 FT/S GPM (L/M)	6" MOTOR 0.50 FT/S GPM (L/M)	8" MOTOR 0.50 FT/S GPM (L/M)
4 (102)	1.2 (4.5)	-	-
5 (127)	7 (26.5)	-	-
6 (152)	13 (49)	9 (34)	-
7 (178)	20 (76)	25 (95)	-
8 (203)	30 (114)	45 (170)	10 (40)
10 (254)	50 (189)	90 (340)	55 (210)
12 (305)	80 (303)	140 (530)	110 (420)
14 (356)	110 (416)	200 (760)	170 (645)
16 (406)	150 (568)	280 (1060)	245 (930)

0.25 ft/s = 7.62 cm/sec 0.50 ft/s = 15.24 cm/sec
1 inch = 2.54 cm

Flow Inducer Sleeve

If the flow rate is less than specified, then a flow inducer sleeve must be used. A flow sleeve is always required in an open body of water. FIG. 1 shows a typical flow inducer sleeve construction.

EXAMPLE: A 6" motor and pump that delivers 60 gpm will be installed in a 10" well.

From table 6, 90 gpm would be required to maintain proper cooling. In this case adding an 8" or smaller flow sleeve provides the required cooling.

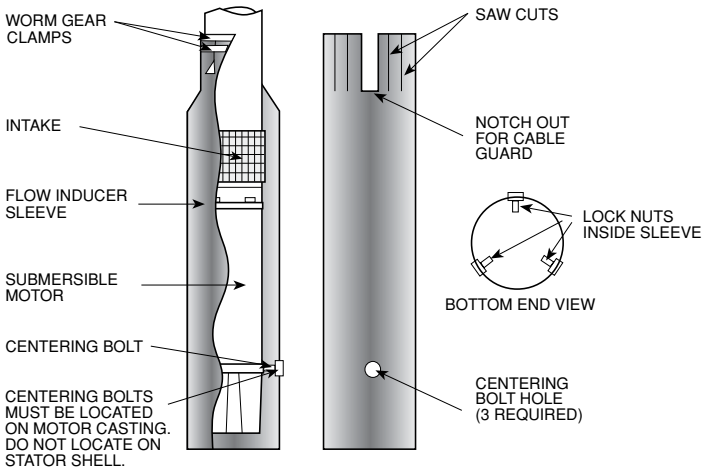

FIG. 1

Head Loss From Flow Past Motor

Table 7 lists the approximate head loss due to flow between an average length motor and smooth casing or flow inducer sleeve.

Table 7 Head Loss in Feet (Meters) at Various Flow Rates

MOTOR DIAMETER		4"	4"	4"	6"	6"	6"	8"	8"
CASING ID IN INCHES (MM)		4 (102)	5 (127)	6 (152)	6 (152)	7 (178)	8 (203)	8.1 (206)	10 (254)
Flow Rate in gpm (l/m)	25 (95)	0.3 (.09)							
	50 (189)	1.2 (.37)							
	100 (378)	4.7 (1.4)	0.3 (.09)		1.7 (.52)				
	150 (568)	10.2 (3.1)	0.6 (.18)	0.2 (.06)	3.7 (1.1)				
	200 (757)		1.1 (.34)	0.4 (.12)	6.3 (1.9)	0.5 (.15)		6.8 (2.1)	
	250 (946)		1.8 (.55)	0.7 (.21)	9.6 (2.9)	0.8 (.24)		10.4 (3.2)	
	300 (1136)		2.5 (.75)	1.0 (.30)	13.6 (4.1)	1.2 (.37)	0.2 (.06)	14.6 (4.5)	
	400 (1514)				23.7 (7.2)	2.0 (.61)	0.4 (.12)	24.6 (7.5)	
	500 (1893)					3.1 (.94)	0.7 (.21)	37.3 (11.4)	0.6 (0.2)
	600 (2271)					4.4 (1.3)	1.0 (.30)	52.2 (15.9)	0.8 (0.3)
	800 (3028)								1.5 (0.5)
	1000 (3785)								2.4 (0.7)

Hot Water Applications (Standard Motors)

Franklin Electric offers a line of Hi-Temp motors which are designed to operate in water with various temperatures up to 194 °F (90 °C) without increased flow. When a standard pump-motor operates in water hotter than 86 °F (30 °C), a flow rate of at least 3 ft/s is required. When selecting the motor to drive a pump in over 86 °F (30 °C) water, the motor horsepower must be de-rated per the following procedure.

1. Using table 7A, determine pump gpm required for different well or sleeve diameters. If necessary, add a flow sleeve to obtain at least 3 ft/s flow rate.

Table 7A Minimum gpm (l/m) Required for 3 ft/s (.91 m/sec) Flow Rate

CASING OR SLEEVE ID		4" HIGH THRUST MOTOR		6" MOTOR		8" MOTOR	
INCHES	(MM)	GPM	(L/M)	GPM	(L/M)	GPM	(L/M)
4	(102)	15	(57)				
5	(127)	80	(303)				
6	(152)	160	(606)	52	(197)		
7	(178)			150	(568)		
8	(203)			260	(984)	60	(227)
10	(254)			520	(1970)	330	(1250)
12	(305)					650	(2460)
14	(356)					1020	(3860)
16	(406)					1460	(5530)

Continued on next page

2. Determine pump horsepower required from the pump manufacturer's curve.

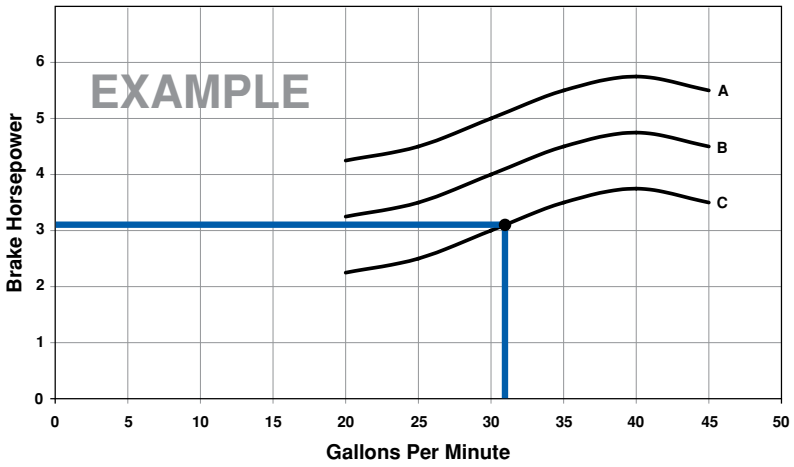

FIG. 2 MANUFACTURER'S PUMP CURVE

3. Multiply the pump horsepower required by the heat factor multiplier from table 8.

Table 8 Heat Factor Multiplier at 3 ft/s (.91 m/sec) Flow Rate

MAXIMUM WATER TEMPERATURE	1/3 - 5 HP .25 - 3.7 KW	7 1/2 - 30 HP 5.5 - 22 KW	OVER 30 HP OVER 22 KW
140 °F (60 °C)	1.25	1.62	2.00
131 °F (55 °C)	1.11	1.32	1.62
122 °F (50 °C)	1.00	1.14	1.32
113 °F (45 °C)	1.00	1.00	1.14
104 °F (40 °C)	1.00	1.00	1.00
95 °F (35 °C)	1.00	1.00	1.00

4. Select a rated hp motor on table 8A whose Service Factor Horsepower is at least the value calculated in Item 3.

Table 8A Service Factor Horsepower

HP	KW	SFHP	HP	KW	SFHP	HP	KW	SFHP	HP	KW	SFHP
1/3	0.25	0.58	3	2.2	3.45	25	18.5	28.75	100	75	115.00
1/2	0.37	0.80	5	3.7	5.75	30	22.0	34.50	125	93	143.75
3/4	0.55	1.12	7.5	5.5	8.62	40	30.0	46.00	150	110	172.50
1	0.75	1.40	10	7.5	11.50	50	37.0	57.50	175	130	201.25
1.5	1.10	1.95	15	11.0	17.25	60	45.0	69.00	200	150	230.00
2	1.50	2.50	20	15.0	23.00	75	55.0	86.25			

Hot Water Applications - Example

EXAMPLE: A 6" pump end requiring 39 hp input will pump 124 °F water in an 8" well at a delivery rate of 140 gpm. From table 7A, a 6" flow sleeve will be required to increase the flow rate to at least 3 ft/s.

Using table 8, the 1.62 heat factor multiplier is selected because the hp required is over 30 hp and water temperature is above 122 °F. Multiply 39 hp x 1.62 (multiplier), which equals 63.2 hp. This is the minimum rated service factor horsepower usable at 39 hp in 124 °F. Using table 8A, select a motor with a rated service factor horsepower above 63.2 hp. A 60 hp motor has a service factor horsepower of 69, so a 60 hp motor may be used.

Drawdown Seals

Allowable motor temperature is based on atmospheric pressure or higher surrounding the motor. “Drawdown seals,” which seal the well to the pump above its intake to maximize delivery, are not recommended, since the suction created can be lower than atmospheric pressure.

Grounding Control Boxes and Panels

The National Electrical Code requires that the control box or panel-grounding terminal always be connected to supply ground. If the circuit has no grounding conductor and no metal conduit from the box to supply panel, use a wire at least as large as line conductors and connect as required by the National Electrical Code, from the grounding terminal to the electrical supply ground.

WARNING: Failure to ground the control frame can result in a serious or fatal electrical shock hazard.

Grounding Surge Arrestors

An above ground surge arrestor must be grounded, metal to metal, all the way to the lowest draw down water strata for the surge arrestor to be effective. GROUNDING THE ARRESTOR TO THE SUPPLY GROUND OR TO A DRIVEN GROUND ROD PROVIDES LITTLE OR NO SURGE PROTECTION FOR THE MOTOR.

Control Box, Pumptec Products and Panel Environment

Franklin Electric control boxes, Pumptec products and three-phase panels meet UL requirements for NEMA Type 3R enclosures. They are suitable for indoor and outdoor applications within temperatures of +14 °F (-10 °C) to 122 °F (50 °C). Operating control boxes below +14 °F can cause reduced starting torque and loss of overload protection when overloads are located in control boxes.

Control boxes, Pumptec products and three-phase panels should never be mounted in direct sunlight or high temperature locations. This will cause shortened capacitor life (where applicable) and unnecessary tripping of overload protectors. A ventilated enclosure painted white to reflect heat is recommended for an outdoor, high temperature location.

A damp well pit, or other humid location, accelerates component failure from corrosion.

Control boxes with voltage relays are designed for vertical upright mounting only. Mounting in other positions will affect the operation of the relay.

Equipment Grounding

WARNING: Serious or fatal electrical shock may result from failure to connect the motor, control enclosures, metal plumbing and all other metal near the motor or cable to the power supply ground terminal using wire no smaller than motor cable wires.

The primary purpose of grounding the metal drop pipe and/or metal well casing in an installation is safety. It is done to limit the voltage between nonelectrical (exposed metal) parts of the system and ground, thus minimizing dangerous shock hazards. Using wire at least the size of the motor cable wires provides adequate current-carrying capability for any ground fault that might occur. It also provides a low resistance path to ground, ensuring that the current to ground will be large enough to trip any overcurrent device designed to detect faults (such as a ground fault circuit interrupter, or GFCI).

Normally, the ground wire to the motor would provide the primary path back to the power supply ground for any ground fault. There are conditions, however, where the ground wire connection could become compromised. One such example would be the case where the water in the well is abnormally corrosive or aggressive. In this example, a grounded metal drop pipe or casing would then become the primary path to ground. However, the many installations that now use plastic drop pipes and/or casings require further steps to be taken for safety purposes, so that the water column itself does not become the conductive path to ground.

When an installation has abnormally corrosive water AND the drop pipe or casing is plastic, Franklin Electric recommends the use of a GFCI with a 10 mA set-point. In this case, the motor ground wire should be routed through the current-sensing device along with the motor power leads. Wired this way, the GFCI will trip only when a ground fault has occurred AND the motor ground wire is no longer functional.

Table 16 Three-Phase 60 °C Cable, 60 Hz (Service Entrance to Motor) Maximum Length in Feet

60 °C

MOTOR RATING			60 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
200 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	710	1140	1800	2840	4420													
	3/4	0.55	510	810	1280	2030	3160													
	1	0.75	430	690	1080	1710	2670	4140	5140											
	1.5	1.1	310	500	790	1260	1960	3050	3780											
	2	1.5	240	390	610	970	1520	2360	2940	3610	4430	5420								
	3	2.2	180	290	470	740	1160	1810	2250	2760	3390	4130								
	5	3.7	**110**	170	280	440	690	1080	1350	1660	2040	2490	3050	3670	4440	5030				
	7.5	5.5	0	0	200	310	490	770	960	1180	1450	1770	2170	2600	3150	3560				
	10	7.5	0	0	0	**230**	370	570	720	880	1090	1330	1640	1970	2390	2720	3100	3480	3800	4420
	15	11	0	0	0	**160**	**250**	390	490	600	740	910	1110	1340	1630	1850	2100	2350	2570	2980
	20	15	0	0	0	0	**190**	**300**	380	460	570	700	860	1050	1270	1440	1650	1850	2020	2360
	25	18.5	0	0	0	0	0	**240**	**300**	**370**	460	570	700	840	1030	1170	1330	1500	1640	1900
	30	22	0	0	0	0	0	0	**250**	**310**	**380**	470	580	700	850	970	1110	1250	1360	1590
230 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	930	1490	2350	3700	5760	8910												
	3/4	0.55	670	1080	1700	2580	4190	6490	8060	9860										
	1	0.75	560	910	1430	2260	3520	5460	6780	8290										
	1.5	1.1	420	670	1060	1670	2610	4050	5030	6160	7530	9170								
	2	1.5	320	510	810	1280	2010	3130	3890	4770	5860	7170	8780							
	3	2.2	240	390	620	990	1540	2400	2980	3660	4480	5470	6690	8020	9680					
	5	3.7	**140**	230	370	590	920	1430	1790	2190	2690	3290	4030	4850	5870	6650	7560	8460	9220	
	7.5	5.5	0	**160**	260	420	650	1020	1270	1560	1920	2340	2870	3440	4160	4710	5340	5970	6500	7510
	10	7.5	0	0	**190**	310	490	760	950	1170	1440	1760	2160	2610	3160	3590	4100	4600	5020	5840
	15	11	0	0	0	**210**	330	520	650	800	980	1200	1470	1780	2150	2440	2780	3110	3400	3940
	20	15	0	0	0	0	**250**	400	500	610	760	930	1140	1380	1680	1910	2180	2450	2680	3120
	25	18.5	0	0	0	0	0	**320**	400	500	610	750	920	1120	1360	1540	1760	1980	2160	2520
	30	22	0	0	0	0	0	**260**	**330**	**410**	510	620	760	930	1130	1280	1470	1650	1800	2110
380 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	2690	4290	6730															
	3/4	0.55	2000	3190	5010	7860														
	1	0.75	1620	2580	4060	6390	9980													
	1.5	1.1	1230	1970	3100	4890	7630													
	2	1.5	870	1390	2180	3450	5400	8380												
	3	2.2	680	1090	1710	2690	4200	6500	8020	9830										
	5	3.7	400	640	1010	1590	2490	3870	4780	5870	7230	8830								
	7.5	5.5	270	440	690	1090	1710	2640	3260	4000	4930	6010	7290	8780						
	10	7.5	**200**	**320**	510	800	1250	1930	2380	2910	3570	4330	5230	6260	7390	8280	9340			
	15	11	0	0	**370**	590	920	1430	1770	2170	2690	3290	4000	4840	5770	6520	7430	8250	8990	
	20	15	0	0	0	**440**	700	1090	1350	1670	2060	2530	3090	3760	4500	5110	5840	6510	7120	8190
	25	18.5	0	0	0	**360**	570	880	1100	1350	1670	2050	2510	3040	3640	4130	4720	5250	5740	6590
	30	22	0	0	0	0	**470**	730	910	1120	1380	1700	2080	2520	3020	3430	3920	4360	4770	5490
	40	30	0	0	0	0	0	**530**	660	820	1010	1240	1520	1840	2200	2500	2850	3170	3470	3990
	50	37	0	0	0	0	0	0	**540**	**660**	820	1000	1220	1480	1770	2010	2290	2550	2780	3190
	60	45	0	0	0	0	0	0	0	**560**	**690**	850	1030	1250	1500	1700	1940	2150	2350	2700
	75	55	0	0	0	0	0	0	0	0	**570**	**700**	**860**	1050	1270	1440	1660	1850	2030	2350
	100	75	0	0	0	0	0	0	0	0	0	**510**	**630**	**760**	910	1030	1180	1310	1430	1650
	125	93	0	0	0	0	0	0	0	0	0	0	0	**620**	**740**	**840**	**950**	1060	1160	1330
	150	110	0	0	0	0	0	0	0	0	0	0	0	0	**620**	**700**	**790**	**880**	**960**	1090
	175	130	0	0	0	0	0	0	0	0	0	0	0	0	0	**650**	**750**	**840**	**920**	1070
	200	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**630**	**700**	**760**	**880**

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See page 11 for additional details.

Continued on next page

Table 17 Three-Phase 60 °C Cable (Continued)

60 °C

MOTOR RATING			60 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
460 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	3770	6020	9460															
	3/4	0.55	2730	4350	6850															
	1	0.75	2300	3670	5770	9070														
	1.5	1.1	1700	2710	4270	6730														
	2	1.5	1300	2070	3270	5150	8050													
	3	2.2	1000	1600	2520	3970	6200													
	5	3.7	590	950	1500	2360	3700	5750												
	7.5	5.5	420	680	1070	1690	2640	4100	5100	6260	7680									
	10	7.5	310	500	790	1250	1960	3050	3800	4680	5750	7050								
	15	11	0	**340**	540	850	1340	2090	2600	3200	3930	4810	5900	7110						
	20	15	0	0	**410**	650	1030	1610	2000	2470	3040	3730	4580	5530						
	25	18.5	0	0	0	**530**	830	1300	1620	1990	2450	3010	3700	4470	5430					
	30	22	0	0	0	**430**	680	1070	1330	1640	2030	2490	3060	3700	4500	5130	5860			
	40	30	0	0	0	0	**500**	790	980	1210	1490	1830	2250	2710	3290	3730	4250			
	50	37	0	0	0	0	0	**640**	800	980	1210	1480	1810	2190	2650	3010	3420	3830	4180	4850
	60	45	0	0	0	0	0	**540**	**670**	**830**	1020	1250	1540	1850	2240	2540	2890	3240	3540	4100
	75	55	0	0	0	0	0	0	0	**680**	**840**	1030	1260	1520	1850	2100	2400	2700	2950	3440
	100	75	0	0	0	0	0	0	0	0	**620**	**760**	**940**	1130	1380	1560	1790	2010	2190	2550
	125	93	0	0	0	0	0	0	0	0	0	0	**740**	**890**	**1000**	1220	1390	1560	1700	1960
	150	110	0	0	0	0	0	0	0	0	0	0	0	**760**	**920**	**1050**	**1190**	1340	1460	1690
	175	130	0	0	0	0	0	0	0	0	0	0	0	0	**810**	**930**	**1060**	**1190**	1300	1510
	200	150	0	0	0	0	0	0	0	0	0	0	0	0	0	**810**	**920**	**1030**	**1130**	1310
575 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	5900	9410																
	3/4	0.55	4270	6810																
	1	0.75	3630	5800	9120															
	1.5	1.1	2620	4180	6580															
	2	1.5	2030	3250	5110	8060														
	3	2.2	1580	2530	3980	6270														
	5	3.7	920	1480	2330	3680	5750													
	7.5	5.5	660	1060	1680	2650	4150													
	10	7.5	490	780	1240	1950	3060	4770	5940											
	15	11	**330**	530	850	1340	2090	3260	4060											
	20	15	0	**410**	650	1030	1610	2520	3140	3860	4760	5830								
	25	18.5	0	0	**520**	830	1300	2030	2530	3110	3840	4710								
	30	22	0	0	**430**	680	1070	1670	2080	2560	3160	3880	4770	5780	7030	8000				
	40	30	0	0	0	**500**	790	1240	1540	1900	2330	2860	3510	4230	5140	5830				
	50	37	0	0	0	0	**640**	1000	1250	1540	1890	2310	2840	3420	4140	4700	5340	5990	6530	7580
	60	45	0	0	0	0	0	**850**	1060	1300	1600	1960	2400	2890	3500	3970	4520	5070	5530	6410
	75	55	0	0	0	0	0	**690**	**860**	**1060**	1310	1600	1970	2380	2890	3290	3750	5220	4610	5370
	100	75	0	0	0	0	0	0	0	**790**	**970**	**1190**	1460	1770	2150	2440	2790	3140	3430	3990
	125	93	0	0	0	0	0	0	0	0	**770**	**950**	**1160**	1400	1690	1920	2180	2440	2650	3070
	150	110	0	0	0	0	0	0	0	0	0	**800**	**990**	**1190**	1440	1630	1860	2080	2270	2640
	175	130	0	0	0	0	0	0	0	0	0	0	**870**	**1050**	**1270**	**1450**	1650	1860	2030	2360
	200	150	0	0	0	0	0	0	0	0	0	0	0	**920**	**1110**	**1260**	**1440**	1620	1760	2050

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See 11 for additional details.

Continued on next page

Table 18 Three-Phase 60 °C Cable (Continued)

60 °C

MOTOR RATING			60 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
200 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	160	250	420	660	1030	1620	2020	2490	3060	3730	4570	5500	6660	7540				
	7.5	5.5	110	180	300	460	730	1150	1440	1770	2170	2650	3250	3900	4720	5340				
	10	7.5	**80**	130	210	340	550	850	1080	1320	1630	1990	2460	2950	3580	4080	4650	5220	5700	6630
	15	11	0	0	**140**	240	370	580	730	900	1110	1360	1660	2010	2440	2770	3150	3520	3850	4470
	20	15	0	0	0	**170**	280	450	570	690	850	1050	1290	1570	1900	2160	2470	2770	3030	3540
	25	18.5	0	0	0	**140**	**220**	360	450	550	690	850	1050	1260	1540	1750	1990	2250	2460	2850
	30	22	0	0	0	0	**180**	294	370	460	570	700	870	1050	1270	1450	1660	1870	2040	2380
230 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	210	340	550	880	1380	2140	2680	3280	4030	4930	6040	7270	8800	9970				
	7.5	5.5	150	240	390	630	970	1530	1900	2340	2880	3510	4300	5160	6240	7060	8010	8950	9750	
	10	7.5	**110**	180	280	460	730	1140	1420	1750	2160	2640	3240	3910	4740	5380	6150	6900	7530	8760
	15	11	0	0	**190**	310	490	780	970	1200	1470	1800	2200	2670	3220	3660	4170	4660	5100	5910
	20	15	0	0	**140**	230	370	600	750	910	1140	1390	1710	2070	2520	2860	3270	3670	4020	4680
	25	18.5	0	0	0	**190**	300	480	600	750	910	1120	1380	1680	2040	2310	2640	2970	3240	3780
	30	22	0	0	0	**150**	**240**	390	490	610	760	930	1140	1390	1690	1920	2200	2470	2700	3160
380 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	600	960	1510	2380	3730	5800	7170	8800										
	7.5	5.5	400	660	1030	1630	2560	3960	4890	6000	7390	9010								
	10	7.5	300	480	760	1200	1870	2890	3570	4360	5350	6490	7840	9390						
	15	11	210	340	550	880	1380	2140	2650	3250	4030	4930	6000	7260	8650	9780				
	20	15	**160**	260	410	660	1050	1630	2020	2500	3090	3790	4630	5640	6750	7660	4260	9760		
	25	18.5	0	**210**	330	540	850	1320	1650	2020	2500	3070	3760	4560	5460	6190	7080	7870	8610	9880
	30	22	0	0	**270**	430	700	1090	1360	1680	2070	2550	3120	3780	4530	5140	5880	6540	7150	8230
	40	30	0	0	0	**320**	510	790	990	1230	1510	1860	2280	2760	3300	3750	4270	4750	5200	5980
	50	37	0	0	0	**250**	**400**	630	810	990	1230	1500	1830	2220	2650	3010	3430	3820	4170	4780
	60	45	0	0	0	0	**340**	540	660	840	1030	1270	1540	1870	2250	2550	2910	3220	3520	4050
	75	55	0	0	0	0	0	**450**	550	690	855	1050	1290	1570	1900	2160	2490	2770	3040	3520
	100	75	0	0	0	0	0	0	**420**	**520**	640	760	940	1140	1360	1540	1770	1960	2140	2470
	125	93	0	0	0	0	0	0	0	**400**	**490**	**600**	730	930	1110	1260	1420	1590	1740	1990
	150	110	0	0	0	0	0	0	0	0	**420**	**510**	**620**	750	930	1050	1180	1320	1440	1630
	175	130	0	0	0	0	0	0	0	0	**360**	**440**	**540**	660	780	970	1120	1260	1380	1600
	200	150	0	0	0	0	0	0	0	0	0	0	**480**	**580**	**690**	790	940	1050	1140	1320
460 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	880	1420	2250	3540	5550	8620												
	7.5	5.5	630	1020	1600	2530	3960	6150	7650	9390										
	10	7.5	460	750	1180	1870	2940	4570	5700	7020	8620									
	15	11	310	510	810	1270	2010	3130	3900	4800	5890	7210	8850							
	20	15	**230**	380	610	970	1540	2410	3000	3700	4560	5590	6870	8290						
	25	18.5	**190**	310	490	790	1240	1950	2430	2980	3670	4510	5550	6700	8140					
	30	22	0	**250**	410	640	1020	1600	1990	2460	3040	3730	4590	5550	6750	7690	8790			
	40	30	0	0	**300**	480	750	1180	1470	1810	2230	2740	3370	4060	4930	5590	6370			
	50	37	0	0	0	**370**	590	960	1200	1470	1810	2220	2710	3280	3970	4510	5130	5740	6270	7270
	60	45	0	0	0	**320**	**500**	810	1000	1240	1530	1870	2310	2770	3360	3810	4330	4860	5310	6150
	75	55	0	0	0	0	**420**	660	810	1020	1260	1540	1890	2280	2770	3150	3600	4050	4420	5160
	100	75	0	0	0	0	0	**500**	**610**	760	930	1140	1410	1690	2070	2340	2680	3010	3280	3820
	125	93	0	0	0	0	0	0	**470**	**590**	**730**	880	1110	1330	1500	1830	2080	2340	2550	2940
	150	110	0	0	0	0	0	0	0	**510**	**630**	**770**	950	1140	1380	1570	1790	2000	2180	2530
	175	130	0	0	0	0	0	0	0	0	**550**	**680**	**830**	1000	1220	1390	1580	1780	1950	2270
	200	150	0	0	0	0	0	0	0	0	0	**590**	**730**	**880**	1070	1210	1380	1550	1690	1970
575 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	1380	2220	3490	5520	8620													
	7.5	5.5	990	1590	2520	3970	6220													
	10	7.5	730	1170	1860	2920	4590	7150	8910											
	15	11	490	790	1270	2010	3130	4890	6090											
	20	15	370	610	970	1540	2410	3780	4710	5790	7140	8740								
	25	18.5	**300**	490	780	1240	1950	3040	3790	4660	5760	7060								
	30	22	**240**	400	645	1020	1600	2500	3120	3840	4740	5820	7150	8670						
	40	30	0	**300**	480	750	1180	1860	2310	2850	3490	4290	5260	6340	7710	8740				
	50	37	0	0	**380**	590	960	1500	1870	2310	2830	3460	4260	5130	6210	7050	8010	8980	9790	
	60	45	0	0	0	**500**	**790**	1270	1590	1950	2400	2940	3600	4330	5250	5950	6780	7600	8290	9610
	75	55	0	0	0	**420**	**660**	1030	1290	1590	1960	2400	2950	3570	4330	4930	5620	6330	6910	8050
	100	75	0	0	0	0	**400**	**780**	960	1180	1450	1780	2190	2650	3220	3660	4180	4710	5140	5980
	125	93	0	0	0	0	0	**600**	**740**	920	1150	1420	1740	2100	2530	2880	3270	3660	3970	4600
	150	110	0	0	0	0	0	0	**650**	**800**	**990**	1210	1480	1780	2160	2450	2790	3120	3410	3950
	175	130	0	0	0	0	0	0	0	**700**	**860**	1060	1300	1570	1910	2170	2480	2780	3040	3540
	200	150	0	0	0	0	0	0	0	0	**760**	**930**	1140	1370	1670	1890	2160	2420	2640	3070

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See page 11 for additional details.

Table 19 Three-Phase 75 °C Cable, 60 Hz (Service Entrance to Motor) Maximum Length in Feet

75 °C

MOTOR RATING			75 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
200 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	710	1140	1800	2840	4420													
	3/4	0.55	510	810	1280	2030	3160													
	1	0.75	430	690	1080	1710	2670	4140	5140											
	1.5	1.1	310	500	790	1260	1960	3050	3780											
	2	1.5	240	390	610	970	1520	2360	2940	3610	4430	5420								
	3	2.2	180	290	470	740	1160	1810	2250	2760	3390	4130								
	5	3.7	**110**	170	280	440	690	1080	1350	1660	2040	2490	3050	3670	4440	5030				
	7.5	5.5	0	0	200	310	490	770	960	1180	1450	1770	2170	2600	3150	3560				
	10	7.5	0	0	**150**	230	370	570	720	880	1090	1330	1640	1970	2390	2720	3100	3480	3800	4420
	15	11	0	0	0	**160**	250	390	490	600	740	910	1110	1340	1630	1850	2100	2350	2570	2980
	20	15	0	0	0	0	**190**	300	380	460	570	700	860	1050	1270	1440	1650	1850	2020	2360
	25	18.5	0	0	0	0	0	**240**	300	370	460	570	700	840	1030	1170	1330	1500	1640	1900
	30	22	0	0	0	0	0	**200**	**250**	310	380	470	580	700	850	970	1110	1250	1360	1590
230 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	930	1490	2350	3700	5760	8910												
	3/4	0.55	670	1080	1700	2580	4190	6490	8060	9860										
	1	0.75	560	910	1430	2260	3520	5460	6780	8290										
	1.5	1.1	420	670	1060	1670	2610	4050	5030	6160	7530	9170								
	2	1.5	320	510	810	1280	2010	3130	3890	4770	5860	7170	8780							
	3	2.2	240	390	620	990	1540	2400	2980	3660	4480	5470	6690	8020	9680					
	5	3.7	**140**	230	370	590	920	1430	1790	2190	2690	3290	4030	4850	5870	6650	7560	8460	9220	
	7.5	5.5	0	**160**	260	420	650	1020	1270	1560	1920	2340	2870	3440	4160	4710	5340	5970	6500	7510
	10	7.5	0	0	**190**	310	490	760	950	1170	1440	1760	2160	2610	3160	3590	4100	4600	5020	5840
	15	11	0	0	0	**210**	330	520	650	800	980	1200	1470	1780	2150	2440	2780	3110	3400	3940
	20	15	0	0	0	**160**	**250**	400	500	610	760	930	1140	1380	1680	1910	2180	2450	2680	3120
	25	18.5	0	0	0	0	**200**	320	400	500	610	750	920	1120	1360	1540	1760	1980	2160	2520
	30	22	0	0	0	0	0	**260**	330	410	510	620	760	930	1130	1280	1470	1650	1800	2110
380 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	2690	4290	6730															
	3/4	0.55	2000	3190	5010	7860														
	1	0.75	1620	2580	4060	6390	9980													
	1.5	1.1	1230	1970	3100	4890	7630													
	2	1.5	870	1390	2180	3450	5400	8380												
	3	2.2	680	1090	1710	2690	4200	6500	8020	9830										
	5	3.7	400	640	1010	1590	2490	3870	4780	5870	7230	8830								
	7.5	5.5	270	440	690	1090	1710	2640	3260	4000	4930	6010	7290	8780						
	10	7.5	**200**	320	510	800	1250	1930	2380	2910	3570	4330	5230	6260	7390	8280	9340			
	15	11	0	0	370	590	920	1430	1770	2170	2690	3290	4000	4840	5770	6520	7430	8250	8990	
	20	15	0	0	**280**	440	700	1090	1350	1670	2060	2530	3090	3760	4500	5110	2840	6510	7120	8190
	25	18.5	0	0	0	**360**	570	880	1100	1350	1670	2050	2510	3040	3640	4130	4720	5250	5740	6590
	30	22	0	0	0	**290**	470	730	910	1120	1380	1700	2080	2520	3020	3430	3920	4360	4770	5490
	40	30	0	0	0	0	0	**530**	660	820	1010	1240	1520	1840	2200	2500	2850	3170	3470	3990
	50	37	0	0	0	0	0	**440**	**540**	660	820	1000	1220	1480	1770	2010	2290	2550	2780	3190
	60	45	0	0	0	0	0	**370**	**460**	**560**	690	850	1030	1250	1500	1700	1940	2150	2350	2700
	75	55	0	0	0	0	0	0	0	**460**	**570**	700	860	1050	1270	1440	1660	1850	2030	2350
	100	75	0	0	0	0	0	0	0	0	**420**	**510**	**630**	760	910	1030	1180	1310	1430	1650
	125	93	0	0	0	0	0	0	0	0	0	0	**510**	**620**	**740**	840	950	1060	1160	1330
	150	110	0	0	0	0	0	0	0	0	0	0	0	**520**	**620**	**700**	**790**	880	960	1090
	175	130	0	0	0	0	0	0	0	0	0	0	0	0	**560**	**650**	**750**	**840**	920	1070
	200	150	0	0	0	0	0	0	0	0	0	0	0	0	0	**550**	**630**	**700**	**760**	880

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See page 11 for additional details.

Continued on next page

Table 20 Three-Phase 75 °C Cable (Continued)

75 °C

MOTOR RATING			75 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
460 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	3770	6020	9460															
	3/4	0.55	2730	4350	6850															
	1	0.75	2300	3670	5770	9070														
	1.5	1.1	1700	2710	4270	6730														
	2	1.5	1300	2070	3270	5150	8050													
	3	2.2	1000	1600	2520	3970	6200													
	5	3.7	590	950	1500	2360	3700	5750												
	7.5	5.5	420	680	1070	1690	2640	4100	5100	6260	7680									
	10	7.5	310	500	790	1250	1960	3050	3800	4680	5750	7050								
	15	11	0	**340**	540	850	1340	2090	2600	3200	3930	4810	5900	7110						
	20	15	0	0	410	650	1030	1610	2000	2470	3040	3730	4580	5530						
	25	18.5	0	0	**330**	530	830	1300	1620	1990	2450	3010	3700	4470	5430					
	30	22	0	0	**270**	430	680	1070	1330	1640	2030	2490	3060	3700	4500	5130	5860			
	40	30	0	0	0	**320**	**500**	790	980	1210	1490	1830	2250	2710	3290	3730	4250			
	50	37	0	0	0	0	**410**	640	800	980	1210	1480	1810	2190	2650	3010	3420	3830	4180	4850
	60	45	0	0	0	0	0	**540**	**670**	830	1020	1250	1540	1850	2240	2540	2890	3240	3540	4100
	75	55	0	0	0	0	0	**440**	**550**	**680**	840	1030	1260	1520	1850	2100	2400	2700	2950	3440
	100	75	0	0	0	0	0	0	0	**500**	**620**	**760**	940	1130	1380	1560	1790	2010	2190	2550
	125	93	0	0	0	0	0	0	0	0	0	**600**	**740**	**890**	1000	1220	1390	1560	1700	1960
	150	110	0	0	0	0	0	0	0	0	0	0	**630**	**760**	**920**	1050	1190	1340	1460	1690
	175	130	0	0	0	0	0	0	0	0	0	0	0	**670**	**810**	**930**	1060	1190	1300	1510
	200	150	0	0	0	0	0	0	0	0	0	0	0	**590**	**710**	**810**	**920**	1030	1130	1310
575 V 60 Hz Three-Phase 3 - Lead	1/2	0.37	5900	9410																
	3/4	0.55	4270	6810																
	1	0.75	3630	5800	9120															
	1.5	1.1	2620	4180	6580															
	2	1.5	2030	3250	5110	8060														
	3	2.2	1580	2530	3980	6270														
	5	3.7	920	1480	2330	3680	5750													
	7.5	5.5	660	1060	1680	2650	4150													
	10	7.5	490	780	1240	1950	3060	4770	5940											
	15	11	**330**	530	850	1340	2090	3260	4060											
	20	15	0	**410**	650	1030	1610	2520	3140	3860	4760	5830								
	25	18.5	0	0	520	830	1300	2030	2530	3110	3840	4710								
	30	22	0	0	**430**	680	1070	1670	2080	2560	3160	3880	4770	5780	7030	8000				
	40	30	0	0	0	**500**	790	1240	1540	1900	2330	2860	3510	4230	5140	5830				
	50	37	0	0	0	**410**	**640**	1000	1250	1540	1890	2310	2840	3420	4140	4700	5340	5990	6530	7580
	60	45	0	0	0	0	**540**	850	1060	1300	1600	1960	2400	2890	3500	3970	4520	5070	5530	6410
	75	55	0	0	0	0	0	**690**	860	1060	1310	1600	1970	2380	2890	3290	3750	5220	4610	5370
	100	75	0	0	0	0	0	0	**640**	**790**	970	1190	1460	1770	2150	2440	2790	3140	3430	3990
	125	93	0	0	0	0	0	0	0	**630**	**770**	**950**	1160	1400	1690	1920	2180	2440	2650	3070
	150	110	0	0	0	0	0	0	0	0	**660**	**800**	**990**	1190	1440	1630	1860	2080	2270	2640
	175	130	0	0	0	0	0	0	0	0	0	**700**	**870**	**1050**	1270	1450	1650	1860	2030	2360
	200	150	0	0	0	0	0	0	0	0	0	0	**760**	**920**	**1110**	1260	1440	1620	1760	2050

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See page 11 for additional details.

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APPLICATION
Three-Phase Motors

Table 21 Three-Phase 75 °C Cable (Continued)

75 °C

MOTOR RATING			75 °C INSULATION - AWG COPPER WIRE SIZE													MCM COPPER WIRE SIZE				
VOLTS	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
200 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	160	250	420	660	1030	1620	2020	2490	3060	3730	4570	5500	6660	7540				
	7.5	5.5	110	180	300	460	730	1150	1440	1770	2170	2650	3250	3900	4720	5340				
	10	7.5	**80**	130	210	340	550	850	1080	1320	1630	1990	2460	2950	3580	4080	4650	5220	5700	6630
	15	11	0	0	140	240	370	580	730	900	1110	1360	1660	2010	2440	2770	3150	3520	3850	4470
	20	15	0	0	**120**	170	280	450	570	690	850	1050	1290	1570	1900	2160	2470	2770	3030	3540
	25	18.5	0	0	0	**140**	220	360	450	550	690	850	1050	1260	1540	1750	1990	2250	2460	2850
	30	22	0	0	0	**120**	**180**	294	370	460	570	700	870	1050	1270	1450	1660	1870	2040	2380
230 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	210	340	550	880	1380	2140	2680	3280	4030	4930	6040	7270	8800	9970				
	7.5	5.5	150	240	390	630	970	1530	1900	2340	2880	3510	4300	5160	6240	7060	8010	8950	9750	
	10	7.5	**110**	180	280	460	730	1140	1420	1750	2160	2640	3240	3910	4740	5380	6150	6900	7530	8760
	15	11	0	**130**	190	310	490	780	970	1200	1470	1800	2200	2670	3220	3660	4170	4660	5100	5910
	20	15	0	0	**140**	230	370	600	750	910	1140	1390	1710	2070	2520	2860	3270	3670	4020	4680
	25	18.5	0	0	**120**	190	300	480	600	750	910	1120	1380	1680	2040	2310	2640	2970	3240	3780
	30	22	0	0	0	**150**	240	390	490	610	760	930	1140	1390	1690	1920	2200	2470	2700	3160
380 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	600	960	1510	2380	3730	5800	7170	8800										
	7.5	5.5	400	660	1030	1630	2560	3960	4890	6000	7390	9010								
	10	7.5	300	480	760	1200	1870	2890	3570	4360	5350	6490	7840	9390						
	15	11	210	340	550	880	1380	2140	2650	3250	4030	4930	6000	7260	8650	9780				
	20	15	**160**	260	410	660	1050	1630	2020	2500	3090	3790	4630	5640	6750	7660	4260	9760		
	25	18.5	0	**210**	330	540	850	1320	1650	2020	2500	3070	3760	4560	5460	6190	7080	7870	8610	9880
	30	22	0	0	**270**	430	700	1090	1360	1680	2070	2550	3120	3780	4530	5140	5880	6540	7150	8230
	40	30	0	0	**210**	320	510	790	990	1230	1510	1860	2280	2760	3300	3750	4270	4750	5200	5980
	50	37	0	0	0	**250**	400	630	810	990	1230	1500	1830	2220	2650	3010	3430	3820	4170	4780
	60	45	0	0	0	0	**340**	540	660	840	1030	1270	1540	1870	2250	2550	2910	3220	3520	4050
	75	55	0	0	0	0	**290**	450	550	690	855	1050	1290	1570	1900	2160	2490	2770	3040	3520
	100	75	0	0	0	0	0	**340**	**420**	520	640	760	940	1140	1360	1540	1770	1960	2140	2470
	125	93	0	0	0	0	0	0	**340**	**400**	**490**	600	730	930	1110	1260	1420	1590	1740	1990
	150	110	0	0	0	0	0	0	0	**350**	**420**	**510**	620	750	930	1050	1180	1320	1440	1630
	175	130	0	0	0	0	0	0	0	0	**360**	**440**	**540**	660	780	970	1120	1260	1380	1600
	200	150	0	0	0	0	0	0	0	0	0	**410**	**480**	**580**	690	790	940	1050	1140	1320
460 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	880	1420	2250	3540	5550	8620												
	7.5	5.5	630	1020	1600	2530	3960	6150	7650	9390										
	10	7.5	460	750	1180	1870	2940	4570	5700	7020	8620									
	15	11	310	510	810	1270	2010	3130	3900	4800	5890	7210	8850							
	20	15	230	380	610	970	1540	2410	3000	3700	4560	5590	6870	8290						
	25	18.5	**190**	310	490	790	1240	1950	2430	2980	3670	4510	5550	6700	8140					
	30	22	0	**250**	410	640	1020	1600	1990	2460	3040	3730	4590	5550	6750	7690	8790			
	40	30	0	0	**300**	480	750	1180	1470	1810	2230	2740	3370	4060	4930	5590	6370			
	50	37	0	0	**250**	370	590	960	1200	1470	1810	2220	2710	3280	3970	4510	5130	5740	6270	7270
	60	45	0	0	0	**320**	500	810	1000	1240	1530	1870	2310	2770	3360	3810	4330	4860	5310	6150
	75	55	0	0	0	0	**420**	660	810	1020	1260	1540	1890	2280	2770	3150	3600	4050	4420	5160
	100	75	0	0	0	0	**310**	**500**	610	760	930	1140	1410	1690	2070	2340	2680	3010	3280	3820
	125	93	0	0	0	0	0	**390**	**470**	**590**	730	880	1110	1330	1500	1830	2080	2340	2550	2940
	150	110	0	0	0	0	0	0	**420**	**510**	**630**	770	950	1140	1380	1570	1790	2000	2180	2530
	175	130	0	0	0	0	0	0	0	**450**	**550**	**680**	830	1000	1220	1390	1580	1780	1950	2270
	200	150	0	0	0	0	0	0	0	0	**480**	**590**	**730**	880	1070	1210	1380	1550	1690	1970
575 V 60 Hz Three-Phase 6 - Lead Y-D	5	3.7	1380	2220	3490	5520	8620													
	7.5	5.5	990	1590	2520	3970	6220													
	10	7.5	730	1170	1860	2920	4590	7150	8910											
	15	11	490	790	1270	2010	3130	4890	6090											
	20	15	370	610	970	1540	2410	3780	4710	5790	7140	8740								
	25	18.5	**300**	490	780	1240	1950	3040	3790	4660	5760	7060								
	30	22	**240**	400	645	1020	1600	2500	3120	3840	4740	5820	7150	8670						
	40	30	0	**300**	480	750	1180	1860	2310	2850	3490	4290	5260	6340	7710	8740				
	50	37	0	0	**380**	590	960	1500	1870	2310	2830	3460	4260	5130	6210	7050	8010	8980	9790	
	60	45	0	0	**330**	500	790	1270	1590	1950	2400	2940	3600	4330	5250	5950	6780	7600	8290	9610
	75	55	0	0	0	**420**	660	1030	1290	1590	1960	2400	2950	3570	4330	4930	5620	6330	6910	8050
	100	75	0	0	0	0	**400**	780	960	1180	1450	1780	2190	2650	3220	3660	4180	4710	5140	5980
	125	93	0	0	0	0	0	**600**	740	920	1150	1420	1740	2100	2530	2880	3270	3660	3970	4600
	150	110	0	0	0	0	0	**520**	**650**	800	990	1210	1480	1780	2160	2450	2790	3120	3410	3950
	175	130	0	0	0	0	0	0	**570**	**700**	860	1060	1300	1570	1910	2170	2480	2780	3040	3540
	200	150	0	0	0	0	0	0	**500**	**610**	**760**	930	1140	1370	1670	1890	2160	2420	2640	3070

Lengths in **BOLD** only meet the US National Electrical Code ampacity requirements for individual conductors in free air or water. Lengths NOT in bold meet NEC ampacity requirements for either individual conductors or jacketed cable. See page 11 for additional details.

Table 22 Three-Phase Motor Specifications (60 Hz) 3450 rpm

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM LOAD		LINE TO LINE RESISTANCE OHMS	EFFICIENCY %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	AMPS	WATTS	AMPS	WATTS		S.F.	F.L.		
4"	234501	1/2	0.37	200	60	1.6	2.8	585	3.4	860	6.6-8.4	70	64	17.5	N
	234511			230	60	1.6	2.4	585	2.9	860	9.5-10.9	70	64	15.2	N
	234541			380	60	1.6	1.4	585	2.1	860	23.2-28.6	70	64	9.2	N
	234521			460	60	1.6	1.2	585	1.5	860	38.4-44.1	70	64	7.6	N
	234531			575	60	1.6	1.0	585	1.2	860	58.0-71.0	70	64	6.1	N
	234502	3/4	0.55	200	60	1.5	3.6	810	4.4	1150	4.6-5.9	73	69	24.6	N
	234512			230	60	1.5	3.1	810	3.8	1150	6.8-7.8	73	69	21.4	N
	234542			380	60	1.5	1.9	810	2.5	1150	16.6-20.3	73	69	13	N
	234522			460	60	1.5	1.6	810	1.9	1150	27.2-30.9	73	69	10.7	N
	234532			575	60	1.5	1.3	810	1.6	1150	41.5-50.7	73	69	8.6	N
	234503	1	0.75	200	60	1.4	4.5	1070	5.4	1440	3.8-4.5	72	70	30.9	M
	234513			230	60	1.4	3.9	1070	4.7	1440	4.9-5.6	72	70	26.9	M
	234543			380	60	1.4	2.3	1070	2.8	1440	12.2-14.9	72	70	16.3	M
	234523			460	60	1.4	2	1070	2.4	1440	19.9-23.0	72	70	13.5	M
	234533			575	60	1.4	1.6	1070	1.9	1440	30.1-36.7	72	70	10.8	M
	234504	1.5	1.1	200	60	1.3	5.8	1460	6.8	1890	2.5-3.0	76	76	38.2	K
	234514			230	60	1.3	5	1460	5.9	1890	3.2-4.0	76	76	33.2	K
	234544			380	60	1.3	3	1460	3.6	1890	8.5-10.4	76	76	20.1	K
	234524			460	60	1.3	2.5	1460	3.1	1890	13.0-16.0	76	76	16.6	K
	234534			575	60	1.3	2	1460	2.4	1890	20.3-25.0	76	76	13.3	K
	234305	2	1.5	200	60	1.25	7.7	1960	9.3	2430	1.8-2.4	76	76	50.3	K
	234315			230	60	1.25	6.7	1960	8.1	2430	2.3-3.0	76	76	45.0	K
	234345			380	60	1.25	4.1	1960	4.9	2430	6.6-8.2	76	76	26.6	K
	234325			460	60	1.25	3.4	1960	4.1	2430	9.2-12.0	76	76	22.5	K
	234335			575	60	1.25	2.7	1960	3.2	2430	14.6-18.7	76	76	17.8	K
	234306	3	2.2	200	60	1.15	10.9	2920	12.5	3360	1.3-1.7	77	77	69.5	K
	234316			230	60	1.15	9.5	2920	10.9	3360	1.8-2.2	77	77	60.3	K
	234346			380	60	1.15	5.8	2920	6.6	3360	4.7-6.0	77	77	37.5	K
	234326			460	60	1.15	4.8	2920	5.5	3360	7.2-8.8	77	77	31.0	K
	234336			575	60	1.15	3.8	2920	4.4	3360	11.4-13.9	77	77	25.1	K
	234307	5	3.7	200	60	1.15	18.3	4800	20.5	5500	.68-.83	78	78	116	K
	234317			230	60	1.15	15.9	4800	17.8	5500	.91-1.1	78	78	102	K
	234347			380	60	1.15	9.6	4800	10.8	5500	2.6-3.2	78	78	60.2	K
	234327			460	60	1.15	8.0	4800	8.9	5500	3.6-4.4	78	78	53.7	K
	234337			575	60	1.15	6.4	4800	7.1	5500	5.6-6.9	78	78	41.8	K
	234308	7.5	5.5	200	60	1.15	26.5	7150	30.5	8200	.43-.53	78	78	177	K
	234318			230	60	1.15	23.0	7150	26.4	8200	.60-.73	78	78	152	K
	234348			380	60	1.15	13.9	7150	16.0	8200	1.6-2.0	78	78	92.7	K
	234328			460	60	1.15	11.5	7150	13.2	8200	2.3-2.8	78	78	83.8	K
	234338			575	60	1.15	9.2	7150	10.6	8200	3.6-4.5	78	78	64.6	K
	234549	10	7.5	380	60	1.15	19.3	10000	21.0	11400	1.2-1.6	75	75	140	L
	234595			460	60	1.15	15.9	10000	17.3	11400	1.8-2.3	75	75	116.0	L
	234598			575	60	1.15	12.5	10000	13.6	11400	2.8-3.5	75	75	92.8	L

Table 23 Three-Phase Motor Fuse Sizing

TYPE	MOTOR MODEL PREFIX	RATING			CIRCUIT BREAKERS OR FUSE AMPS (MAXIMUM PER NEC)			CIRCUIT BREAKERS OR FUSE AMPS (TYPICAL SUBMERSIBLE)		
		HP	KW	VOLTS	STANDARD FUSE	DUAL ELEMENT TIME DELAY FUSE	CIRCUIT BREAKER	STANDARD FUSE	DUAL ELEMENT TIME DELAY FUSE	CIRCUIT BREAKER
4"	234501	1/2	0.37	200	10	5	8	10	4	15
	234511			230	8	4.5	6	8	4	15
	234541			380	5	2.5	4	5	2	15
	234521			460	4	2.25	3	4	2	15
	234531			575	3	1.8	3	3	1.4	15
	234502	3/4	0.55	200	15	7	10	12	5	15
	234512			230	10	5.6	8	10	5	15
	234542			380	6	3.5	5	6	3	15
	234522			460	5	2.8	4	5	3	15
	234532			575	4	2.5	4	4	1.8	15
	234503	1	0.75	200	15	8	15	15	6	15
	234513			230	15	7	10	12	6	15
	234543			380	8	4.5	8	8	4	15
	234523			460	6	3.5	5	6	3	15
	234533			575	5	2.8	4	5	2.5	15
	234504	1.5	1.1	200	20	12	15	20	8	15
	234514			230	15	9	15	15	8	15
	234544			380	10	5.6	8	10	4	15
	234524			460	8	4.5	8	8	4	15
	234534			575	6	3.5	5	6	3	15
	234305	2	1.5	200	25	15	20	25	11	20
	234315			230	25	12	20	25	10	20
	234345			380	15	8	15	15	6	15
	234325			460	15	6	10	11	5	15
	234335			575	10	5	8	10	4	15
	234306	3	2.2	200	35	20	30	35	15	30
	234316			230	30	17.5	25	30	12	25
	234346			380	20	12	15	20	8	15
	234326			460	15	9	15	15	6	15
	234336			575	15	7	10	11	5	15
	234307	5	3.7	200	60	35	50	60	25	50
	234317			230	50	30	40	45	20	40
	234347			380	30	17.5	25	30	12	25
	234327			460	25	15	20	25	10	20
	234337			575	20	12	20	20	8	20
	234308	7.5	5.5	200	90	50	70	80	35	70
	234318			230	80	45	60	70	30	60
	234348			380	45	25	40	40	20	40
	234328			460	40	25	30	35	15	30
	234338			575	30	17.5	25	30	12	25
	234349	10	7.5	380	70	40	60	60	25	60
	234329			460	60	30	45	50	25	45
	234339			575	45	25	35	40	20	35
	234549			380	70	35	60	60	25	60
	234595			460	60	30	45	50	25	45
	234598			575	45	25	35	40	20	35

Table 24 Three-Phase Motor Specifications (60 Hz) 3450 rpm

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM LOAD		LINE TO LINE RESISTANCE OHMS	EFFICIENCY %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	AMPS	WATTS	AMPS	WATTS		S.F.	F.L.		
6" STD.	236650	5	3.7	200	60	1.15	17.5	4700	20.0	5400	.77-.93	79	79	99	H
	236600			230	60	1.15	15	4700	17.6	5400	1.0-1.2	79	79	86	H
	236660			380	60	1.15	9.1	4700	10.7	5400	2.6-3.2	79	79	52	H
	236610			460	60	1.15	7.5	4700	8.8	5400	3.9-4.8	79	79	43	H
	236620			575	60	1.15	6	4700	7.1	5400	6.3-7.7	79	79	34	H
	236651	7.5	5.5	200	60	1.15	25.1	7000	28.3	8000	.43-.53	80	80	150	H
	236601			230	60	1.15	21.8	7000	24.6	8000	.64-.78	80	80	130	H
	236661			380	60	1.15	13.4	7000	15	8000	1.6-2.1	80	80	79	H
	236611			460	60	1.15	10.9	7000	12.3	8000	2.4-2.9	80	80	65	H
	236621			575	60	1.15	8.7	7000	9.8	8000	3.7-4.6	80	80	52	H
	236652	10	7.5	200	60	1.15	32.7	9400	37	10800	.37-.45	79	79	198	H
	236602			230	60	1.15	28.4	9400	32.2	10800	.47-.57	79	79	172	H
	236662			380	60	1.15	17.6	9400	19.6	10800	1.2-1.5	79	79	104	H
	236612			460	60	1.15	14.2	9400	16.1	10800	1.9-2.4	79	79	86	H
	236622			575	60	1.15	11.4	9400	12.9	10800	3.0-3.7	79	79	69	H
	236653	15	11	200	60	1.15	47.8	13700	54.4	15800	.24-.29	81	81	306	H
	236603			230	60	1.15	41.6	13700	47.4	15800	.28-.35	81	81	266	H
	236663			380	60	1.15	25.8	13700	28.9	15800	.77-.95	81	81	161	H
	236613			460	60	1.15	20.8	13700	23.7	15800	1.1-1.4	81	81	133	H
	236623			575	60	1.15	16.6	13700	19	15800	1.8-2.3	81	81	106	H
	236654	20	15	200	60	1.15	61.9	18100	69.7	20900	.16-.20	82	82	416	J
	236604			230	60	1.15	53.8	18100	60.6	20900	.22-.26	82	82	362	J
	236664			380	60	1.15	33	18100	37.3	20900	.55-.68	82	82	219	J
	236614			460	60	1.15	26.9	18100	30.3	20900	.8-1.0	82	82	181	J
	236624			575	60	1.15	21.5	18100	24.2	20900	1.3-1.6	82	82	145	J
	236655	25	18.5	200	60	1.15	77.1	22500	86.3	25700	.12-.15	83	83	552	J
	236605			230	60	1.15	67	22500	75	25700	.15-.19	83	83	480	J
	236665			380	60	1.15	41	22500	46	25700	.46-.56	83	83	291	J
	236615			460	60	1.15	33.5	22500	37.5	25700	.63-.77	83	83	240	J
	236625			575	60	1.15	26.8	22500	30	25700	1.0-1.3	83	83	192	J
	236656			200	60	1.15	90.9	26900	104	31100	.09-.11	83	83	653	J
	236606			230	60	1.15	79	26900	90.4	31100	.14-.17	83	83	568	J
	236666	30	22	380	60	1.15	48.8	26900	55.4	31100	.35-.43	83	83	317	J
	236616			460	60	1.15	39.5	26900	45.2	31100	.52-.64	83	83	284	J
	236626			575	60	1.15	31.6	26900	36.2	31100	.78-.95	83	83	227	J
	236667	40	30	380	60	1.15	66.5	35600	74.6	42400	.26-.33	83	83	481	J
	236617			460	60	1.15	54.9	35600	61.6	42400	.34-.42	83	83	397	J
	236627			575	60	1.15	42.8	35600	49.6	42400	.52-.64	83	83	318	H
	236668	50	37	380	60	1.15	83.5	45100	95	52200	.21-.25	82	83	501	H
	236618			460	60	1.15	67.7	45100	77	52200	.25-.32	82	83	414	H
	236628			575	60	1.15	54.2	45100	61.6	52200	.40-.49	82	83	331	H
	276668			380	60	1.15	82.4	45100	94.5	52200	.21 - .25	82	83	501	H
	276618			460	60	1.15	68.1	45100	78.1	52200	.25 - .32	82	83	414	H
	276628			575	60	1.15	54.5	45100	62.5	52200	.40 - .49	82	83	331	H
	236669	60	45	380	60	1.15	98.7	53500	111	61700	.15-.18	84	84	627	H
	236619			460	60	1.15	80.5	53500	91	61700	.22-.27	84	84	518	H
	236629			575	60	1.15	64.4	53500	72.8	61700	.35-.39	84	84	414	H
	276669			380	60	1.15	98.1	53500	111.8	61700	.15 - .18	84	84	627	H
	276619			460	60	1.15	81.0	53500	92.3	61700	.22 - .27	84	84	518	H
	276629			575	60	1.15	64.8	53500	73.9	61700	.35 - .39	84	84	414	H

Model numbers above are for three-lead motors. Six-lead motors with different model numbers have the same running performance, but when Wye connected for starting have locked rotor amps 33% of the values shown. Six-lead individual phase resistance = table X 1.5.

Table 25 6" Three-Phase Motor Specifications (60 Hz) 3450 rpm

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM LOAD		LINE TO LINE RESISTANCE OHMS	EFFICIENCY %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	AMPS	WATTS	AMPS	WATTS		S.F.	F.L.		
6" HI-TEMP 90 °C	276650	5	3.7	200	60	1.15	17.2	5200	19.8	5800	.53 - .65	73	72	124	K
	276600			230	60	1.15	15.0	5200	17.2	5800	.68 - .84	73	72	108	K
	276660			380	60	1.15	9.1	5200	10.4	5800	2.0 - 2.4	73	72	66.0	K
	276610			460	60	1.15	7.5	5200	8.6	5800	2.8 - 3.4	73	72	54.0	K
	276620			575	60	1.15	6.0	5200	6.9	5800	4.7 - 5.7	73	72	43.0	K
	276651	7.5	5.5	200	60	1.15	24.8	7400	28.3	8400	.30 - .37	77	76	193	K
	276601			230	60	1.15	21.6	7400	24.6	8400	.41 - .50	77	76	168	K
	276661			380	60	1.15	13.1	7400	14.9	8400	1.1 - 1.4	77	76	102	K
	276611			460	60	1.15	10.8	7400	12.3	8400	1.7 - 2.0	77	76	84.0	K
	276621			575	60	1.15	8.6	7400	9.9	8400	2.6 - 3.2	77	76	67.0	K
	276652	10	7.5	200	60	1.15	32.0	9400	36.3	10700	.21 - .26	80	79	274	L
	276602			230	60	1.15	27.8	9400	31.6	10700	.28 - .35	80	79	238	L
	276662			380	60	1.15	16.8	9400	19.2	10700	.80 - .98	80	79	144	L
	276612			460	60	1.15	13.9	9400	15.8	10700	1.2 - 1.4	80	79	119	L
	276622			575	60	1.15	11.1	9400	12.7	10700	1.8 - 2.2	80	79	95.0	L
	276653	15	11	200	60	1.15	48.5	14000	54.5	15900	.15 - .19	81	80	407	L
	276603			230	60	1.15	42.2	14000	47.4	15900	.19 - .24	81	80	354	L
	276663			380	60	1.15	25.5	14000	28.7	15900	.52 - .65	81	80	214	L
	276613			460	60	1.15	21.1	14000	23.7	15900	.78 - .96	81	80	177	L
	276623			575	60	1.15	16.9	14000	19.0	15900	1.2 - 1.4	81	80	142	L
	276654	20	15	200	60	1.15	64.9	18600	73.6	21300	.10 - .12	80	80	481	K
	276604			230	60	1.15	56.4	18600	64.0	21300	.14 - .18	80	80	418	K
	276664			380	60	1.15	34.1	18600	38.8	21300	.41 - .51	80	80	253	K
	276614			460	60	1.15	28.2	18600	32.0	21300	.58 - .72	80	80	209	K
	276624			575	60	1.15	22.6	18600	25.6	21300	.93 - 1.15	80	80	167	K
	276655	25	18.5	200	60	1.15	80.0	22600	90.6	25800	.09 - .11	83	82	665	L
	276605			230	60	1.15	69.6	22600	78.8	25800	.11 - .14	83	82	578	L
	276665			380	60	1.15	42.1	22600	47.7	25800	.27 - .34	83	82	350	L
	276615			460	60	1.15	34.8	22600	39.4	25800	.41 - .51	83	82	289	L
	276625			575	60	1.15	27.8	22600	31.6	25800	.70 - .86	83	82	231	L
	276656	30	22	200	60	1.15	95.0	28000	108.6	31900	.07 - .09	81	80	736	K
	276606			230	60	1.15	82.6	28000	94.4	31900	.09 - .12	81	80	640	K
	276666			380	60	1.15	50.0	28000	57.2	31900	.23 - .29	81	80	387	K
	276616			460	60	1.15	41.3	28000	47.2	31900	.34 - .42	81	80	320	K
	276626			575	60	1.15	33.0	28000	37.8	31900	.52 - .65	81	80	256	K
	276667	40	30	380	60	1.15	67.2	35900	76.0	42400	.18 - .23	84	83	545	L
	276617			460	60	1.15	55.4	35900	62.8	42400	.23 - .29	84	83	450	L
	276627			575	60	1.15	45.2	35900	50.2	42400	.34 - .43	84	83	360	L

Model numbers above are for three-lead motors. Six-lead motors with different model numbers have the same running performance, but when Wye connected for starting have locked rotor amps 33% of the values shown. Six-lead individual phase resistance = table X 1.5.

Table 26 Three-Phase Motor Fuse Sizing

TYPE	MOTOR MODEL PREFIX		RATING			CIRCUIT BREAKERS OR FUSE AMPS (MAXIMUM PER NEC)			CIRCUIT BREAKERS OR FUSE AMPS (TYPICAL SUBMERSIBLE)		
			HP	KW	VOLTS	STANDARD FUSE	DUAL ELEMENT TIME DELAY FUSE	CIRCUIT BREAKER	STANDARD FUSE	DUAL ELEMENT TIME DELAY FUSE	CIRCUIT BREAKER
6" STD. & HI-TEMP	236650	276650	5	3.7	200	60	35	45	50	25	45
	236600	276600			230	45	30	40	45	20	40
	236660	276660			380	30	17.5	25	30	12	25
	236610	276610			460	25	15	20	25	10	20
	236620	276620			575	20	12	15	20	8	15
	236651	276651	7.5	5.5	200	80	45	70	80	35	70
	236601	276601			230	70	40	60	70	30	60
	236661	276661			380	45	25	35	40	20	35
	236611	276611			460	35	20	30	35	15	30
	236621	276621			575	30	17.5	25	25	11	25
	236652	276652	10	7.5	200	100	60	90	100	45	90
	236602	276602			230	90	50	80	90	40	80
	236662	276662			380	60	35	45	50	25	45
	236612	276612			460	45	25	40	45	20	40
	236622	276622			575	35	20	30	35	15	30
	236653	276653	15	11	200	150	90	125	150	60	125
	236603	276603			230	150	80	110	125	60	110
	236663	276663			380	80	50	70	80	35	70
	236613	276613			460	70	40	60	60	30	60
	236623	276623			575	60	30	45	50	25	45
	236654	276654	20	15	200	200	110	175	175	80	175
	236604	276604			230	175	100	150	175	70	150
	236664	276664			380	100	60	90	100	45	90
	236614	276614			460	90	50	70	80	35	70
	236624	276624			575	70	40	60	70	30	60
	236655	276655	25	18.5	200	250	150	200	225	100	200
	236605	276605			230	225	125	175	200	90	175
	236665	276665			380	125	80	110	125	50	110
	236615	276615			460	110	60	90	100	45	90
	236625	276625			575	90	50	70	80	35	70
	236656	276656			200	300	175	250	300	125	250
	236606	276606			230	250	150	225	250	100	200
	236666	276666	30	22	380	150	90	125	150	60	125
	236616	276616			460	125	70	110	125	50	100
	236626	276626			575	100	60	90	100	40	80
	236667	276667	40	30	380	200	125	175	200	90	175
	236617	276617			460	175	100	150	175	70	150
	236627	276627			575	150	80	110	125	60	110
	236668	276668	50	37	380	250	150	225	250	110	225
	236618	276618			460	225	125	175	200	90	175
	236628	276628			575	175	100	150	175	70	150
	236669	276669	60	45	380	300	175	250	300	125	250
	236619	276619			460	250	150	225	250	100	225
	236629	276629			575	200	125	175	200	80	175

Table 30 - 60 Hz 6" Standard & Hi-Temp Motors

HP	KW	VOLTS	NEMA STARTER SIZE	HEATERS FOR OVERLOAD RELAYS		ADJUSTABLE RELAYS (NOTE 3)	
				FURNAS (NOTE 1)	G.E. (NOTE 2)	SET	MAX.
5	3.7	200	1	K61	L220B	17.6	19.1
		230	1	K61	L199B	15.4	16.6
		380	0	K52	L122B	9.4	10.1
		460	0	K49	L100B	7.7	8.3
		575	0	K42	L825A	6.1	6.6
7.5	5.5	200	1	K67	L322B	26.3	28.3
		230	1	K64	L293B	22.9	24.6
		380	1	K57	L165B	13.9	14.9
		460	1	K54	L147B	11.4	12.3
		575	1	K52	L111B	9.1	9.8
10	7.5	200	2(1)	K72	L426B	34.4	37.0
		230	2(1)	K70	L390B	29.9	32.2
		380	1	K61	L220B	18.1	19.5
		460	1	K58	L181B	15.0	16.1
		575	1	K55	L147B	12.0	12.9
15	11	200	3(1)	K76	L650B	50.7	54.5
		230	2	K75	L520B	44.1	47.4
		380	2(1)	K68	L322B	26.7	28.7
		460	2(1)	K64	L265B	22.0	23.7
		575	2(1)	K61	L220B	17.7	19.0
20	15	200	3	K78	L787B	64.8	69.7
		230	3(1)	K77	L710B	56.4	60.6
		380	2	K72	L426B	34.1	36.7
		460	2	K69	L352B	28.2	30.3
		575	2	K64	L393B	22.7	24.4
25	18.5	200	3	K86	L107C	80.3	86.3
		230	3	K83	L866B	69.8	75.0
		380	2	K74	L520B	42.2	45.4
		460	2	K72	L426B	34.9	37.5
		575	2	K69	L352B	27.9	30.0
30	22	200	4(1)	K88	L126C	96.7	104.0
		230	3	K87	L107C	84.1	90.4
		380	3(1)	K76	L650B	50.9	54.7
		460	3(1)	K74	L520B	42.0	45.2
		575	3(1)	K72	L390B	33.7	36.2
40	30	380	3	K83	L866B	69.8	75.0
		460	3	K77	L710B	57.7	62.0
		575	3	K74	L593B	46.1	49.6
50	37	380	3	K87	L107C	86.7	93.2
		460	3	K83	L950B	71.6	77.0
		575	3	K77	L710B	57.3	61.6
60	45	380	4(1)	K89	L126C	102.5	110.2
		460	4(1)	K87	L107C	84.6	91.0
		575	4(1)	K78	L866B	67.7	72.8

Footnotes for Tables 29, 30, and 31

NOTE 1: Furnas intermediate sizes between NEMA starter sizes apply where (1) is shown in tables, size 1.75 replacing 2, 2.5 replacing 3, 3.5 replacing 4, and 4.5 replacing 5. Heaters were selected from Catalog 294, table 332 and table 632 (starter size 00, size B). Size 4 starters are heater type 4 (JG). Starters using these heater tables include classes 14, 17 and 18 (inNOVA), classes 36 and 37 (reduced voltage), and classes 87, 88 and 89 (pump and motor control centers). Overload relay adjustments should be set no higher than 100% unless necessary to stop nuisance tripping with measured amps in all lines below nameplate maximum. Heater selections for class 16 starters (Magnetic Definite Purpose) will be furnished upon request.

NOTE 2: General Electric heaters are type CR123 usable only on type CR124 overload relays and were selected from Catalog GEP-126OJ, page 184. Adjustment should be set no higher than 100%, unless necessary to stop nuisance tripping with measured amps in all lines below nameplate maximum.

NOTE 3: Adjustable overload relay amp settings apply to approved types listed. Relay adjustment should be set at the specified SET amps. Only if tripping occurs with amps in all lines measured to be within nameplate maximum amps should the setting be increased, not to exceed the MAX value shown.

NOTE 4: Heaters shown for ratings requiring NEMA size 5 or 6 starters are all used with current transformers per manufacturer standards. Adjustable relays may or may not use current transformers depending on design.

SUBMERSIBLE PUMP
Installation Check List

1. Motor Inspection

- ☐ A. Verify that the model, hp or kW, voltage, phase and hertz on the motor nameplate match the installation requirements.
- ☐ B. Check that the motor lead assembly is not damaged.
- ☐ C. Measure insulation resistance using a 500 or 1000 volt DC megohmmeter from each lead wire to the motor frame. Resistance should be at least 200 megohms without drop cable.
- ☐ D. Keep a record of motor model number, hp or kW, voltage, and serial number (S/N). (S/N is stamped in shell above the nameplate. A typical example, S/N 07A18 01-0123)

2. Pump Inspection

- ☐ A. Check that the pump rating matches the motor.
- ☐ B. Check for pump damage and verify that the pump shaft turns freely.

3. Pump/Motor Assembly

- ☐ A. If not yet assembled, check that pump and motor mounting faces are free from dirt, debris and uneven paint thickness.
- ☐ B. Pumps and motors over 5 hp should be assembled in the vertical position to prevent stress on pump brackets and shafts. Assemble the pump and motor together so their mounting faces are in contact and then tighten assembly bolts or nuts evenly to manufacturer specifications.
- ☐ C. If accessible, check that the pump shaft turns freely.
- ☐ D. Assemble the pump lead guard over the motor leads. Do not cut or pinch lead wires during assembly or installation.

4. Power Supply and Controls

- ☐ A. Verify that the power supply voltage, Hertz, and kVA capacity match motor requirements.
- ☐ B. Verify control box hp and voltage matches motor (3-wire only).
- ☐ C. Check that the electrical installation and controls meet all safety regulations and match the motor requirements, including fuse or circuit breaker size and motor overload protection. Connect all metal plumbing and electrical enclosures to the power supply ground to prevent shock hazard. Comply with national and local codes.

5. Lightning and Surge Protection

- ☐ A. Use properly rated surge (lightning) arrestors on all submersible pump installations. Motors 5 hp and smaller, which are marked “Equipped with Lightning Arrestors”, contain internal arrestors.
- ☐ B. Ground all above ground arrestors with copper wire directly to the motor frame, or to metal drop pipe or casing which reaches below the well pumping level. Connecting to a ground rod does not provide good surge protection.

6. Electrical Drop Cable

- ☐ A. Use submersible cable sized in accordance with local regulations and the cable charts. See pages 11 and 16-21. Ground motor per national and local codes.
- ☐ B. Include a ground wire to the motor and surge protection, connected to the power supply ground if required by codes. Always ground any pump operated outside a drilled well.

7. Motor Cooling

- ☐ A. Ensure at all times that the installation provides adequate motor cooling; see page 6 for details.

SUBMERSIBLE PUMP
Installation Check List

8. Pump/Motor Installation

- ☐ A. Splice motor leads to supply cable using electrical grade solder or compression connectors, and carefully insulate each splice with watertight tape or adhesive-lined shrink tubing, as shown in motor or pump installation data.
- ☐ B. Support the cable to the delivery pipe every 10 feet (3 meters) with straps or tape strong enough to prevent sagging. Use padding between cable and any metal straps.
- ☐ C. A check valve in the delivery pipe is recommended. More than one check valve may be required, depending on valve rating and pump setting; see page 5 for details.
- ☐ D. Assemble all pipe joints as tightly as practical, to prevent unscrewing from motor torque. Torque should be at least 10 pound feet per hp (2 meter-KG per kW).
- ☐ E. Set the pump far enough below the lowest pumping level to assure the pump inlet will always have at least the Net Positive Suction Head (NPSH) specified by the pump manufacturer. Pump should be at least 10 feet (3 meters) from the bottom of the well to allow for sediment build up.
- ☐ F. Check insulation resistance as pump/motor assembly is lowered into the well. Resistance may drop gradually as more cable enters the water, but any sudden drop indicates possible cable, splice or motor lead damage; see page 45.

9. After Installation

- ☐ A. Check all electrical and water line connections and parts before starting the pump.
- ☐ B. Start the pump and check motor amps and pump delivery. If normal, continue to run the pump until delivery is clear. If three-phase pump delivery is low, it may be running backward. Rotation may be reversed (with power off) by interchanging any two motor lead connections to the power supply.
- ☐ C. Check three-phase motors for current balance within 5% of average, using motor manufacturer instructions Imbalance over 5% will cause higher motor temperatures and may cause overload trip, vibration, and reduced life.
- ☐ D. Verify that starting, running and stopping cause no significant vibration or hydraulic shocks.
- ☐ E. After at least 15 minutes running time, verify that pump output, electrical input, pumping level, and other characteristics are stable and as specified.

Date _____ Filled In By _____

Notes _____

_____

_____

_____

_____

_____

Franklin Electric

SUBMERSIBLE MOTOR INSTALLATION RECORD
Form 2207 - Page 1

RMA Number

KEY DEALER #

DISTRIBUTOR	INSTALLER	END USER
Name:	Name:	Name:
City:	City:	City:
State: Zip:	State: Zip:	State: Zip:

Well ID or GPS: _____ _____ _____ Water Temperature: _____ ☐ °F ☐ °C

Application/Water Use (e.g. potable water, irrigation, municipal, fountain, etc.): _____

Date Installed (mm/yy): _____ Date Failed (mm/yy): _____ Motor Position Shaft-Up: ☐ Yes ☐ No

Operating Cycle: ON Time Per Start _____ ☐ Hrs. ☐ Mins. Time OFF Between Stop & Restart _____ ☐ Hrs. ☐ Mins.

MOTOR

Model: _____ Serial Number: _____ Date Code (if updated): _____

MOTOR OVERLOAD

System Typical Operating Current: _____ Amps @ _____ Volts

Overload: ☐ FE SubMonitor Input Amps _____ D3 Attached ☐ Yes ☐ No Fault Settings Attached ☐ Yes ☐ No

☐ Other Manufacturer Model: _____ Dial Set at: _____ or Heater# _____

NEMA Class: ☐ 10 ☐ 20 ☐ 30 Ambient Compensated: ☐ Yes ☐ No

Power to Motor by: ☐ Full Volt Starter ☐ VFD ☐ Soft Starter VFD or Soft Starter Mfr. & Model: _____

PUMP

Manufacturer: _____

Model: _____

Stages: _____

Design Rating: _____ gpm @ _____ ft TDH

Horsepower Required by Pump End: _____

Actual Pump Delivery: _____ gpm @ _____ psi

What Controls When System Runs & Stops:

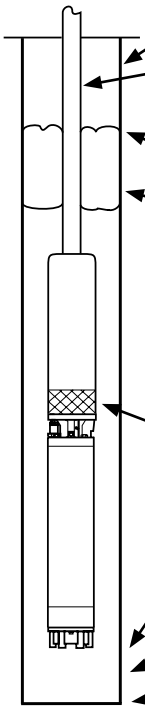
_____

(e.g. pressure, level, flow, manual on/off, timer, time clock etc.)

YOUR NAME / DATE

_____ / _____

WELL DATA (All measurements from well head down.)



Casing Diameter _____ in

Drop Pipe Diameter _____ in

Number of Sticks of Drop Pipe _____

Static Water Level _____ ft

Drawdown (pumping) Water Level _____ ft

Spring Assist Check Valves:
(Measured from Well Head Down)

#1 _____ #2 _____ #3 _____ #4 _____ ft

☐ Solid ☐ Drilled Poppet ☐ Break-Off Plug

Pump Inlet Setting _____ ft

Flow Sleeve ☐ No ☐ Yes, Dia. _____ in

Case Ends _____ ft

☐ Well Screen ☐ Perforated Casing

#1 from ____ to ____ ft & #2 from ____ to ____ ft

Well Depth _____ ft

Franklin Electric

SUBMERSIBLE MOTOR INSTALLATION RECORD
Form 2207 - Page 2

RMA Number

TRANSFORMERS

Number of Transformers: ☐ Two ☐ Three Transformers Supply Motor Only: ☐ Yes ☐ No ☐ Unsure

Transformer #1: _____ kVA Transformer #2: _____ kVA Transformer #3: _____ kVA

POWER CABLES & GROUND WIRE

1 **Service Entrance to Pump Control Panel:**

Length: _____ ft. & Gauge: _____ AWG/MCM

Material: ☐ Copper ☐ Aluminum Construction: ☐ Jacketed ☐ Individual Conductors ☐ Web ☐ Twisted

Temperature Rating of Cable: ☐ 60C ☐ 75C ☐ 90C ☐ 125C or Insulation Type: _____ (e.g. THHN)

2 **Pump Control Panel to Motor:**

Length: _____ ft. & Gauge: _____ AWG/MCM

Material: ☐ Copper ☐ Aluminum Construction: ☐ Jacketed ☐ Individual Conductors ☐ Web ☐ Twisted

Temperature Rating of Cable: ☐ 60C ☐ 75C ☐ 90C ☐ 125C or Insulation Type: _____ (e.g. THHN)

3 **Ground Wire Size:** From Control Panel to Motor: _____ AWG/MCM

Control Grounded to (mark all that apply):

☐ Well Head ☐ Metal Casing ☐ Motor ☐ Driven Rod ☐ Power Supply

INCOMING VOLTAGE

No Load L1-L2 _____ L2-L3 _____ L1-L3 _____

Full Load L1-L2 _____ L2-L3 _____ L1-L3 _____

RUNNING AMPS & CURRENT BALANCE

Full Load L1 _____ L2 _____ L3 _____

% Unbalance: _____

CONTROL PANEL

1 **Pump Panel Manufacturer/Fabricator:** _____

2 **Short Circuit Protection - Fuses or Circuit Breaker**

Option #1 - Fuse

Manufacturer: _____ Model: _____ Rating: _____ Amps

Type: ☐ Time-Delay ☐ Standard

Option #2 - Circuit Breaker

Manufacturer: _____ Model: _____ Rating: _____ Amps Setting: _____

3 **Starter - Full Voltage, Reduced Voltage, Soft-Starter or VFD (Variable Frequency Drive)**

Option #1 - Full Voltage

Manufacturer: _____ Model: _____ Size: _____ Contacts: ☐ NEMA ☐ IEC

Option #2 - Reduced Voltage

Manufacturer: _____ Model: _____ Ramp Time to Full Voltage: _____ sec.

Option #3 - Soft-Starter or VFD

Manufacturer: _____ Model: _____ Max. Continuous Amp Output Rating: _____

Min. Setting: _____ Hz & GPM: _____ Max. Setting: _____ Hz & GPM: _____

Start Ramp Time to 30 Hz: _____ sec. Stop Mode: ☐ Power Off Coast ☐ 30-0 Hz Ramp _____ sec.

Special Output Filter Purchased: ☐ Yes ☐ No

Output Filter Manufacturer: _____ Model: _____ % Reactance: _____

4 **Surge Arrestor:** ☐ No ☐ Yes, Manufacturer: _____ Model: _____

Franklin Electric

SUBMERSIBLE MOTOR
Booster Installation Record

RMA Number

Date _____ /_____/_____ Filled In By _____

INSTALLATION

Owner/User _____ Telephone (_____) _____
Address _____City _____ State _____ Zip _____
Installation Site, If Different _____
Contact _____ Telephone (_____) _____
System Application_____

_____

_____

System Manufactured By_____Model _____ Serial No. _____
System Supplied By_____ City _____ State _____ Zip _____
Is this a "HERO" system (10.0 - 10.5 PH)? ☐ Yes ☐ No

MOTOR

Model No. _____ Serial No. _____ Date Code _____
Horsepower _____ Voltage _____ ☐ Single-Phase ☐ Three-Phase Diameter _____ in.
Slinger Removed? ☐ Yes ☐ No Check Valve Plug Removed? ☐ Yes ☐ No
Motor Fill Solution ☐ Standard ☐ DI Water Model No. _____ Serial No. _____ Date Code _____

PUMP

Manufacturer _____ Model _____ Serial No. _____
Stages _____ Diameter _____ Flow Rate Of _____ gpm At _____TDH
Booster Case Internal Diameter _____ Material _____

CONTROLS AND PROTECTIVE DEVICES

SubMonitor? ☐ Yes ☐ No If Yes, Warranty Registration No._____
If Yes, Overload Set? ☐ Yes ☐ No _____ Set At _____
Underload Sets? ☐ Yes ☐ No _____ Set At _____
VFD or Reduced Voltage Starter? ☐ Yes ☐ No If Yes, Type _____
Mfr. _____Setting _____% Full Voltage In _____sec
Pump Panel? ☐ Yes ☐ No If Yes, Mfr. _____Size _____
Magnetic Starter/Contactor Mfr. _____ Model _____Size_____
Heaters Mfr. _____ No. _____ If Adjustable Set At _____
Fuses Mfr. _____ Size _____ Type _____
Lightning/Surge Arrestor Mfr. _____ Model _____
Controls Are Grounded to _____ with No. _____Wire

Inlet Pressure Control	☐ Yes	☐ No	If Yes, Mfr._____	Model _____	Setting _____ psi	Delay ____ sec
Inlet Flow Control	☐ Yes	☐ No	If Yes, Mfr._____	Model _____	Setting _____ gpm	Delay ____ sec
Outlet Pressure Control	☐ Yes	☐ No	If Yes, Mfr._____	Model _____	Setting _____ psi	Delay ____ sec
Outlet Flow Control	☐ Yes	☐ No	If Yes, Mfr._____	Model _____	Setting _____ gpm	Delay ____ sec
Water Temperature Control	☐ Yes	☐ No	If Yes, Mfr._____	Model _____		Delay ____ sec

Set At _____ °F or _____ °C Located _____

Franklin Electric

SUBMERSIBLE MOTOR
Booster Installation Record

INSULATION CHECK

Initial Megs: Motor & Lead Only — Black (T1/U1)_____ Yellow (T2/V1)_____ Red (T3/W1)_____

Installed Megs: Motor, Lead, & Cable — Black (T1/U1)_____ Yellow (T2/V1)_____ Red (T3/W1)_____

VOLTAGE TO MOTOR

Non-Operating: — B-Y (T1/U1 - T2/V1)_____ Y-R (T2/V1 - T3/W1)_____ R-B (T3/W1 - T1/U1)_____

At Rated Flow of _____gpm — B-Y (T1/U1 - T2/V1)_____ Y-R (T2/V1 - T3/W1)_____ R-B (T3/W1 - T1/U1)_____

At Open Flow _____gpm — B-Y (T1/U1 - T2/V1)_____ Y-R (T2/V1 - T3/W1)_____ R-B (T3/W1 - T1/U1)_____

AMPS TO MOTOR

At Rated Flow of _____gpm — Black (T1/U1)_____ Yellow (T2/V1)_____ Red (T3/W1)_____

At Open Flow _____gpm — Black (T1/U1)_____ Yellow (T2/V1)_____ Red (T3/W1)_____

At Shut Off* — Black (T1/U1)_____ Yellow (T2/V1)_____ Red (T3/W1)_____

*Do **NOT** run at Shut Off more than two (2) minutes.

Inlet Pressure _____psi Outlet Pressure _____psi Water Temperature _____ °F or _____ °C

If you have any questions or problems, call the Franklin Electric Toll-Free Hot Line: 1-800-348-2420

Comments: _____

_____

_____

_____

PLEASE SKETCH THE SYSTEM

Franklin Electric

SubMonitor Three-Phase Protection

Applications

SubMonitor is designed to protect 3-phase pumps/motors with service factor amp ratings (SFA) from 5 to 350 A (approx. 3 to 200 hp). Current, voltage, and motor temperature are monitored using all three legs and allows the user to set up the SubMonitor quickly and easily.

Protects Against

- Under/Overload
- Under/Overvoltage
- Current Unbalance
- Overheated Motor
  (if equipped with Subtrol Heat Sensor)
- False Start (Chattering)
- Phase Reversal

Power Factor Correction

In some installations, power supply limitations make it necessary or desirable to increase the power factor of a submersible motor. The table lists the capacitive kVAR required to increase the power factor of large Franklin three-phase submersible motors to the approximate values shown at maximum input loading.

Capacitors must be connected on the line side of the overload relay, or overload protection will be lost.

Table 32 kVAR Required 60 Hz

MOTOR		KVAR REQUIRED FOR PF OF:		
HP	KW	0.90	0.95	1.00
5	3.7	1.2	2.1	4.0
7.5	5.5	1.7	3.1	6.0
10	7.5	1.5	3.3	7.0
15	11	2.2	4.7	10.0
20	15	1.7	5.0	12.0
25	18.5	2.1	6.2	15.0
30	22	2.5	7.4	18.0
40	30	4.5	11.0	24.0
50	37	7.1	15.0	32.0
60	45	8.4	18.0	38.0
75	55	6.3	18.0	43.0
100	75	11.0	27.0	60.0
125	93	17.0	36.0	77.0
150	110	20.0	42.0	90.0
175	130	9.6	36.0	93.0
200	150	16.0	46.0	110.0

Values listed are total required (not per phase).

Three-Phase Starter Diagrams

Three-phase combination magnetic starters have two distinct circuits: a power circuit and a control circuit.

The power circuit consists of a circuit breaker or fused line switch, contacts, and overload heaters connecting incoming power lines L1, L2, L3 and the three-phase motor.

The control circuit consists of the magnetic coil, overload contacts and a control device such as a pressure switch. When the control device contacts are closed, current flows through the magnetic contactor coil, the contacts close, and power is applied to the motor. Hand-Off-Auto switches, start timers, level controls and other control devices may also be in series in the control circuit.

Line Voltage Control

This is the most common type of control encountered. Since the coil is connected directly across the power lines L1 and L2, the coil must match the line voltage.

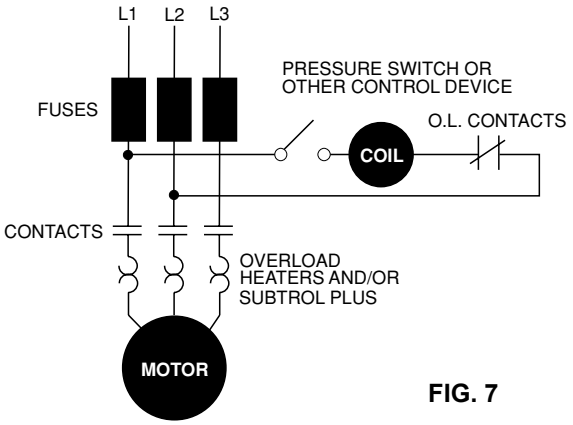


FIG. 7

Low Voltage Transformer Control

This control is used when it is desirable to operate push buttons or other control devices at some voltage lower than the motor voltage. The transformer primary must match the line voltage and the coil voltage must match the secondary voltage of the transformer.

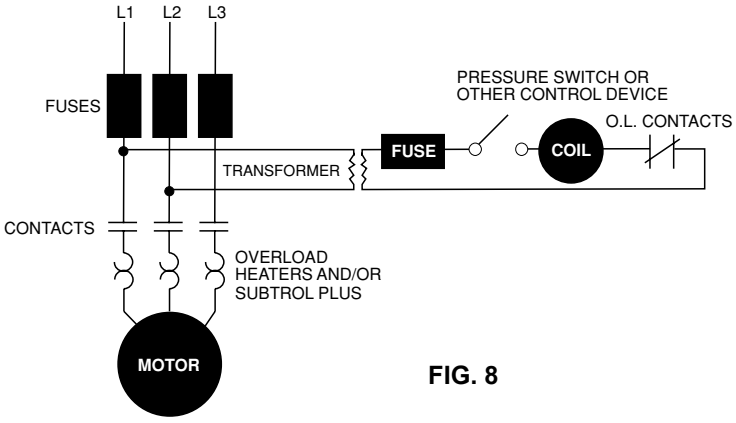


FIG. 8

External Voltage Controls

Control of a power circuit by a lower circuit voltage can also be obtained by connecting to a separate control voltage source. The coil rating must match the control voltage source, such as 115 or 24 volts.

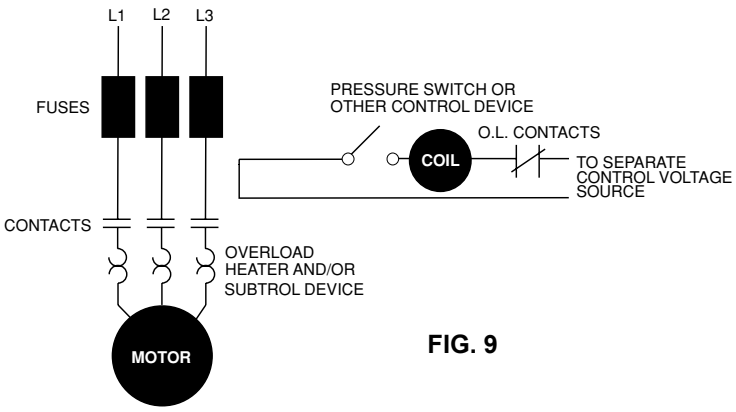


FIG. 9

Three-Phase Power Unbalance

A full three-phase supply is recommended for all three-phase motors, consisting of three individual transformers or one three-phase transformer. So-called “open” delta or Wye connections using only two transformers can be used, but are more likely to cause problems, such as poor performance, overload tripping or early motor failure due to current unbalance.

Transformer rating should be no smaller than listed in table 4 for supply power to the motor alone.

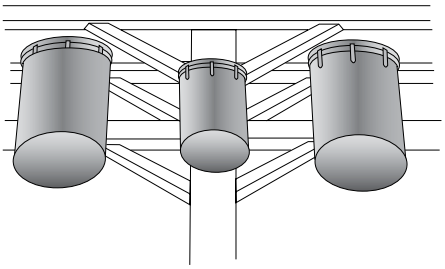


FIG. 10
FULL THREE-PHASE

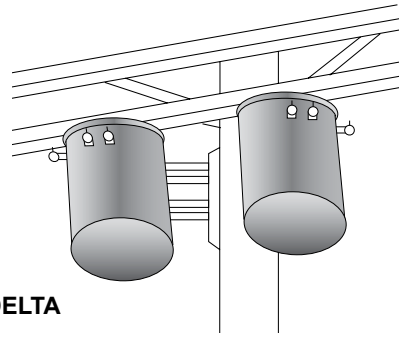


FIG. 11
OPEN DELTA

Checking and Correcting Rotation and Current Unbalance

1. Establish correct motor rotation by running the motor in both directions. Normal rotation is CCW viewing the shaft end. Rotation can be changed by interchanging any two of the three motor leads. The rotation that gives the most water flow is typically the correct rotation.
2. After correct rotation has been established, check the current in each of the three motor leads and calculate the current unbalance as explained in 3 below.

   If the current unbalance is 2% or less, leave the leads as connected.

   If the current unbalance is more than 2%, current readings should be checked on each leg using each of three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.
3. To calculate percent of current unbalance:
   A. Add the three line amps values together.
   B. Divide the sum by three, yielding average current.
   C. Pick the amp value which is furthest from the average current (either high or low).
   D. Determine the difference between this amp value (furthest from average) and the average.
   E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.
4. Current unbalance should not exceed 5% at max amp load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the “power side” of the system. If the reading farthest from average moves with the same motor lead, the primary source of unbalance is on the “motor side” of the starter. In this instance, consider a damaged cable, leaking splice, poor connection, or faulty motor winding.

Phase designation of leads for CCW rotation viewing shaft end.

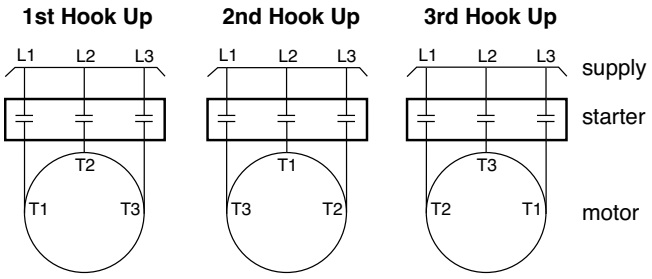
To reverse rotation, interchange any two leads.

Phase 1 or “A” - Black, T1, or U1

Phase 2 or “B” - Yellow, T2, or V1

Phase 3 or “C” - Red, T3, or W1

NOTICE: Phase 1, 2 and 3 may not be L1, L2 and L3.



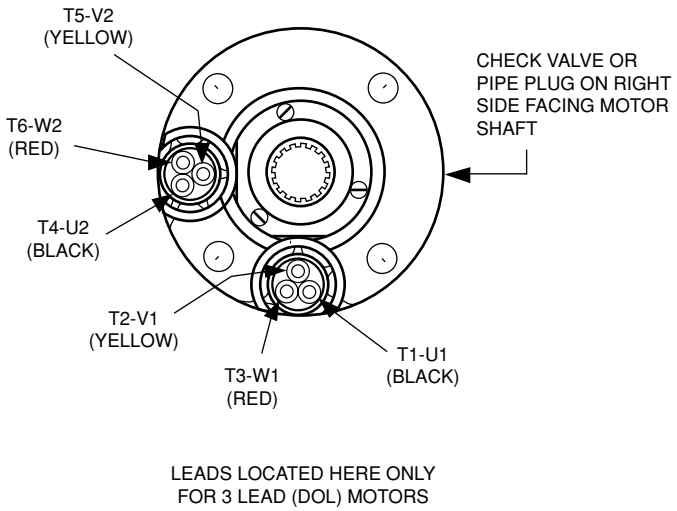
EXAMPLE:

T1 = 51 amps	T3 = 50 amps	T2 = 50 amps
T2 = 46 amps	T1 = 49 amps	T3 = 48 amps
+ T3 = 53 amps	+ T2 = 51 amps	+ T1 = 52 amps
Total = 150 amps	Total = 150 amps	Total = 150 amps
$\frac{150}{3}$ = 50 amps	$\frac{150}{3}$ = 50 amps	$\frac{150}{3}$ = 50 amps
50 - 46 = 4 amps	50 - 49 = 1 amp	50 - 48 = 2 amps
$\frac{4}{50}$ = 0.08 or 8%	$\frac{1}{50}$ = 0.02 or 2%	$\frac{2}{50}$ = 0.04 or 4%

Three-Phase Motor Lead Identification

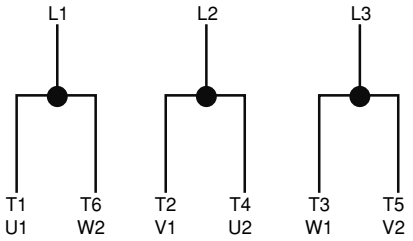
Line Connections — Six-Lead Motors

WARNING: When installing 6-lead motors extra care must be used to ensure lead identification at the surface. Leads must be marked and connected per diagram. Motor leads are not connected red to red, yellow to yellow, etc.

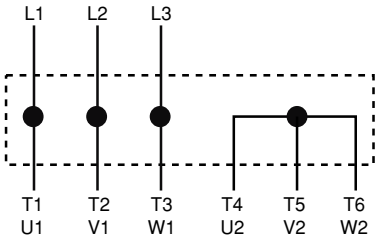


90° Lead Spacing

Connections for across-the-line starting, running, and any reduced voltage starting except WYE-DELTA type starters.



WYE-DELTA starters connect the motor as shown below during starting, then change to the running connection shown at the left.



Each motor lead is numbered with two markers, one near each end. To reverse rotation, interchange any two line connections.

Phase Converters

There are a number of different types of phase converters available. Each generates three-phase power from a single-phase power line.

In all phase converters, the voltage balance is critical to current balance. Although some phase converters may be well balanced at one point on the system-operating curve, submersible pumping systems often operate at differing points on the curve as water levels and operating pressures fluctuate. Other converters may be well balanced at varying loads, but their output may vary widely with fluctuations in the input voltage.

The following guidelines have been established for submersible installations to be warrantable when used with a phase converter.

1. Limit pump loading to rated horsepower. Do not load into motor service factor.
2. Maintain at least 3 ft/s flow past the motor. Use a flow sleeve when necessary.
3. Use time delay fuses or circuit breakers in pump panel. Standard fuses or circuit breakers do not provide secondary motor protection.
4. SubMonitor may be used with electro mechanical type phase converters, however special connections are required. Consult SubMonitor Manual for connections of receiver and lightning arrestor.
5. SubMonitor will not work with electronic solid state phase converters.
6. Current unbalance must not exceed 10%.

Reduced Voltage Starters

All Franklin three-phase submersible motors are suitable for full-voltage starting. Under this condition the motor speed goes from zero to full speed within a half second or less. The motor current goes from zero to locked rotor amps, then drops to running amps at full speed. This may dim lights, cause momentary voltage dips to other electrical equipment, and shock power distribution transformers.

In some cases the power companies may require reduced-voltage starters to limit this voltage dip. There are also times when reduced-voltage starters may be desirable to reduce motor starting torque thus reducing the stress on shafts, couplings, and discharge piping. Reduced-voltage starters also slow the rapid acceleration of the water on start-up to help control upthrust and water hammer.

Reduced-voltage starters may not be required if the maximum recommended cable length is used. With maximum recommended cable length there is a 5% voltage drop in the cable at running amps, resulting in about 20% reduction in starting current and about 36% reduction in starting torque compared to having rated voltage at the motor. This may be enough reduction in starting current so that reduced-voltage starters are not required.

Three-Lead Motors: Autotransformer or solid-state reduced-voltage starters may be used for soft-starting standard three-phase motors.

When autotransformer starters are used, the motor should be supplied with at least 55% of rated voltage to ensure adequate starting torque. Most autotransformer starters have 65% and 80% taps. Setting the taps on these starters depends on the percentage of the maximum allowable cable length used in the system. If the cable length is less than 50% of the maximum allowable, either the 65% or the 80% taps may be used. When the cable length is more than 50% of allowable, the 80% tap should be used.

Six-Lead Motors: Wye-Delta starters are used with six-lead Wye-Delta motors. All Franklin 6" and 8" three-phase motors are available in six-lead Wye-Delta construction. Consult the factory for details and availability. Part winding starters are not compatible with Franklin Electric submersible motors and should not be used.

Wye-Delta starters of the open-transition type, which momentarily interrupt power during the starting cycle, are not recommended. Closed-transition starters have no interruption of power during the start cycle and can be used with satisfactory results.

Reduced-voltage starters have adjustable settings for acceleration ramp time, typically preset at 30 seconds. They must be adjusted so the motor is at full voltage within THREE SECONDS MAXIMUM to prevent excessive radial and thrust bearing wear.

If Subtrol-Plus or SubMonitor is used the acceleration time must be set to TWO SECONDS MAXIMUM due to the 3 second reaction time of the Subtrol-Plus or SubMonitor.

Solid-state starters AKA soft starts may not be compatible with Subtrol-Plus/SubMonitor. However, in some cases a bypass contactor has been used. Consult the factory for details.

During shutdown, Franklin Electric's recommendation is for the power to be removed, allowing the pump/motor to coast down. Stopping the motor by ramping down the voltage is possible, but should be limited to three (3) seconds maximum.

Inline Booster Pump Systems

Franklin Electric offers three different types of motors for non-vertical applications.

1. The **Booster** motors are specifically designed for booster applications. They are the **"Best Choice" for sealed Reverse Osmosis applications.** These motors are the result of two years of focused development and bring additional value and durability to booster module systems. These motors are only available to OEMs or Distributors who have demonstrated capability in Booster Module systems design and operation and adhere to Franklin's Application Manual requirements.

2. The **Hi-Temp** motors have many of the internal design features of the Booster motor. It's additional length allows for higher temperature handling and the Sand Fighter sealing system provides greater abrasion resistance. One or both of these conditions are often experienced in open atmosphere applications such as lakes, ponds, etc.

3. The **Standard Vertical Water Well** (40-125 hp) motors can be adapted to non-vertical applications when applied per the below guidelines. However, they will be more sensitive to application variances than the other two designs.

All of the above motors must be applied per the guidelines listed below. In addition, for all applications where the motor is applied in a sealed system, a Submersible Motor Booster Installation Record (Form 3655) or its equivalent must be completed at startup and received by Franklin Electric within 60 days. A sealed system is one where the motor and pump intake are mounted in a sleeve and the water feeding the pump intake is not open to the atmosphere.

Continued on next page

Inline Booster Pump Systems (continued)

Design And Operational Requirements

1. **Non-Vertical Operation:** Vertical Shaft-up (0°) to Horizontal (90°) operation is acceptable as long as the pump transmits "down-thrust" to the motor within 3 seconds after start-up and continuously during operation. However, it is best practice to provide a positive slope whenever it is possible, even if it is only a few degrees.

2. **Motor, Sleeve, and Pump Support System:** The booster sleeve ID must be sized according to the motor cooling and pump NPSHR requirements. The support system must support the motor's weight, prevent motor rotation and keep the motor and pump aligned. The support system must also allow for thermal axial expansion of the motor without creating binding forces.

3. **Motor Support Points:** A minimum of two support points are required on the motor. One in the motor/pump flange connection area and one in the bottom end of the motor area. The motor castings, not the shell area, are recommended as support points. If the support is a full length support and/or has bands in the shell area, they must not restrict heat transfer or deform the shell.

4. **Motor Support Material and Design:** The support system shall not create any areas of cavitation or other areas of reduced flow less than the minimum rate required by this manual. They should also be designed to minimize turbulence and vibration and provide stable alignment. The support materials and locations must not inhibit the heat transfer away from the motor.

5. **Motor and Pump Alignment:** The maximum allowable misalignment between the motor, pump, and pump discharge is 0.025 inch per 12 inches of length (2 mm per 1000 mm of length). This must be measured in both directions along the assembly using the motor/pump flange connection as the starting point. The booster sleeve and support system must be rigid enough to maintain this alignment during assembly, shipping, operation and maintenance.

6. The best motor lubrication and heat resistance is obtained with the factory based propylene glycol fill solution. Only when an application MUST HAVE deionized (DI) water should the factory fill solution be replaced. When a deionized water fill is required, the motor must be derated as indicated on the below chart. The exchange of the motor fill solution to DI water must be done by an approved Franklin service shop or representative using a vacuum fill system per Franklin's Motor Service Manual instruction. The motor shell then must be permanently stamped with a D closely behind the Serial Number.

   The maximum pressure that can be applied to the motor internal components during the removal of the factory fill solution is 7 psi (0.5 bar.)

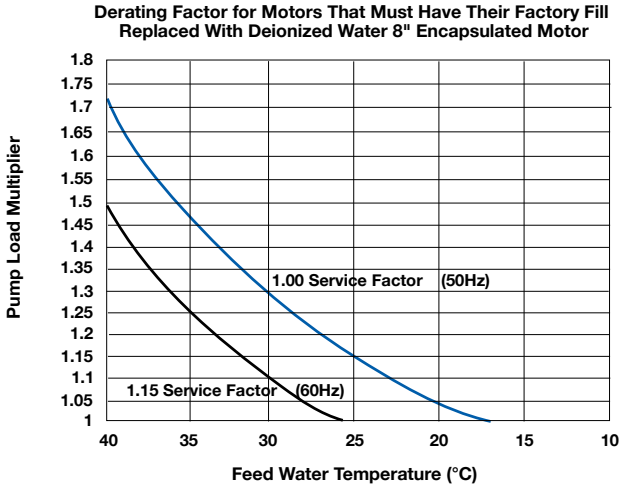


FIG. 12

First: Determine maximum Feed Water Temperature that will be experienced in this application. If the feed water exceeds the maximum ambient of the motor, both the DI water derating and a hot water application derating must be applied.

Second: Determine the Pump Load Multiplier from the appropriate Service Factor curve. (Typical 1.15 Service Factor is for 60 Hz ratings &1.00 Service Factor for 50 Hz ratings).

Third: Multiply the Pump Load Requirement times the pump load multiplier number indicated on the vertical axis to determine the Minimum Motor Nameplate Rating.

Fourth: Select a motor with a nameplate equal or higher than the above calculated value.

7. **Motor Alterations - Sand Slinger & Check Valve Plug:** On 6" and 8" motors, the rubber sand slinger located on the shaft must be removed. If a pipe plug is covering the check valve, it must be removed. The special Booster motor already has these modifications.

8. **Frequency of Starts:** Fewer than 10 starts per 24-hour period are recommended. Allow at least 20 minutes between shutdown and start-up of the motor.

Continued on next page

Inline Booster Pump Systems (continued)

9. **Controls-Soft Starters and VFDs:** Reduced voltage starters and variable speed drives (inverter drives) may be used with Franklin three-phase submersible motors to reduce starting current, upthrust, and mechanical stress during start-up. The guidelines for their use with submersible motors are different than with normal air cooled motor applications. Refer to the Franklin Electric Application, Installation and Maintenance (AIM) Manual Reduced Voltage Starters section or Variable Speed Submersible Pump Operation, Inverter Drives sections for specific details including required filtering.

10. **Motor Overload Protection:** Submersible motors require properly sized ambient compensated Class 10 quick-trip overloads per Franklin's AIM Manual guidelines to protect the motor. Class 20 or higher overloads are NOT acceptable. Franklin's SubMonitor is strongly recommended for all large submersibles since it is capable of sensing motor heat without any additional wiring to the motor. Applications using Soft Starters with a SubMonitor require a start-up bypass - consult the factory for details. SubMonitor can not be used in applications using a VFD control.

11. **Motor Surge Protection:** Properly sized, grounded and dedicated motor surge arrestors must be installed in the supply line of the booster module as close to the motor as possible. This is required on all systems including those using soft-starters and variable speed drives (inverter drives).

12. **Wiring:** Franklin's lead assemblies are only sized for submerged operation in water to the motor nameplate maximum ambient temperature and may overheat and cause failure or serious injury if operated in air. Any wiring not submerged must meet applicable national and local wiring codes and Franklin Cable Chart tables 16-21. (Notice: wire size, wire rating and insulation temperature rating must be known when determining its suitability to operate in air or conduit. Typically, for a given size and rating, as the insulation temperature rating increases its ability to operate in air or conduit also increases.)

13. **Check Valves:** Spring-loaded check valves must be used on start-up to minimize motor upthrusting, water hammer, or in multiple booster (parallel) applications to prevent reverse flow.

14. **Pressure Relief Valves:** A pressure relief valve is required and must be selected to ensure that, as the pump approaches shut-off, it never reaches the point that the motor will not have adequate cooling flow past it.

15. **System Purge (Can Flooding):** An air bleeder valve must be installed on the booster sleeve so that flooding may be accomplished prior to booster start-up. Once flooding is complete, the booster should be started and brought up to operating pressure as quickly as possible to minimize the duration of an upthrust condition. At no time should air be allowed to gather in the booster sleeve because this will prevent proper cooling of the motor and permanently damage it.

16. **System Flush – Must Not Spin Pump:** Applications may utilize a low flow flushing operation. Flow through the booster sleeve must not spin the pump impellers and the motor shaft. If spinning takes place, the bearing system will be permanently damaged and the motor life shortened. Consult the booster pump manufacturer for maximum flow rate through the pump when the motor is not energized.

Table 38 Franklin Cable chart (See 12. Wiring)

CABLE TEMP. RATING (°C)	MOTOR NAMEPLATE RATED AMPS FULL LOAD	#10 AWG		#8 AWG		#6 AWG		#4 AWG		#2 AWG	
		IN AIR	IN CONDUIT	IN AIR	IN CONDUIT	IN AIR	IN CONDUIT	IN AIR	IN CONDUIT	IN AIR	IN CONDUIT
75	3-LEAD (DOL)	40A	28A	56A	40A	76A	52A	100A	68A	136A	92A
	6-LEAD (Y-Δ)	69A	48A	97A	69A	132A	90A	173A	118A	236A	159A
90	3-LEAD (DOL)	44A	32A	64A	44A	84A	60A	112A	76A	152A	104A
	6-LEAD (Y-Δ)	76A	55A	111A	76A	145A	104A	194A	132A	263A	180A
125	3-LEAD (DOL)	66A	46A	77A	53A	109A	75A	153A	105A	195A	134A
	6-LEAD (Y-Δ)	114A	80A	133A	91A	188A	130A	265A	181A	337A	232A

Based on 30 °C maximum ambient with cable length of 100 feet or less.

Continued on next page

Inline Booster Pump Systems (continued)

17. **Open Atmosphere Booster Pump Systems:** When an open booster is placed in a lake, tank, etc. that is open to atmospheric pressure, the water level must provide sufficient head pressure to allow the pump to operate above its NPSHR requirement at all times and all seasons. Adequate inlet pressure must be provided prior to booster start-up.

Four Continuous Monitoring System Requirements for Sealed Booster Systems.

1. **Water Temperature:** Feed water on each booster must be continuously monitored and not allowed to exceed the motor nameplate maximum ambient temperature at any time. IF THE INLET TEMPERATURE EXCEEDS THE MOTOR NAMEPLATE MAXIMUM AMBIENT TEMPERATURE, THE SYSTEM MUST SHUTDOWN IMMEDIATELY TO PREVENT PERMANENT MOTOR DAMAGE. If feed water temperatures are expected to be above the allowable temperature, the motor must be derated. See Franklin's AIM Manual Hot Water Applications section for derating guidelines. (The high temperature feed water derating is in addition to the exchange to DI water derating if the motor factory fill solution was exchanged to DI water.)

2. **Inlet Pressure:** The inlet pressure on each booster module must be continuously monitored. It must always be positive and higher than the NPSHR (Net Positive Suction Head Requirement) of the pump. A minimum of 20 PSIG (1.38 Bar) is required at all times, except for 10 seconds or less when the motor is starting and the system is coming up to pressure. Even during these 10 seconds the pressure must remain positive and be higher than the NPSHR (Net Positive Suction Head Requirement) of the pump.

   PSIG is the actual value displayed on a pressure gauge in the system piping. PSIG is the pressure above the atmospheric conditions. If at any time these pressure requirements are not being met, the motor must be de-energized immediately to prevent permanent damage to the motor. Once the motor is damaged, it is usually not immediately noticeable, but progresses and results in a premature motor failure weeks or months after the damage occurred.

   Motors that will be exposed to pressure in excess of 500 psi (34.47 Bar) must undergo special high pressure testing. Consult factory for details and availability.

3. **Discharge Flow:** The flow rate for each pump must not be allowed to drop below the motor minimum cooling flow requirement. IF THE MOTOR MINIMUM COOLING FLOW REQUIREMENT IS NOT BEING MET FOR MORE THAN 10 SECONDS, THE SYSTEM MUST BE SHUT DOWN IMMEDIATELY TO PREVENT PERMANENT MOTOR DAMAGE.

4. **Discharge Pressure:** The discharge pressure must be monitored to ensure that a downthrust load toward the motor is present within 3 seconds after start-up and continuously during operation. IF THE MOTOR DISCHARGE PRESSURE IS NOT ADEQUATE TO MEET THIS REQUIREMENT, THE SYSTEM MUST BE SHUT DOWN IMMEDIATELY TO PREVENT PERMANENT MOTOR DAMAGE.

Variable Frequency Drive Submersible Motor Requirements

Franklin Electric's three-phase, encapsulated submersible motors can be used with variable frequency drives (VFD) when applied within the guidelines below.

All three-phase, encapsulated submersible motors must have the VFD sized based on the motor's nameplate maximum amps, not horsepower. The continuous rated amps of the VFD must be equal to or greater than the motor's nameplate maximum amps or warranty will be void.

Franklin Electric's single-phase, 2- and 3-wire, encapsulated submersible motors can only be used with the appropriate Franklin constant pressure controller.

Franklin Electric's submersible motor Application Installation Maintenance (AIM) manual should be checked for the latest guidelines and can be found online at www.franklin-electric.com.

WARNING: There is a potential shock hazard from contact with and/or touching the insulated cables connected to the variable frequency drive output anytime the motor has energy applied.

Output Filter Requirement Test:

NOTICE: An incoming power supply or line-side filter for the drive does not replace the need for additional output filters.

An output filter is required if the answer is yes to one or both of the items below:
#1 - Is the VFD's pulse width modulation (PWM) voltage rise-time (dV/dt) more than 500 Volts per micro-second (500 V/µ-second)?

#2 - Is the motor nameplate voltage more than 379 Volts and is the cable from drive-to-motor more than 50 ft (15.2 m)?

NOTICE:
More than 99% of the drives applied on water well submersible motors will require the purchase of additional output filtering based on question #1.

Output filters can be expensive. However, when needed, it is required for the motor to be considered for warranty. Make sure this item is not overlooked when quoting a job.

PWM dV/dt value can be defined as: the rate at which voltage is changing with time or how fast the voltage is accelerating. This information can be supplied by the drive manufacturer or the manufacturer's drive specification sheet. The dV/dt value cannot be measured with typical field equipment, even when using a true-RMS voltage/amperage multi-meter.

Franklin Electric has a line of VFDs that are specifically designed for Franklin application systems. These VFDs are used in the MonoDrive and SubDrive constant pressure systems. Franklin drive systems have the required additional output filtering installed; however, the SubDrive HPX does not.

Types of Output Filters:

A resistor-inductor-capacitor (RLC) filter has both a high pass filter & a low pass filter section and are considered the best practice, but a high pass reactor filter is also acceptable.

Filters should be recommended by the drive manufacturer; for the correct recommendations provide them with answers to all five of the items below.

REQUIRED ITEMS FOR PROPER VFD FILTER SIZING:
(1) VFD model (2) Carrier frequency setting (3) Motor nameplate voltage (4) Motor nameplate max amps (5) Cable length from the drive output terminals to the motor

Input Current & Motor Overload Protection:

- Motor input current should be set at the system's typical operating current when running at nameplate rated voltage and frequency (Hz).
- Motor overload protection should be set to trip at 115% of the system's typical operating current.
- Motor overload protection must trip equal to or faster than NEMA Class 10 motor overload curve requirements.

Motor Maximum Load Limits:

- The system must never operate in excess of the motor nameplate maximum amps.
- On 50 Hz motors, nameplate amps are maximum amps as these motors have a 1.0 service factor.

Variable Frequency Drive Submersible Motor Requirements

Motor Operating Hertz, Cooling Requirements & Underload Settings:

- Standard practice for large VFD installations is to limit the operation to 60 Hz max. Operating at greater than 60 Hz requires special system design considerations.
- The motor must never operate below 30 Hz. This is the minimum speed required to provide correct bearing lubrication.
- The motor's operating speed must always operate so the minimum water flow requirements of 0.5 ft/sec for 6-inch & 8-inch motors and 0.25 ft/sec for 4-inch motors is supplied.
- The motor underload protection is normally set to trip at 80% of the system's typical operating current. However, the underload trip point must be selected so that minimum flow requirements are always met.

Starting & Stopping Ramp Settings:

- The motor must reach or pass the 30 Hz operating speed within 1 second of the motor being energized. If this does not occur, the motor bearings will be damaged and the motor life reduced.
- The best stopping method is to turn power off followed by a natural coast to stop.
- A controlled stop from 30 Hz to 0 Hz is allowed if the time does not exceed 1 second.

Drive Carrier Frequency:

- The carrier frequency is set in the field. The drive typically has a selectable range between 2k and 12k Hz. The higher the carrier wave frequency setting, the greater the voltage spikes; the lower the carrier wave frequency setting, the rougher/poorer the shape of the power curve.
- The carrier frequency should be set within the range of 4k to 5k Hz for encapsulated submersible motors.

Application Function Setting:

- If the VFD has a setting of centrifugal pump or propeller fan it should be used.
- Centrifugal pumps and fans have similar load characteristics.

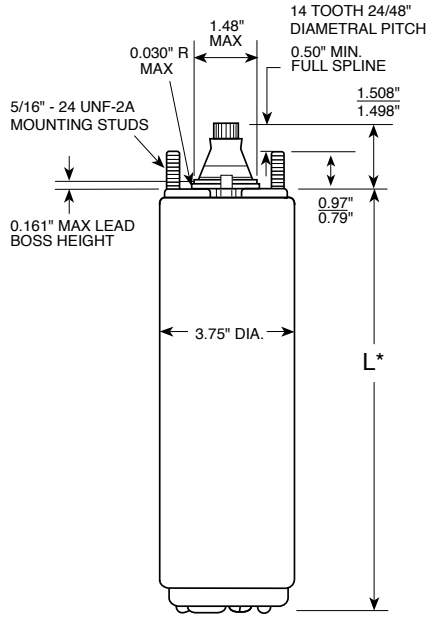
VFD Frequency of Starts:

- Keeping the starts per day within the recommended numbers shown in the frequency of starts section of the AIM manual provides the best system life. However, since in-rush current is typically reduced when used with a properly configured VFD, large 3-phase submersible motors can be started more frequently. In all cases a minimum of 7 minutes must be allowed between a power off and the next restart attempt or consecutive restart attempts.

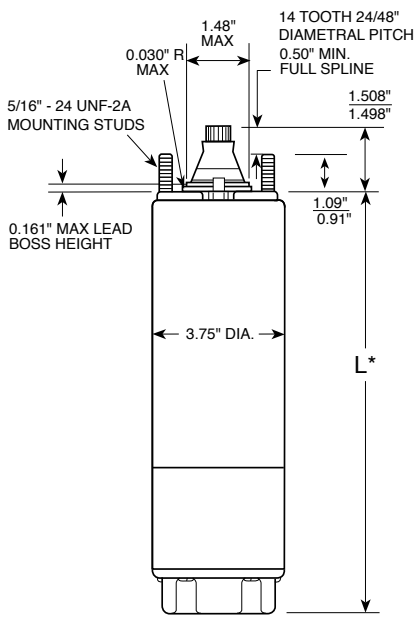
NEMA MG1 Above Ground Motor Standard Comments:

- Franklin Electric encapsulated submersible motors are not declared inverter duty motors by NEMA MG1 standards. The reason is NEMA MG1 standard part 31 does not include a section covering encapsulated winding designs.
- Franklin submersible motors can be used with VFDs without problems or warranty concerns providing Franklin's Application Installation Maintenance (AIM) manual guidelines are followed. See Franklin's on-line AIM manual for the latest guidelines.

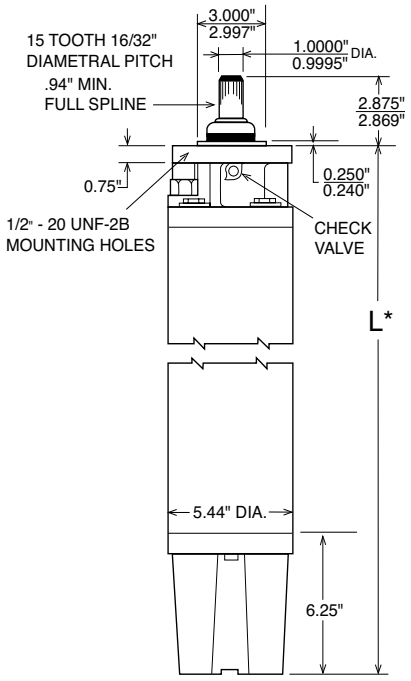
4" Super Stainless — Dimensions (Standard Water Well)



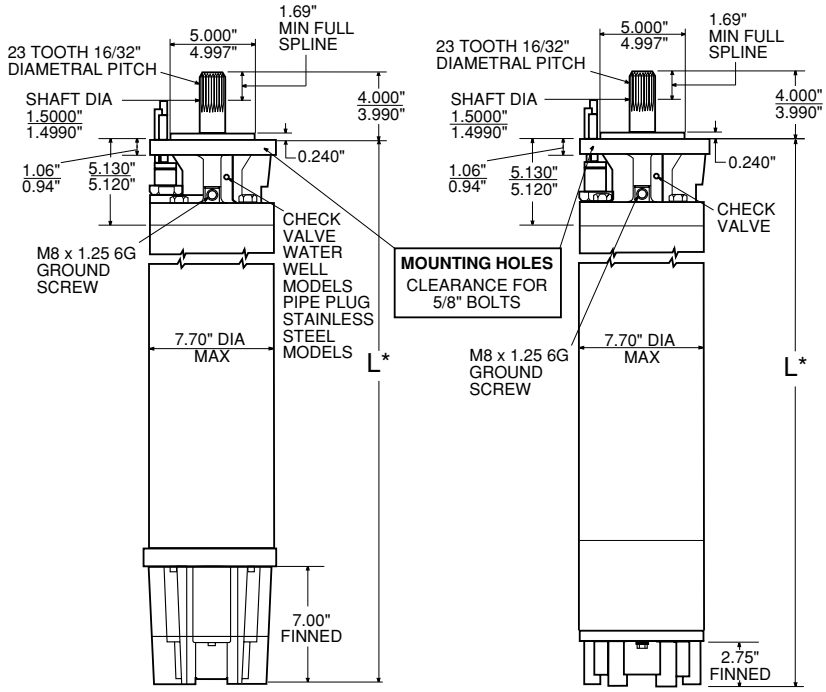
4" High Thrust — Dimensions (Standard Water Well)



6" — Dimensions (Standard Water Well)



8" — Dimensions (Standard Water Well)



*** Motor lengths and shipping weights are available on Franklin Electric's web site (www.franklin-electric.com) or by calling Franklin's submersible hotline (800-348-2420).**

Tightening Motor Lead Connector Jam Nut

4" Motors with Jam Nut:
15 to 20 ft-lb (20 to 27 Nm)

4" Motors with 2 Screw Clamp Plate:
35 to 45 in-lb (4.0 to 5.1 Nm)

6" Motors:
40 to 50 ft-lb (54 to 68 Nm)

8" Motors with 1-3/16" to 1-5/8" Jam Nut:
50 to 60 ft-lb (68 to 81 Nm)

8" Motors with 4 Screw Clamp Plate:
Apply increasing torque to the screws equally in a criss-cross pattern until 80 to 90 in-lb (9.0 to 10.2 Nm) is reached.

Jam nut tightening torques recommended for field assembly are shown. Rubber compression set within the first few hours after assembly may reduce the jam nut torque. This is a normal condition which does not indicate reduced seal effectiveness. Retightening is not required, but is permissible and recommended if original torque was questionable.

A motor lead assembly should not be reused. A new lead assembly should be used whenever one is removed from the motor, because rubber set and possible damage from removal may prevent proper resealing of the old lead.

All motors returned for warranty consideration must have the lead returned with the motor.

Pump to Motor Coupling

Assemble coupling with non-toxic FDA approved waterproof grease such as Mobile FM102, Texaco CYGNUS2661, or approved equivalent. This prevents abrasives from entering the spline area and prolongs spline life.

Pump to Motor Assembly

After assembling the motor to the pump, torque mounting fasteners to the following:

4" Pump and Motor: 10 lb-ft (14 Nm)

6" Pump and Motor: 50 lb-ft (68 Nm)

8" Pump and Motor: 120 lb-ft (163 Nm)

Shaft Height and Free End Play

Table 42

MOTOR	NORMAL SHAFT HEIGHT		DIMENSION SHAFT HEIGHT		FREE END PLAY	
					MIN.	MAX.
4"	1 1/2"	38.1 mm	1.508" / 1.498"	38.30 / 38.05 mm	0.010" 0.25 mm	0.045" 1.14 mm
6"	2 7/8"	73.0 mm	2.875" / 2.869"	73.02 / 72.88 mm	0.030" 0.76 mm	0.050" 1.27 mm
8" TYPE 1	4"	101.6 mm	4.000" / 3.990"	101.60 / 101.35 mm	0.008" 0.20 mm	0.032" 0.81 mm
8" TYPE 2.1	4"	101.6 mm	4.000" / 3.990"	101.60 / 101.35 mm	0.030" 0.76 mm	0.080" 2.03 mm

If the height, measured from the pump-mounting surface of the motor, is low and/or end play exceeds the limit, the motor thrust bearing is possibly damaged, and should be replaced.

Submersible Leads and Cables

A common question is why motor leads are smaller than specified in Franklin's cable charts.

The leads are considered a part of the motor and actually are a connection between the large supply wire and the motor winding. The motor leads are short and there is virtually no voltage drop across the lead.

In addition, the lead assemblies **operate under water**, while at least part of the supply cable must **operate in air.** Lead assemblies running under water operate cooler.

CAUTION: Lead assemblies on submersible motors are suitable only for use in water and may overheat and cause failure if operated in air.

System Troubleshooting

Motor Does Not Start

POSSIBLE CAUSE	CHECKING PROCEDURES	CORRECTIVE ACTION
A. No power or incorrect voltage.	Check voltage at line terminals. The voltage must be ± 10% of rated voltage.	Contact power company if voltage is incorrect.
B. Fuses blown or circuit breakers tripped.	Check fuses for recommended size and check for loose, dirty or corroded connections in fuse receptacle. Check for tripped circuit breakers.	Replace with proper fuse or reset circuit breakers.
C. Defective pressure switch.	Check voltage at contact points. Improper contact of switch points can cause voltage less than line voltage.	Replace pressure switch or clean points.
D. Control box malfunction.	For detailed procedure, see pages 48-56.	Repair or replace.
E. Defective wiring.	Check for loose or corroded connections or defective wiring	Correct faulty wiring or connections.
F. Bound pump.	Check for misalignment between pump and motor or a sand bound pump. Amp readings will be 3 to 6 times higher than normal until the overload trips	Pull pump and correct problem. Run new installation until the water clears
G. Defective cable or motor.	For detailed procedure, see pages 46 & 47.	Repair or replace.

Motor Starts Too Often

A. Pressure switch.	Check setting on pressure switch and examine for defects.	Reset limit or replace switch.
B. Check valve - stuck open.	Damaged or defective check valve will not hold pressure.	Replace if defective.
C. Waterlogged tank.	Check air charge	Clean or replace.
D. Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.

System Troubleshooting

Motor Runs Continuously

POSSIBLE CAUSE	CHECKING PROCEDURES	CORRECTIVE ACTION
A. Pressure switch.	Check switch for welded contacts. Check switch adjustments.	Clean contacts, replace switch, or adjust setting.
B. Low water level in well.	Pump may exceed well capacity. Shut off pump, wait for well to recover. Check static and drawdown level from well head.	Throttle pump output or reset pump to lower level. Do not lower if sand may clog pump.
C. Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.
D. Worn pump.	Symptoms of worn pump are similar to those of drop pipe leak or low water level in well. Reduce pressure switch setting, if pump shuts off worn parts may be the fault.	Pull pump and replace worn parts.
E. Loose coupling or broken motor shaft.	Check for loose coupling or damaged shaft.	Replace worn or damaged parts.
F. Pump screen blocked.	Check for clogged intake screen.	Clean screen and reset pump depth.
G. Check valve stuck closed.	Check operation of check valve.	Replace if defective.
H. Control box malfunction.	See pages 47-55 for single-phase.	Repair or replace.

Motor Runs But Overload Protector Trips

A. Incorrect voltage.	Using voltmeter, check the line terminals. Voltage must be within ± 10% of rated voltage.	Contact power company if voltage is incorrect.
B. Overheated protectors.	Direct sunlight or other heat source can raise control box temperature causing protectors to trip. The box must not be hot to touch.	Shade box, provide ventilation or move box away from source.
C. Defective control box.	For detailed procedures, see pages 47-55.	Repair or replace.
D. Defective motor or cable.	For detailed procedures, see pages 45 & 46.	Repair or replace.
E. Worn pump or motor.	Check running current, see tables 13, 22, 24 & 27.	Replace pump and/or motor.

Table 45 Preliminary Tests - All Sizes Single- and Three-Phase

TEST	PROCEDURE	WHAT IT MEANS
Insulation Resistance	1. Open master breaker and disconnect all leads from control box or pressure switch (QD type control, remove lid) to avoid electric shock hazard and damage to the meter. 2. Use a megohmmeter or set the scale lever to R X 100K on an ohmmeter. Zero the meter. 3. Connect one meter lead to any one of the motor leads and the other lead to the metal drop pipe. If the drop pipe is plastic, connect the meter lead to ground.	1. If the ohms value is normal (table 46), the motor is not grounded and the cable insulation is not damaged. 2. If the ohms value is below normal, either the windings are grounded or the cable insulation is damaged. Check the cable at the well seal as the insulation is sometimes damaged by being pinched.
Winding Resistance	1. Open master breaker and disconnect all leads from control box or pressure switch (QD type control, remove lid) to avoid electric shock hazard and damage to the meter. 2. Set the scale lever to R X 1 for values under 10 ohms. For values over 10 ohms, set the scale lever to R X 10. "zero" the ohmmeter. 3. On 3-wire motors measure the resistance of yellow to black (main winding) and yellow to red (start winding). On 2-wire motors: measure the resistance from line-to-line. Three-phase motors: measure the resistance line-to-line for all three combinations.	1. If all ohms values are normal (tables 13, 22, 24 & 27), the motor windings are neither shorted nor open, and the cable colors are correct 2. If any one value is less than normal, the motor is shorted. 3. If any one ohm value is greater than normal, the winding or the cable is open, or there is a poor cable joint or connection. 4. If some ohms values are greater than normal and some less on single-phase motors, the leads are mixed. See page 46 to verify cable colors.

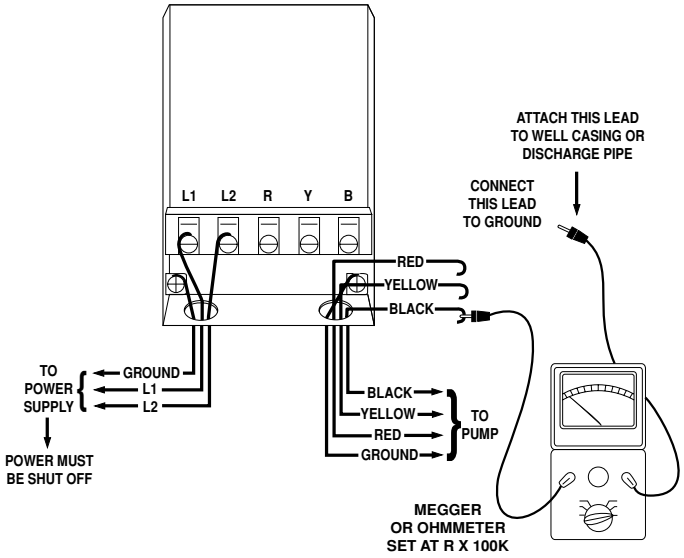


FIG. 13

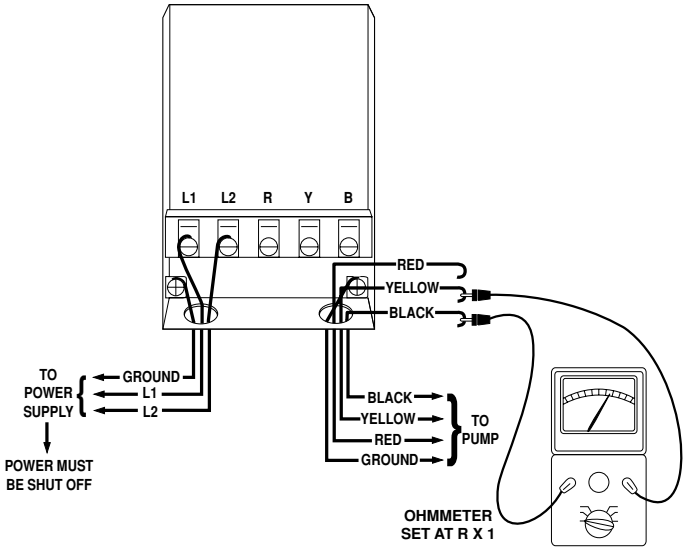


FIG. 14

Insulation Resistance Readings

Table 46 Normal ohm and Megohm Values Between All Leads and Ground

CONDITION OF MOTOR AND LEADS	OHMS VALUE	MEGOHM VALUE
A new motor (without drop cable).	200,000,000 (or more)	200.0 (or more)
A used motor which can be reinstalled in well.	10,000,000 (or more)	10.0 (or more)
MOTOR IN WELL. READINGS ARE FOR DROP CABLE PLUS MOTOR.		
New motor.	2,000,000 (or more)	2.0 (or more)
Motor in good condition.	500,000 - 2,000,000	0.50 - 2.0
Insulation damage, locate and repair.	Less than 500,000	Less than .50

Insulation resistance varies very little with rating. Motors of all hp, voltage, and phase rating have similar values of insulation resistance.

The table above is based on readings taken with a megohm meter with a 500 VDC output. Readings may vary using a lower voltage ohmmeter, consult Franklin Electric if readings are in question.

Resistance of Drop Cable (ohms)

The values below are for copper conductors. If aluminum conductor drop cable is used, the resistance will be higher. To determine the actual resistance of the aluminum drop cable, divide the ohm readings from this chart by 0.61. This chart shows total resistance of cable from control to motor and back.

Winding Resistance Measuring

The winding resistance measured at the motor should fall within the values in tables 13, 22, 24 & 27. When measured through the drop cable, the resistance of the drop cable must be subtracted from the ohmmeter readings to get the winding resistance of the motor. See table below.

Table 46A DC Resistance in ohms per 100 ft of Wire (Two conductors) @ 50 °F

AWG OR MCM WIRE SIZE (COPPER)	14	12	10	8	6	4	3	2
OHMS	0.544	0.338	0.214	0.135	0.082	0.052	0.041	0.032

1	1/0	2/0	3/0	4/0	250	300	350	400	500	600	700
0.026	0.021	0.017	0.013	0.010	0.0088	0.0073	0.0063	0.0056	0.0044	0.0037	0.0032

Pumptec-Plus

Pumptec-Plus is a pump/motor protection device designed to work on any 230 V single-phase induction motor (PSC, CSCR, CSIR, and split phase) ranging in size from 1/2 to 5 horsepower. Pumptec-Plus uses a micro-computer to continuously monitor motor power and line voltage to provide protection against dry well, water logged tank, high and low voltage and mud or sand clogging.

Pumptec-Plus – Troubleshooting During Installation

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Unit Appears Dead (No Lights)	No Power to Unit	Check wiring. Power supply voltage should be applied to L1 and L2 terminals of the Pumptec-Plus. In some installations the pressure switch or other control devices is wired to the input of the Pumptec-Plus. Make sure this switch is closed.
Flashing Yellow Light	Unit Needs to Be Calibrated	Pumptec-Plus is calibrated at the factory so that it will overload on most pump systems when the unit is first installed. This overload condition is a reminder that the Pumptec-Plus unit requires calibration before use. See step 7 of the installation instructions.
	Miscalibrated	Pumptec-Plus should be calibrated on a full recovery well with the maximum water flow. Flow restrictors are not recommended.
Flashing Yellow Light During Calibration	2-Wire Motor	Step C of the calibration instructions indicate that a flashing green light condition will occur 2 to 3 seconds after taking the SNAPSHOT of the motor load. On some two-wire motors the yellow light will flash instead of the green light. Press and release the reset button. The green should start flashing.
Flashing Red and Yellow Lights	Power Interruption	During the installation of Pumptec-Plus power may be switched on and off several times. If power is cycled more than four times within a minute Pumptec-Plus will trip on rapid cycle. Press and release the reset button to restart the unit.
	Float Switch	A bobbing float switch may cause the unit to detect a rapid cycle condition on any motor or an overload condition on two-wire motors. Try to reduce water splashing or use a different switch.
Flashing Red Light	High Line Voltage	The line voltage is over 253 volts. Check line voltage. Report high line voltage to the power company.
	Unloaded Generator	If you are using a generator the line voltage may become too high when the generator unloads. Pumptec-Plus will not allow the motor to turn on again until the line voltage returns to normal. Overvoltage trips will also occur if line frequency drops too far below 60 Hz.
Solid Red Light	Low Line Voltage	The line voltage is below 207 volts. Check line voltage.
	Loose Connections	Check for loose connections which may cause voltage drops.
	Loaded Generator	If you are using a generator the line voltage may become too low when the generator loads. Pumptec-Plus will trip on undervoltage if the generator voltage drops below 207 volts for more than 2.5 seconds. Undervoltage trips will also occur if the line frequency rises too far above 60 Hz.

Pumptec-Plus

Pumptec-Plus - Troubleshooting After Installation

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Solid Yellow Light	Dry Well	Wait for the automatic restart timer to time out. During the time out period the well should recover and fill with water. If the automatic reset timer is set to the manual position, then the reset button must be pressed to reactivate the unit.
	Blocked Intake	Clear or replace pump intake screen.
	Blocked Discharge	Remove blockage in plumbing.
	Check Valve Stuck	Replace check valve.
	Broken Shaft	Replace broken parts.
	Severe Rapid Cycling	Machine gun rapid cycling can cause an underload condition. See flashing red and yellow lights section below.
	Worn Pump	Replace worn pump parts and recalibrate.
Yellow Flashing Light	Stalled Motor	Repair or replace motor. Pump may be sand or mud locked.
	Float Switch	A bobbing float switch can cause two-wire motors to stall. Arrange plumbing to avoid splashing water. Replace float switch.
	Ground Fault	Check insulation resistance on motor and control box cable.
Solid Red Light	Low Line Voltage	The line voltage is below 207 volts. Pumptec-Plus will try to restart the motor every two minutes until line voltage is normal.
	Loose Connections	Check for excessive voltage drops in the system electrical connections (i.e. circuit breakers, fuse clips, pressure switch, and Pumptec-Plus L1 and L2 terminals). Repair connections.
Flashing Red Light	High Line Voltage	The line voltage is over 253 volts. Check line voltage. Report high line voltage to the power company.
Flashing Red and Yellow Lights	Rapid Cycle	The most common cause for the rapid cycle condition is a waterlogged tank. Check for a ruptured bladder in the water tank. Check the air volume control or snifter valve for proper operation. Check setting on the pressure switch and examine for defects.
	Leaky Well System	Replace damaged pipes or repair leaks.
	Stuck Check Valve	Failed valve will not hold pressure. Replace valve.
	Float Switch	Press and release the reset button to restart the unit. A bobbing float switch may cause the unit to detect a rapid cycle condition on any motor or an overload condition on 2-wire motors. Try to reduce water splashing or use a different switch.

QD Pumptec and Pumptec

QD Pumptec and Pumptec are load sensing devices that monitor the load on submersible pumps/motors. If the load drops below a preset level for a minimum of 4 seconds the QD Pumptec or the Pumptec will shut off the motor.

The QD Pumptec is designed and calibrated expressly for use on Franklin Electric 230 V 3-wire motors (1/3 to 1 hp.) The QD Pumptec must be installed in QD relay boxes.

The Pumptec is designed for use on Franklin Electric 2- and 3-wire motors (1/3 to 1.5 hp) 115 and 230 V. The Pumptec is not designed for jet pumps.

QD Pumptec & Pumptec – Troubleshooting

SYMPTOM	CHECKS OR SOLUTION
If the QD Pumptec or Pumptec trips in about 4 seconds with some water delivery.	A. Is the voltage less than 90% of nameplate rating? B. Are the pump and motor correctly matched? C. Is the **QD Pumptec** or **Pumptec** wired correctly? For the **Pumptec** check the wiring diagram and pay special attention to the positioning of the power lead (230 V or 115 V). D. For **QD Pumptec** is your system 230 V 60 Hz or 220 V 50 Hz?
If the QD Pumptec or Pumptec trips in about 4 seconds with no water delivery.	A. The pump may be airlocked. If there ia a check valve on top of the pump, put another section of pipe between the pump and the check valve. B. The pump may be out of water. C. Check the valve settings. The pump may be dead-heading. D. Pump or motor shaft may be broken. E. Motor overload may be tripped. Check the motor current (amperage).
If the QD Pumptec or Pumptec will not timeout and reset.	A. Check switch position on side of circuit board on **Pumptec**. **QD Pumptec** check timer position on top/front of unit. Make sure the switch is not between settings. B. If the reset time switch is set to manual reset (position 0), **QD Pumptec** and **Pumptec** will not reset (turn power off for 5 sec. then back on to reset).
If your pump/motor will not run at all.	A. Check voltage. B. Check wiring. C. Remove the **QD Pumptec** from the control box. Reconnect wires in box to original state. If motor does not run the problem is not **QD Pumptec**. Bypass **Pumptec** by connecting L2 and motor lead with jumper. Motor should run. If not, the problem is not **Pumptec**. D. On **Pumptec** only check that **Pumptec** is installed between the control switch and the motor.
If your QD Pumptec or Pumptec will not trip when the pump breaks suction.	A. Be sure you have a Franklin motor. B. Check wiring connections. On **Pumptec** is lead power (230 V or 115 V) connected to correct terminal? Is motor lead connected to correct terminal? C. Check for ground fault in the motor and excessive friction in the pump. D. The well may be “gulping” enough water to keep **QD Pumptec** or **Pumptec** from tripping. It may be necessary to adjust the **QD Pumptec** or the **Pumptec** for these extreme applications. Call the Franklin Electric Service Hotline at 800-348-2420 for information. E. On **Pumptec** applications does the control box have a run capacitor? If so, **Pumptec** will not trip. (Except for Franklin 1.5 hp motors).
If your QD Pumptec or Pumptec chatters when running.	A. Check for low voltage. B. Check for waterlogged tank. Rapid cycling for any reason can cause the **QD Pumptec** or the **Pumptec** relay to chatter. C. On **Pumptec** make sure the L2 and motor wires are installed correctly. If they are reversed, the unit can chatter.

SubDrive2W, 75, 100, 150, 300, MonoDrive, & MonoDrive XT

The Franklin Electric SubDrive/MonoDrive Constant Pressure controller is a variable-speed drive that delivers water at a constant pressure.

WARNING: Serious or fatal electrical shock may result from failure to connect the motor, SubDrive/MonoDrive Controller, metal plumbing and all other metal near the motor or cable to the power supply ground terminal using wire no smaller than motor cable wires. To reduce the risk of electrical shock, disconnect power before working on or around the water system. Capacitors inside the SubDrive/MonoDrive Controller can still hold a lethal voltage even after power has been removed. Allow 10 minutes for dangerous internal voltage to discharge. Do not use motor in swimming areas.

SubDrive2W, 75, 100, 150, 300, MonoDrive, & MonoDrive XT

SubDrive/MonoDrive Troubleshooting

Should an application or system problem occur, built-in diagnostics will protect the system. The “FAULT” light or digital display on the front of the SubDrive/MonoDrive Controller will flash a given number of times or display a number indicating the nature of the fault. In some cases, the system will shut itself off until corrective action is taken. Fault codes and their corrective actions are listed below. See SubDrive/MonoDrive Installation Manual for installation data.

NUMBER OF FLASHES OR DIGITAL DISPLAY	FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
1	MOTOR UNDERLOAD	- Overpumped well - Broken shaft or coupling - Blocked screen, worn pump - Air/gas locked pump - SubDrive not set properly for pump end	- Frequency near maximum with less than 65% of expected load, 42% if DIP #3 is “on” - System is drawing down to pump inlet (out of water) - High static, light loading pump - reset DIP switch #3 to “on” for less sensitivity if not out of water - Check pump rotation (SubDrive only) reconnect if necessary for proper rotation - Air/gas locked pump - if possible, set deeper in well to reduce - Verify DIP switches are set properly
2	UNDERVOLTAGE	- Low line voltage - Misconnected input leads	- Line voltage low, less than approximately 150 VAC (normal operating range = 190 to 260 VAC) - Check incoming power connections and correct or tighten if necessary - Correct incoming voltage - check circuit breaker or fuses, contact power company
3	LOCKED PUMP	- Motor and/or pump misalignment - Dragging motor and/or pump - Abrasives in pump	- Amperage above SFL at 10 Hz - Remove and repair or replace as required
4 (MonoDrive & MonoDriveXT only)	INCORRECTLY WIRED	- MonoDrive only - Wrong resistance values on main and start	- Wrong resistance on DC test at start - Check wiring, check motor size and DIP switch setting, adjust or repair as needed
5	OPEN CIRCUIT	- Loose connection - Defective motor or drop cable - Wrong motor	- Open reading on DC test at start. - Check drop cable and motor resistance, tighten output connections, repair or replace as necessary, use “dry” motor to check drive functions, if drive will not run and exhibits underload fault replace drive
6	SHORT CIRCUIT	- When fault is indicated immediately after power-up, short circuit due to loose connection, defective cable, splice or motor	- Amperage exceeded 50 amps on DC test at start or max amps during running - Incorrect output wiring, phase to phase short, phase to ground short in wiring or motor - If fault is present after resetting and removing motor leads, replace drive
	OVER CURRENT	- When fault is indicated while motor is running, over current due to loose debris trapped in pump	- Check pump
7	OVERHEATED DRIVE	- High ambient temperature - Direct sunlight - Obstruction of airflow	- Drive heat sink has exceeded max rated temperature, needs to drop below 85 °C to restart - Fan blocked or inoperable, ambient above 125 °F, direct sunlight, air flow blocked - Replace fan or relocate drive as necessary
8 (SubDrive300 only)	OVER PRESSURE	- Improper pre-charge - Valve closing too fast - Pressure setting too close to relief valve rating	- Reset the pre-charge pressure to 70% of sensor setting. Reduce pressure setting well below relief valve rating. Use next size larger pressure tank. - Verify valve operation is within manufacturer’s specifications. - Reduce system pressure setting to a value less than pressure relief rating.
RAPID	INTERNAL FAULT	- A fault was found internal to drive	- Unit may require replacement. Contact your supplier.
9 (SubDrive2W only)	OVER RANGE (Values outside normal operating range)	- Wrong hp/voltage - Internal fault	- Verify motor hp and voltage - Unit may require replacement. Contact your supplier.

SubMonitor

SubMonitor Troubleshooting

FAULT MESSAGE	PROBLEM/CONDITION	POSSIBLE CAUSE
SF Amps Set Too High	SF Amps setting above 359 Amps.	Motor SF Amps not entered.
Phase Reversal	Reversed incoming voltage phase sequence.	Incoming power problem.
Underload	Normal line current.	Wrong SF Max Amps setting.
	Low line current.	Over pumping well. Clogged pump intake. Closed valve. Loose pump impeller. Broken shaft or coupling. Phase loss.
Overload	Normal line current.	Wrong SF Max Amps setting.
	High line current.	High or low line voltage. Ground fault. Pump or motor dragging. Motor stalled or bound pump.
Overheat	Motor temperature sensor has detected excess motor temperature.	High or low line voltage. Motor is overloaded. Excessive current unbalance. Poor motor cooling. High water temperature. Excessive electrical noise (VFD in close proximity).
Unbalance	Current difference between any two legs exceeds programmed setting.	Phase loss. Unbalanced power supply. Open Delta transformer.
Overvoltage	Line voltage exceeds programmed setting.	Unstable power supply.
Undervoltage	Line voltage below programmed setting.	Poor connection in motor power circuit. Unstable or weak power supply.
False Starts	Power has been interrupted too many times in a 10 second period.	Chattering contacts. Loose connections in motor power circuit. Arcing contacts.

Continued on next page

Subtrol-Plus (Obsolete - See SubMonitor)

Subtrol-Plus - Troubleshooting After Installation

SYMPTOM	POSSIBLE CAUSE OR SOLUTION
Subtrol-Plus Dead	When the Subtrol-Plus reset button is depressed and released, all indicator lights should flash. If line voltage is correct at the Subtrol-Plus L1, L2, L3 terminals and the reset button does not cause lights to flash, Subtrol-Plus receiver is malfunctioning.
Green Off Time Light Flashes	The green light will flash and not allow operation unless both sensor coils are plugged into the receiver. If both are properly connected and it still flashes, the sensor coil or the receiver is faulty. An ohmmeter check between the two center terminals of each sensor coil connected should read less than 1 ohm, or coil is faulty. If both coils check good, receiver is faulty.
Green Off Time Light On	The green light is on and the Subtrol-Plus requires the specified off time before the pump can be restarted after having been turned off. If the green light is on except as described, the receiver is faulty. Note that a power interruption when the motor is running will initiate the delay function.
Overheat Light On	This is a normal protective function which turns off the pump when the motor reaches maximum safe temperatures. Check that amps are within the nameplate maximum on all three lines, and that the motor has proper water flow past it. If overheat trip occurs without apparent motor overheating, it may be the result of an arcing connection somewhere in the circuit or extreme noise interference on the power lines. Check with the power company or Franklin Electric. A true motor overheat trip will require at least five minutes for a motor started cold. If trips do not conform to this characteristic, suspect arcing connections, power line noise, ground fault, or SCR variable speed control equipment.
Overload Light On	This is a normal protective function, protecting against an overload or locked pump. Check the amps in all lines through a complete pumping cycle, and monitor whether low or unbalanced voltage may be causing high amps at particular times. If overload trip occurs without high amps, it may be caused by a faulty rating insert, receiver, or sensor coil. Recheck that the insert rating matches the motor. If it is correct, carefully remove it from the receiver by alternately lifting sides with a knife blade or thin screwdriver, and make sure it has no pins bent over. If the insert is correct and its pins are okay, replace receiver and/or sensor coils.
Underload Light On	This is a normal protective function. A. Make sure the rating insert is correct for the motor. B. Adjusting the underload setting as described to allow the desired range of operating conditions. Note that a DECREASE in underload setting is required to allow loading without trip. C. Check for drop in amps and delivery just before trip, indicating pump breaking suction, and for unbalanced line current. D. With the power turned off, recheck motor lead resistance to ground. A grounded lead can cause underload trip.

Subtrol-Plus (Obsolete - See SubMonitor)

Subtrol-Plus - Troubleshooting After Installation (Continued)

SYMPTOM	POSSIBLE CAUSE OR SOLUTION
Tripped Light On	Whenever the pump is off as a result of Subtrol-Plus protective function, the red tripped light is on. A steady light indicates the Subtrol-Plus will automatically allow the pump to restart as described, and a flashing light indicates repeated trips, requiring manual reset before the pump can be restarted. Any other red light operation indicates a faulty receiver. One-half voltage on 460 V will cause tripped light on.
Control Circuit Fuse Blows	With power turned off, check for a shorted contactor coil or a grounded control circuit lead. The coil resistance should be at least 10 ohms and the circuit resistance to panel frame over 1 megohm. A standard or delay-type 2 amp fuse should be used.
Contactor Will Not Close	If proper voltage is at the control coil terminals when controls are operated to turn the pump on, but the contactor does not close, turn off power and replace the coil. If there is no voltage at the coil, trace the control circuit to determine if the fault is in the Subtrol-Plus receiver, fuse, wiring, or panel operating switches. This tracing can be done by first connecting a voltmeter at the coil terminals, and then moving the meter connections step by step along each circuit to the power source, to determine at which component the voltage is lost. With the Subtrol-Plus receiver powered up, with all leads disconnected from the control terminals and with an ohmmeter set at RX10, measure the resistance between the control terminals. It should measure 100 to 400 ohms. Depress and hold in the reset button. The resistance between the control terminals should measure close to infinity.
Contactor Hums or Chatters	Check that coil voltage is within 10% of rated voltage. If voltage is correct and matches line voltage, turn off power and remove the contactor magnetic assembly and check for wear, corrosion, and dirt. If voltage is erratic or lower than line voltage, trace the control circuit for faults similar to the previous item, but looking for a major drop in voltage rather than its complete loss.
Contactor Opens When Start Switch is Released	Check that the small interlocks switch on the side of the contactor closes when the contactor closes. If the switch or circuit is open, the contactor will not stay closed when the selector switch is in HAND position.
Contactor Closes But Motor Doesn't Run	Turn off power. Check the contactor contacts for dirt, corrosion, and proper closing when the contactor is closed by hand.
Signal Circuit Terminals Do Not Energize	With the Subtrol-Plus receiver powered up and all leads disconnected from the signal terminals, with an 0hmmeter set at RX10, measure the resistance between the signal terminals. Resistance should measure close to infinite. Depress and hold in the reset button. The resistance between the signal terminals should measure 100 to 400 ohms.

Abbreviations

A	Amp or amperage
AWG	American Wire Gauge
BJT	Bipolar Junction Transistor
°C	Degree Celsius
CB	Control Box
CRC	Capacitor Run Control
DI	Deionized
Dv/dt	Rise Time of the Voltage
EFF	Efficiency
°F	Degree Fahrenheit
FDA	Federal Drug Administration
FL	Full Load
ft	Foot
ft-lb	Foot Pound
ft/s	Feet per Second
GFCI	Ground Fault Circuit Interrupter
gpm	Gallon per Minute
HERO	High Efficiency Reverse Osmosis
hp	Horsepower
Hz	Hertz
ID	Inside Diameter
IGBT	Insulated Gate Bipolar Transistor
in	Inch
kVA	Kilovolt Amp
kVAR	Kilovolt Amp Rating
kW	Kilowatt (1000 watts)
L1, L2, L3	Line One, Line Two, Line Three
lb-ft	Pound Feet
L/min	Liter per Minute
mA	Milliamp
max	Maximum
MCM	Thousand Circular Mils
mm	Millimeter
MOV	Metal Oxide Varister
NEC	National Electrical Code
NEMA	National Electrical Manufacturer Association
Nm	Newton Meter
NPSH	Net Positive Suction Head
OD	Outside Diameter
OL	Overload
PF	Power Factor
psi	Pounds per Square Inch
PWM	Pulse Width Modulation
QD	Quick Disconnect
R	Resistance
RMA	Return Material Authorization
RMS	Root Mean Squared
rpm	Revolutions per Minute
SF	Service Factor
SFhp	Service Factor Horsepower
S/N	Serial Number
TDH	Total Dynamic Head
UNF	Fine Thread
V	Voltage
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
VFD	Variable Frequency Drive
W	Watts
XFMR	Transformer
Y-D	Wye-Delta
Ω	ohms

TOLL FREE HELP FROM A FRIEND

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Phone Franklin's toll free SERVICE HOTLINE for answers to your pump and motor installation questions. When you call, a Franklin expert will offer assistance in troubleshooting and provide immediate answers to your system application questions. Technical support is also available online. Visit our website at:

www.franklin-electric.com

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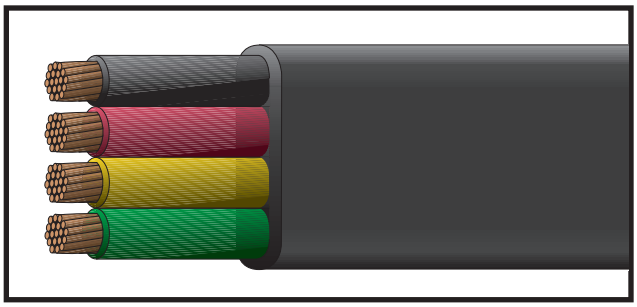

Submersible Pump Cable
TYPE THW-Heavy Duty FLAT BLACK JACKETED with Ground 75°C/600V

Description & Features:
UL listed Type THW heavy duty flat submersible pump cable is a multi-purpose cable with parallel, individually insulated, color coded conductors, green ground insulated conductor and an overall jacket. Construction provides flexible copper stranding insulated with Type THW (PVC) compound. A tough PVC jacket, with a non-penetrating web, is easily stripped to facilitate installation yet provide optimum flexibility, mechanical protection and crush resistance.

- UL listed as Type THW Submersible Pump Cable
- Acid, alkali, oil and grease resistant
- Weather, ozone and sunlight resistant jacket
- Abrasion and crush resistant
- Sequential footage marks

Applications:
- For use within the well casing to supply power to the submersible pump
- Designed for use where extra mechanical protection and flexibility during installation and operation are required

Construction:
Conductors: Flexible stranded soft annealed copper
Insulation: Thermoplastic polyvinyl chloride (PVC)
Color coding: black, red, yellow, green (ground)
Assembly: The insulated conductors, including the grounding conductor, are configured flat and parallel without fillers
Jacket: Black thermoplastic polyvinyl chloride (PVC) applied directly over the conductors with a non-penetrating web
Temperature: 75°C **Voltage:** 600

Specifications & Standards:
UL Standard 83; RoHS Compliant

THREE CONDUCTORS WITH GREEN INSULATED GROUNDING CONDUCTORS

Part Number	Conductor Size, AWG		Dimensions (Inches)			Standard Packaging	Ampacity NEC§	Weight (Lbs./Mft.)
	Power	Ground	Insulation	Jacket	O.D.			
PFB14/3GG	14/3 (7 str)	14 (7 str)	.045	.045	.261 x .763	500' & 1000'	15	145
PFB12/3GG	12/3 (19 str)	12 (19 str)	.045	.045	.280 x .840	500' & 1000'	20	189
PFB10/3GG	10/3 (19 str)	10 (19 str)	.045	.045	.305 x .940	500' & 1000'	30	255
PFB8/3GG	8/3 (19 str)	10 (19 str)	.060	.045	.364 x 1.120	500' & 1000'	50	374
PFB6/3GG	6/3 (19 str)	8 (19 str)	.060	.045	.414 x 1.336	500' & 1000'	65	522
PFB4/3GG	4/3 (19 str)	8 (19 str)	.060	.045	.465 x 1.489	500' & 1000'	85	714
PFB2/3GG	2/3 (19 str)	6 (19 str)	.060	.045	.535 x 1.749	500' & 1000'	115	1,036
PFB1/03GG	1/03 (19 str)	6 (7 str)	.080	.060	.660 x 1.990	Bulk	150	1,613
PFB2/03GG	2/03 (19 str)	6 (7 str)	.080	.060	.700 x 2.120	Bulk	175	1,932
PFB3/03GG	3/03 (19 str)	4 (7 str)	.080	.060	734 x 2.314	Bulk	200	2,135
PFB4/03GG	4/03 (19 str)	4 (7 str)	.080	.060	.800 x 2.490	Bulk	230	2,871
PFB250/3GG	250/3 (37 str)	4 (7 str)	.095	.080	.925 x 2.807	Bulk	235	3,518
PFB350/3GG	350/3 (37 str)	3 (7 str)	.095	.080	1.031 x 3.153	Bulk	310	4,689
PFB500/3GG	500/3 (37 str)	2 (7 str)	.095	.080	1.163 x 3.590	Bulk	380	6,410

TWO CONDUCTORS WITH GREEN INSULATED GROUNDING CONDUCTORS

PFB14/2GG	14/2 (7 str)	14 (7 str)	.045	.045	.261 x .592	500' & 1000'	15	112
PFB12/2GG	12/2 (19 str)	12 (19 str)	.045	.045	.280 x .654	500' & 1000'	20	152
PFB10/2GG	10/2 (19 str)	10 (19 str)	.045	.045	.305 x .729	500' & 1000'	30	210
PFB8/2GG	8/2 (19 str)	10 (19 str)	.060	.045	.364 x .828	500' & 1000'	50	276

§ Per Table 310-16 of the NEC
All values are nominal; all weights are exclusive of packaging. All diameters and weights are subject to normal manufacturing tolerances.
* Direct Burial rated in sizes 12 through 500 KCMIL, upon request
All sales are subject to Standard Terms & Conditions of Sale.

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Rockwell Automation

BULLETIN 1232 PUMP CONTROL PANELS

Introduction | Standards Compliance and Certifications | Cat. No. Explanation | Product Selection | Modifications for Combination Devices
Accessories | Specifications | Full Load Motor Currents | Approximate Dimensions | Renewal Parts

Build a Catalog Number

Heater Elements — Starters with eutectic alloy overload relays require 3 heater elements. Located on **Eutectic Alloy Overload Relay Heater Elements.**

NEMA Size	Continuous Ampere Rating [A]	Maximum Horsepower Rating *Full Load Current Must Not Exceed Continuous Ampere Rating*				Line Voltage [V]	Fuse Clip Rating Amperes [A] *Fuses not included. Select per NEC ‡*	Type 3R Rainproof with Narrow Enclosure
		AC Motor Voltage						
		60 Hz	60 Hz	50 Hz	60 Hz			
		200V	230V	380…415V	460…575V			Cat. No.⋆
1	27	7-1/2	7-1/2	–	–	208…240	30	1232-BN⊗-✪-24
		–	–	10	10	480…600	30	1232-BN⊗-✪-24
		7-1/2	7-1/2	–	–	208…240	60	1232-BN⊗-✪-25
		–	–	10	10	480…600	60	1232-BN⊗-✪-25
2	45	10	15	–	–	208…240	60	1232-CN⊗-✪-25
		–	–	25	25	480…600	60	1232-CN⊗-✪-25
		10	15	–	–	208…240	100	1232-CN⊗-✪-26
		–	–	25	25	480…600	100	1232-CN⊗-✪-26
3	90	25	30	–	–	208…240	100	1232-DN⊗-✪-26
		–	–	50	50	480…600	100	1232-DN⊗-✪-26
		25	30	–	–	208…240	200	1232-DN⊗-✪-27
		–	–	50	50	480…600	200	1232-DN⊗-✪-27

⋆ Class R fuse clips can be supplied as a factory option in place of Class H clips. To order Class R fuse clips, add an "R" after the cat. no. Example: **Cat. No. 1232-BN⊗-✪-24** becomes **Cat. No. 1232-BN⊗-✪-24R**. Class H fuse clips will accept Class R fuses. However, only Class R fuse clips are the rejection type which limit their use to Class R fuses. To order Class J fuse clips, add a "J" after the cat. no. Example: **Cat. No. 1232-BN⊗-✪-24** becomes **Cat. No. 1232-BN⊗-✪-24J.**

‡ Some applications may require time-delay fuses when this size fuse clip is used.

⊗ Coil Voltage Code

The cat. no. as listed is incomplete. Select a coil voltage code from the table below to complete the cat. no. Example: **Cat. No. 1232-BN⊗-✪-24** becomes **Cat. No. 1232-BNA-✪-24**. For other voltages, consult your local Rockwell Automation sales office or Allen–Bradley distributor.

Voltage§	[V]	208	230…240	460…480	575…600

Common Control	AC, 60 Hz	H	A	B	C
Transformer Control♣					
120V Separate Control (without transformer)		AD	AD	CD	CD

✪ Overload Relay Code

Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay. The cat. no. as listed is incomplete. Select an overload relay code from E1 Plus Solid-State Three-Phase Overload Relay (Selectable Class 10, 20, or 30) (Automatic/Manual Reset) to complete the cat. no.
Example: **Cat. No. 1232-BNA-✪-24** becomes **Cat. No. 1232-BNA-A2E-24**.

INSTALLATION INSTRUCTIONS

Revision A2
Rapid City, SD, USA, 01/2010

MODEL 777-P2
777-575-P2
ELECTRONIC OVERLOAD RELAY

IL_777-P2_A2

www.SymCom.com
...your electronic control & protection specialists

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(800) 843-8848 · (605) 348-5580 · fax (605) 348-5685

TABLE OF CONTENTS

DANGER!

HAZARDOUS VOLTAGES MAY BE PRESENT DURING INSTALLATION.
Electrical shock can cause death or serious injury.
Installation should be done by qualified personnel following all national, state and local electrical codes.

BE SURE POWER IS DISCONNECTED PRIOR TO INSTALLATION!
FOLLOW NATIONAL, STATE AND LOCAL CODES.
READ THESE INSTRUCTIONS ENTIRELY BEFORE INSTALLATION.

WARNING!

Hazardous Voltage. Failure to follow these instructions can result in death, serious injury, or equipment damage.

Power must be disconnected prior to attaching and/or using the battery cable.

Damage to the device or serious injury may occur if the battery programming feature is used while power is applied. Always follow proper safety procedures for removing and securing the power source before connecting the battery cable.

The battery cable cannot be used when power is applied to the device. To program the device when it is powered, the user must utilize a network programming option.

The 777-P2 is an electronic overload relay that is fully programmable for customized protection. The 777-P2 is designed to protect 3-phase systems with operating voltages of 200-480VAC (500-600VAC for the Model 777-575-P2). The output relay is a Form C contact, which can control a contactor or other device within the output relay contact rating.

The 777-P2 can be safely programmed prior to installation by supplying power with a 9V battery. See Figure 4 in the PROGRAMMING section. DO NOT connect the battery to the unit when line voltage is present. The 777-P2 **cannot** be tested for proper operation or communications using a 9V battery. For testing purposes, 3-phase power must be used with a minimum voltage of 200VAC (500VAC for the Model 777-575-P2). Follow all safety warnings when dealing with hazardous voltages.

CONNECTIONS

1. Disconnect power and verify line and control power are off.
2. Using the four corner tabs or the DIN rail mount, install the 777-P2 directly above or below the contactor. To mount on a DIN rail, hook the top clips first then apply downward pressure until the lower clips snap onto the rail.
3. a) For amperages from 20-90 amps, insert the motor conductors through the holes marked A, B, and C. Ensure the motor phase conductors correspond with the round hole designations, i.e. the A phase conductor should go through the round hole marked “A”. See Figure 1 for a typical wiring diagram.

   b) For amperages less than 20 amps, loop the motor conductors according to Table 1. Figure 2 shows an example of the looping required for current ranging from 12-20 amps (MULT=2).

c) For amperages greater than 90 amps, external CTs (current transformers) are required. SymCom recommends using CTs with terminal connections for easier installation. All CT secondaries must make five passes through the round holes on the MotorSaver® Plus. See Figure 3 for a typical wiring diagram using external CTs.

NOTE: Pay close attention to the wiring diagrams to eliminate any errors when communicating power factor information over a network. The L2 phase conductor must pass through the B current measurement hole for proper operation.

4. Connect the 3-phase power from the line side of the contactor to L1, L2, and L3 terminals using 12-18 AWG copper wire. These should be tightened to 7 in.-lbs., max.

5. Connect the control circuit wires to the appropriate terminals. The relay is designed for fail-safe operation; the NO (normally open) contact should be in series with the coil on the contactor for motor control (see Figure 1). For alarm circuits, the NC (normally closed) contact is in series with the alarm circuitry.

Recommended Full Load Amps	OC Range (Amps)	UC Range (Amps)	# of Passes through each Window	MULT (CT Ratio)
2-2.5	2-10	0, 1-9.8	10	10
2.5-3	2.2-11.1	0, 1.1-10.8	9	9
3-3.5	2.5-12.5	0, 1.2-12.2	8	8
3.5-4	2.8-14.3	0, 1.4-14	7	7
4-5	3.3-16.7	0, 1.6-16.3	6	6
5-6	4-20.1	0, 2-19.6	5	5
6-8	5-25.1	0, 2.5-24.5	4	4
8-12	6.6-33.5	0, 3.3-32.6	3	3
12-20	10-50.3	0, 5-49	2	2
20-90	20-100	0, 10-98	1	1
80-110	80-140	0, 40-140	5	100 (100:5)
110-160	120-210	0, 60-210	5	150 (150:5)
160-220	160-280	0, 80-280	5	200 (200:5)
220-320	240-420	0, 120-420	5	300 (300:5)
320-420	320-560	0, 160-560	5	400 (400:5)
400-520	400-700	0, 200-700	5	500 (500:5)
480-600	480-840	0, 240-840	5	600 (600:5)
540-700	560-980	0, 280-980	5	700 (700:5)
560-800	640-992/FFF	0, 320-992/FFF	5	800 (800:5)

Table 1: Wiring Configuration Based on Motor Full Load Amps

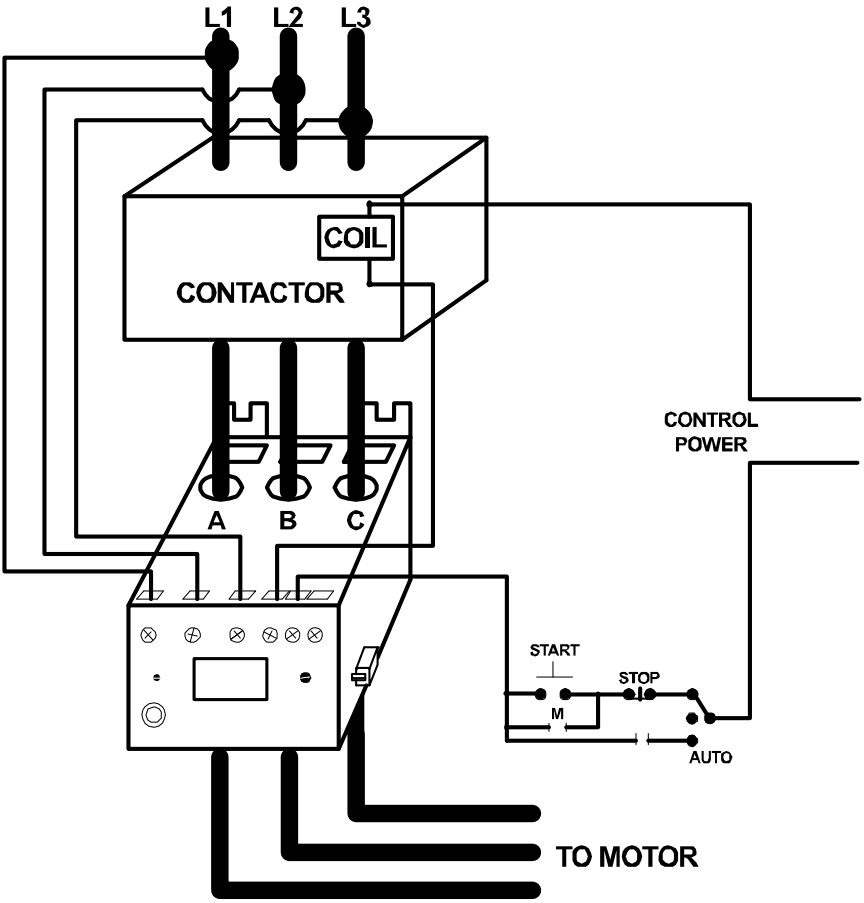


Figure 1: Typical Wiring Diagram

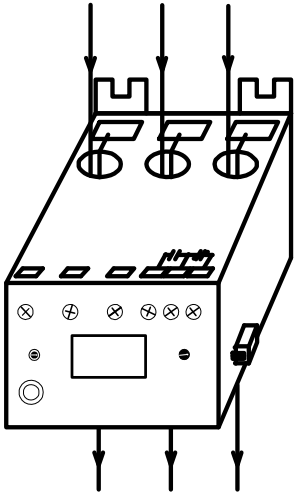


Figure 2: Looping Example for 12-20A, MULT = 2

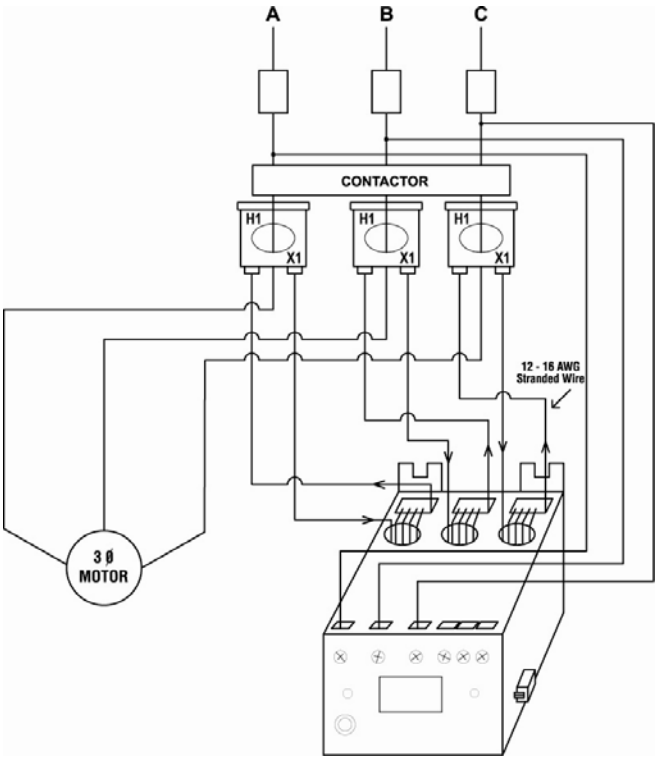


Figure 3: Typical Wiring Using External CTs[1]

[1] All CTs must face the same direction, and all CT secondaries must be wired identically, i.e. all X1 terminals enter the main (round) window and return to H1 terminal after exiting the loop conductor window (rectangle). Every CT secondary must make 5 passes through the corresponding main conductor window. SymCom recommends using CTs with terminals to simplify installation.

PROGRAMMING

To program prior to installation, connect the 9V battery cable to the pins on the left side of the unit (when looking at the display), and then attach a standard 9V battery to the cable. See Figure 4. The 9V battery cable is keyed for proper installation. If the cable is connected improperly, the 777-P2 will not power the display. DO NOT connect the battery when line voltage is present. The 777-P2 **cannot** be tested for proper operation or communications using a 9V battery. For testing purposes, 3-phase power must be used with a minimum voltage of 200VAC (500VAC for the Model 777-575-P2). Follow all safety warnings when dealing with hazardous voltages.

1. Rotate the MODE SELECT switch to the parameter to be programmed. It is recommended that LV be programmed first.
2. Press and hold the RESET/PROGRAM button.
3. While holding the RESET/PROGRAM button, rotate the DISPLAY/PROGRAM knob until the proper setting for the parameter that is being programmed is displayed.
4. Release the RESET/PROGRAM button. This stores the new parameter in the nonvolatile memory. If the number changes back to what is was before programming, then the tamper guard is on and will need to be unlocked before programming can be completed (see Tamper Guard).
5. Move clockwise through the positions to complete the process. Continue steps 1-4 until all parameters are programmed.

Figure 4: Proper Position of the Battery Cable

PROGRAMMABLE PARAMETERS

The following settings MUST be programmed by the user in order to provide proper protection for the application. Settings vary by situation and application and should be selected and tested for each unique installation. All parameters are actual values except for the VUB and CUB settings; these are programmed as percentages. The range each parameter can be programmed is found in the electrical specifications table. See Programming Examples for sample setup instructions. Failure to program all setpoints could result in nuisance tripping or prevent the device from protecting the motor. Always use the proper CTs for the motor full load amperage (FLA).

LV/HV - Low Voltage/High Voltage. The recommended settings for LV (low voltage) and HV (high voltage) according to the NEMA MG1 standard are ±10% of the motor's nameplate voltage. Generally, the motor manufacturer should be contacted to verify these limits. High and low voltage trips are based on average voltage measured. Never set LV higher than HV.

Example: Nameplate voltage = 230 V
LV **=** 90% x 230=207 V
HV = 110% x 230 = 253 V

VUB - Voltage Unbalance. The NEMA MG1 standard says a motor should not be operated above a 1% voltage unbalance without derating the motor. Most utility supplied power sources have a difficult time sustaining a 1% VUB. The motor manufacturer should be consulted for an exact VUB setting. Setting VUB to 999 will disable voltage unbalance protection, but will not disable voltage single-phase protection. Voltage unbalance is calculated as follows:

%Voltage Unbalance = [(Maximum deviation from the average)/Average] x 100%

Example: Measured line-line voltages = 203, 210, and 212. The average = (203+210+212)/3 = 208.3. The maximum deviation from the average is the greatest difference between the average voltage (208.3) and any one voltage reading: 212-208.3 = 3.7, 210-208.3 = 1.7 and 208.3-203 = 5.3. The maximum deviation from the average is 5.3, thus voltage unbalance = 5.3/208.3 x 100= 2.5%.

MULT - MULT (multiplier) setting is found in Table 1. The MULT setting is determined by the number of passes of the motor leads or the size of external CTs and the full load amps of the motor the unit will be monitoring. MULT sets the trip point range for undercurrent, overcurrent and ground fault current faults. Set MULT first, then set UC, OC and GF.

OC - Overcurrent. Is typically set to the service factor amperage (SFA) of the motor or 100-135% of motor full-load amps (FLA), which are determined by the motor manufacturer. The value must be higher than UC. If any one leg exceeds the OC setting, the 777-P2 will trip according to the Trip Class (TC) settings.

NOTE: When using external CTs, do not set OC greater than the thermal rating of the CTs

UC - Undercurrent. Is most commonly set to 80% of the full-load amperage (FLA) of the motor. This is usually adequate for protection of loss of load for many pumps and motors, including submersibles. If the motor is drawing less than full load amperage, then the UC may be set lower than 80% of FLA for adequate protection. Centrifugal/booster pumps may have to be set to something higher than 80% of FLA for adequate protection. UC can be set to 0 if UC protection is not desired. The 777-P2 examines average current to determine if an undercurrent trip condition exists. The value must be lower than OC

CUB - Current Unbalance. SymCom recommends contacting the motor manufacturer for a specific setting. Current unbalance is calculated the same way voltage unbalance is calculated (see formula above). Setting CUB to 999 will disable current unbalance and current single-phase protection.

TC - Trip Class. Determines how quickly the 777-P2 will trip when an overcurrent (overload) condition is detected. TC is a dual-function setting—both a thermal trip class (NEMA standard) and a linear trip delay (in seconds) can be set.

While the standard trip classes are 5, 10, 15, 20, and 30, TC can be set from 2–60, with or without jam protection. The trip class setpoint is the time in seconds that the device will take to trip when any phase current is greater than or equal to 600% of the OC setpoint. These additional "non-standard" trip classes allow the unit to follow a trip curve in-between the "standard" trip class curves shown in Figure 5.

Trip classes 2–60 can be set from approximately the 7 o'clock to 10 o'clock position with the DISPLAY/PROGRAM knob. Trip classes J02–J60, which include jam protection, can be set from approximately the 10 o'clock to 1 o'clock position. This additional jam protection feature, when enabled, is initiated 1 minute after the motor starts and provides a 2-second trip delay for motors exceeding 400% of the OC setting.

The linear overcurrent trip delay can be set from approximately the 1 o'clock to 5 o'clock position from 0–60 seconds (L00–L60) or to "oFF." If TC is set to L00, the 777-P2 will trip off within 1 second after motor current reaches the OC setpoint. If both trip class and linear trip delay settings are programmed, the 777-P2 will follow the faster trip time. For example, TC is set to J15 and L20, and the amperage is 200% of the OC setting. Following the trip class 15 curve, the 777-P2 will trip off in approximately 100 seconds. Thus the 777-P2 will follow the linear trip delay setting, because it is faster, and will trip off in 20 seconds.

The motor manufacturer should be contacted for an exact TC setting. Table 3 describes the trip classes, and Figure 5 shows the trip class curves.

RD1 - Restart Delay One. Rapid-cycle timer, in seconds (default). The purpose of this timer is to provide protection against short cycling and to allow adequate cool down time between motor starts. This timer is initiated when power is first applied to the unit. If no voltage fault conditions exists, the output relay will energize (the NO will close and the NC will open) as soon as RD1 timer expires. In most cases, this is set to 20-30 seconds. This should provide adequate protection for successive power outages or short cycling caused by other motor controls. This timer is also initiated when motor current goes to zero. Setting RD1 to zero will turn off this feature and ensure that when an alarm circuit is used, an alarm will sound only when there is a fault or power to the unit is lost.

RD2 - Restart Delay Two. Referred to as a motor cool-down timer, in minutes (default). RD2 is used to restart the motor after a trip due to a current unbalance, current single-phasing, or an overcurrent condition. A setting of 5-10 minutes will give most motors adequate time to cool down after an overcurrent condition. The motor manufacturer should be contacted for an exact value.

RD3 - Restart Delay Three. This timer, in minutes (default), only initiates after an undercurrent trip and is referred to as a dry-well recovery timer in pumping applications. This is set according to the time it takes for the well to recharge after pumping dry. This setting varies widely by application and there is no typical setting. RD3 can be set from 2-500 minutes or to A to enable the automatic Dry-Well Recovery Calculator.

The Automatic Dry-Well Recovery Calculator allows the 777-P2 to automatically select a restart delay based on the run time of the last run cycle before tripping on an undercurrent fault. Table 2 shows the next restart delay vs. run time. In general, a longer run time produces a shorter restart delay. This feature allows the 777-P2 to optimize running and rest times automatically.

Run Time	Next Restart Delay (minutes)	Starts/Hr
> 1Hr	6	10
30 min.- 59.99 min.	15	4
15 min.- 29.99 min.	30	2
< 15 min.	60	1

TABLE 2: Automatic Dry-Well Recovery Timer

#RU/ADDR - Restart Attempts (undercurrent)/Address. The #RU/ADDR is a dual-function setting. #RU settings are displayed and selected by turning the DISPLAY/PROGRAM dial from approximately the 7 o'clock to 12 o'clock position. ADDR settings are displayed and selected by turning the DISPLAY/PROGRAM dial from approximately the 12 o'clock to 5 o'clock position.

#RU is the number of restarts the 777-P2 will attempt after an undercurrent fault before the unit locks out and requires a manual reset. #RU can be set to 0, 1, 2, 3, 4, or A. This counter is cleared one minute after restarting if the 777-P2 does not trip again on undercurrent.

If #RU is set to "0", the 777-P2 will require manual resetting after all undercurrent faults.
If #RU is set to "A", the 777-P2 will always automatically restart after undercurrent faults, once the RD3 timer expires.

ADDR is the RS-485 address of the 777-P2 and is only used when communicating with any external communication device. The address can be set from A01–A99.

#RF/COM - Restart Attempts (other faults)/ Communications Settings. The #RF settings are displayed and selected by turning the DISPLAY/PROGRAM dial from approximately the 7 o'clock to 12 o'clock position. COM settings are displayed and selected by turning the DISPLAY/PROGRAM dial from approximately the 12 o'clock to 5 o'clock position.

#RF is the number of restarts the 777-P2 will attempt after current unbalance or current single-phase faults before the unit locks out and requires a manual reset. This counter will be cleared one minute after start-up if the unit does not trip again for the same fault condition. Available settings are 0, 1, 2, 3, 4 and A, or to include overcurrent faults, #RF can be set to oc1, oc2, oc3, oc4 or ocA.

If #RF is set to "0", the 777-P2 will require manual resetting after all current unbalance, current single-phase and overcurrent faults.
If #RF is set to "A", the 777-P2 will always restart automatically after current unbalance and current single-phase faults, once the RD2 timer expires. Overcurrent faults will require a manual reset.
If #RF is set to "ocA", the 777-P2 will always restart automatically after current unbalance, current single-phase and overcurrent faults, once the RD2 timer expires.

COM determines the baud rate, even/odd parity, and stop bit. COM can bet set to C00-C07. C00 and C04 are duplicates provided for backward compatibility.

- C00 = 9600 baud, No parity, and 1 stop bit
- C01 = 9600 baud, Odd parity, and 1 stop bit
- C02 = 9600 baud, No parity, and 1 stop bit
- C03 = 9600 baud, Even parity, and 1 stop bit
- C04 = 19200 baud, No parity, and 1 stop bit
- C05 = 19200 baud, Odd parity, and 1 stop bit
- C06 = 19200 baud, No parity, and 1 stop bit
- C07 = 19200 baud, Even parity, and 1 stop bit

UCTD - Undercurrent Trip Delay. The length of time, in seconds (default), the unit will allow the motor to run in an undercurrent situation before de-energizing its relay. Typically, UCTD is set to 2-4 seconds to allow for motor to reach full load.

GF - Ground Fault. The maximum allowable current that can flow to ground before the 777-P2 de-energizes its relay. This is a residual, class II ground fault system and should not be used for personnel safety. A typical setting for GF is 10-20% of motor FLA (in amps). GF may be set to oFF if this feature is not desired. The GF test procedure in this installation instruction manual must be conducted before the device is brought online.

OPERATION

The relay operation of the Model 777-P2 is designed to be fail-safe. This means when the voltage is within the programmed limits, the relay will energize—the NO contact will close and the NC contact will open. When the unit loses power or senses a fault condition, the relay will de-energize and contacts will return to their original state. Once the unit has been installed and programmed, the unit is ready to operate. Turn MODE SELECT to the RUN position. The display will show "run" alternating with a number (the number displayed will be the number corresponding to where the DISPLAY/PROGRAM knob is pointed). It will do this for the restart delay time programmed into RD1. Once the timer expires, the relay will energize—the NO contact will close and the NC contact will open. If something other than this is displayed, see the troubleshooting section for more information. If MODE SELECT is taken out of RUN, the 777-P2's relay will de-energize.

Trip Class	Application Description
5	Small fractional horsepower motors where acceleration times are almost instantaneous or where extremely quick trip times are required
10	(Fast Trip) Hermetic refrigerant motors, compressors, submersible pumps and general-purpose motors that reach rated speed in less than 4 seconds
15	Specialized applications
20	(Standard Trip) Most NEMA-rated general-purpose motors will be protected by this setting
30	(Slow Trip) Motors with long acceleration times (>10 seconds) or high inertia loads
J Prefix (Jam Protection)	Programming any of the trip classes with the J prefix will enable jam protection. This additional protection is enabled 1 minute after the motor starts and provides a 2 second trip time for motors exceeding 400% of the OC setting
Non-Standard Trip Classes	Trip time in seconds when any phase current is 600% of OC. Time is approximately 90% of the TC setting

Table 3: Trip Class Descriptions

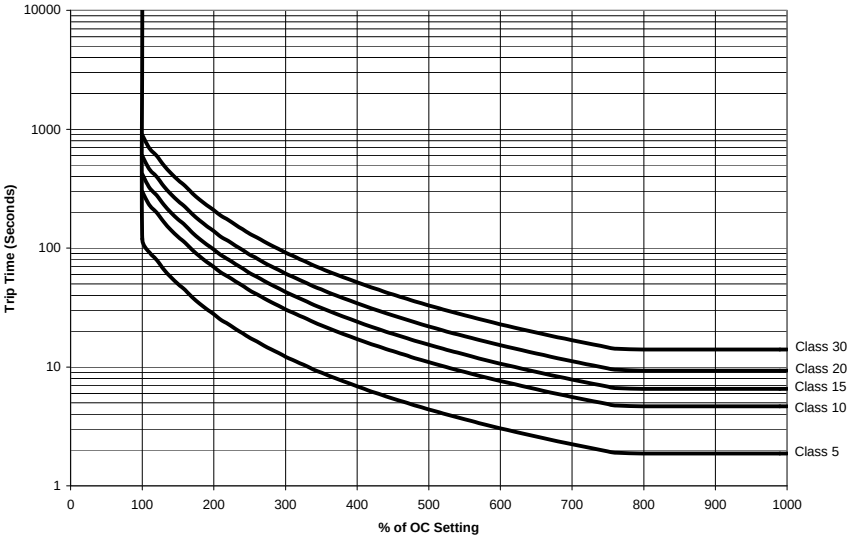


Figure 5: Overload Trip Curves

PROGRAMMING EXAMPLES

NOTE: Since no network communications are connected in these examples there are no setting changes needed for ADDR or COM

Example #1

Motor to be protected: 3-phase, 460 Volt, 25 hp air compressor with a full load amperage rating of 34A and a service factor of 1.1 or max amps at 37.4. Use the following calculations and reasoning to determine the appropriate settings for this application.

LV-	460 x 0.90 = 414
HV-	460 x 1.10 = 506
VUB-	Manufacturer suggests 3
MULT-	MULT=1 from Table 1
OC-	Service Factor Amperage = 37.4
UC-	FLA x 0.80 = 34A x 0.80 = 27.2
CUB-	Manufacturer suggests 5
TC-	From Table 3, general purpose motor = 20 Linear Trip = Off
RD1-	Since this compressor takes about 10 seconds to bleed off excess pressure after a shutdown, setting RD1 = 15 will allow the compressor to unload before being restarted.
RD2-	Because the motor may be hot from running in an unbalance or single-phase condition, a motor cool-down time of 10 minutes should be appropriate, RD2 = 10.
RD3/#RU-	Because an undercurrent would signal a serious problem in this application (a broken shaft or belt), #RU should be set to 0 for a manual reset. Therefore, RD3 does not have any function and no timer setting is needed.
#RF-	Because an overcurrent (overload) fault signals a serious problem in this application (e.g., worn bearings), "oc" should not be included in the #RF setting so that a manual reset after an overcurrent fault is required. A #RF=1 will give the system 1 chance to recover from a current unbalance or current single-phasing problem before manual reset is required.
UCTD-	Setting UCTD = 5 will allow the compressor to reach normal operation and not allow the motor to run too long in a failure mode.
GF-	A ground fault setting of 15% of full load amps may likely indicate that the motor should be evaluated for repair or replacement. Therefore, GF = 34A x 0.15 = 5.1.

Example #2

Motor to be protected: 3-phase, 230 Volt, 5 hp submersible pump with a full load amperage of 15.9A and a service factor of 1.15 or max amps at 18.3. Use the following calculations and reasoning to determine the appropriate settings for this application.

LV-	230 x 0.90 = 207
HV-	230 x 1.10 = 253
VUB-	Manufacturer suggests 3
MULT-	MULT=2 from Table 1
OC-	Service Factor Amperage = 18.3
UC-	FLA x 0.80 = 15.9 x 0.80 = 12.7
CUB-	Manufacturer suggests 5
TC-	From Table 3, for this (and most) submersible pump, TC = 10 (fast trip) Linear Trip = Off
RD1-	To protect the pump from rapid cycling, RD1 = 60
RD2-	Since the motor is small and submerged in water, the motor will generally cool down quickly. RD2=5

RD3- The well history shows that it will fully recover in 2 hours. RD3 = 120

#RU- In this application, we know that the well will eventually recharge itself, #RU = A (Automatic).

#RF- This well is known for sand to jam the impeller, therefore “oc” should be included so that the pump will attempt to automatically restart after an overloaded condition. History shows that 2 or 3 starts and stops usually clears the sand out of the impeller. #RF= oc2 or oc3.

UCTD- This well may become air locked on startup, but will usually re-prime itself in 5 seconds or less. UCTD = 10

GF- Because this type of fault indicates the impending failure of the motor and it may take several days to get a new pump and schedule for a driller to remove and replace the pump, GF setting of 10% of full load amperage will give the well owner enough time to prepare for pump replacement. GF = 15.9A x 0.10 = 1.59 (use a setting of 1.6 amps).

SYSTEM DISPLAY

On power up, the 777-P2 will show the current software revision. For example if the software revision is 33.04, the 777-P2 will show 033 followed by 004.

The output display can show one of the following parameters when MODE SELECT is in RUN: L1-L2, L2-L3, and L3-L1 line voltage; %VUB; A, B, and C phase current; %CUB; measured GF current. The display is used for programming the operating parameters of the device and also identifies what caused the unit to de-energize its relay or what is keeping the unit from energizing its relay, and under normal operating conditions, what the last fault was. The last fault can be displayed by pressing and holding the RESET/PROGRAM button while MODE SELECT is in RUN. When the unit trips off or is holding the motor off, the current fault condition will be shown in the display without pressing the button (CAUTION: pressing the reset button at this time will reset the unit). Table 4 lists the fault codes the unit could display.

Displayed Message	Meaning
oc	Tripped on overcurrent
SP	Tripped on current single-phasing or unit won’t start because the voltage is single-phased
ub	Tripped on current unbalance or unit won’t start because the voltage is unbalanced
uc	Tripped on undercurrent
CF	Tripped on contactor failure (due to faulty contacts or connections on the load side)
GrF	Tripped on ground fault
HI	A high voltage condition exists (won’t allow motor to start)
Lo	A low voltage condition exists (won’t allow motor to start)
rP	Incoming phases have been reversed, the motor may run backwards if started
oFF	A stop command was issued from a remote source
HPr	Tripped on high power
LPr	Tripped on low power
CLo	Tripped on low control voltage
clr	No previous faults
Pro	Shown when programming using the battery in the RUN position
FFF	Displayed value is greater than 999 (can be due to incorrect MULT setting)

Table 4: Fault Codes

TROUBLESHOOTING

The 777-P2 will display a fault code alternating with a number or with "run" when it has tripped. If the unit is showing a fault code alternating with "run," it is timing down the restart delay. If the fault code is alternating with a number (voltage reading or zero), the unit will not allow the motor to start because there is a problem with the incoming voltage. If the display is showing just a fault code, the unit is in a manual reset mode. This could be because the number of restarts (#RF, #RU) has expired or is not allowed. If the display reads "oFF," a stop command was issued through the communications network or a remote monitor.

PROBLEM	SOLUTION
The unit will not start. Display alternates "rP" with the DISPLAY/PROGRAM parameter value.	The voltage inputs are reverse-phased. If this is the initial start-up, swap any two of the leads connected to L1, L2, or L3 on the 777-P2 to correct the problem. If the overload relay has been previously running, the power system has been reverse-phased. Check the phase sequence of the incoming power lines. **Note**: L1 must be tapped from conductor Phase A, L2 from B, and L3 from C for correct power factor measurements on remote communications.
The unit will not start. Display alternates "SP", "ub", "HI", or "Lo" with the DISPLAY/ PROGRAM parameter value.	The incoming voltage is not within the limits programmed in the VUB, HV, and LV settings. Turn the DISPLAY / PROGRAM knob to read each incoming line voltage value. Correct the incoming power problem and check programmed limits by turning the MODE SELECT knob. Compare incoming values for HV, LV, and VUB to setpoints to verify they are correct.
Display alternates "SP", "ub", or "oc" with "run."	The overload relay has tripped on the fault shown on the display and is timing down RD2 before restarting. No further action is required.
Display alternates "uc" with "run."	The overload relay has tripped on undercurrent and is counting down RD3 before restarting. If undercurrent is not a normal condition for this installation, check for broken shafts, broken belts, etc.
Display is showing a solid "SP", "ub", or "oc."	The unit has tripped on the fault shown and a manual reset is required because of the programmed setting in #RF. Check the system for problems that would produce the single-phase, overcurrent or current unbalance fault, such as a jam.
Display is showing a solid "uc."	The unit has tripped on undercurrent and a manual reset is required because of the setting in #RU. Check the system for problems that would produce a loss of load such as a broken belt or a lack of liquid to pump.
Display is showing a solid "CF."	The unit has tripped on current single-phasing, but was not single-phased by the incoming voltage. Check for damaged contacts or loose or corroded wiring connections.
Display is showing a solid "GrF."	A ground fault current greater than the programmed GF value has been detected. Check the motor for insulation breakdown. A manual reset is required to clear this message. Press the RESET button to perform a manual reset.
Display alternates "LPr"[2] with "RUN"	The overload relay has tripped on low power (LPr) and is timing down RD3 before restarting. If LPr is not a normal condition for this installation, check for loss of liquid, closed valves, broken belts, etc.

PROBLEM	SOLUTION
Display is showing a solid “LPr” [2]	The unit has tripped on low power and a manual reset is required because of the setting in #RU. Check the system for problems that would produce a loss of load like a broken belt or a pump is out of liquid. Press the RESET button to perform a manual reset.
Display alternates “HPr” [2] with “RUN”	The unit has tripped on high power and is timing down RD2. Check for a high power condition.
Display is showing solid “HPr” [2]	The unit has tripped on high power and requires a manual reset because of the setting in #RF. Press the RESET button to perform a manual reset.
Display alternates “CLo” [2] with “RUN”	The overload relay has tripped on low control voltage (CLo) and is timing down RD2 before restarting.
Display is showing solid “CLo” [2]	The unit has tripped on low control voltage and a manual reset is required because of the setting in #RF. Verify system voltage is correct. Press the RESET button to perform a manual reset.

[2] LPr, HPr, and CLo are enabled only from a network master via a communications module.

CLEARING LAST FAULT

The last fault stored can be cleared on the 777-P2 by following these steps:

1. Rotate the MODE SELECT switch to GF.
2. Press and hold the RESET/PROGRAM button. Adjust the DISPLAY/PROGRAM knob until “cLr” appears on the display. Release the RESET/PROGRAM button.

To verify the last fault was cleared, place the MODE SELECT switch in the RUN position. Then press and hold the RESET/PROGRAM button; “cLr” should be on the display.

TAMPER GUARD

The 777-P2 setpoints can be locked to protect against unauthorized program changes.

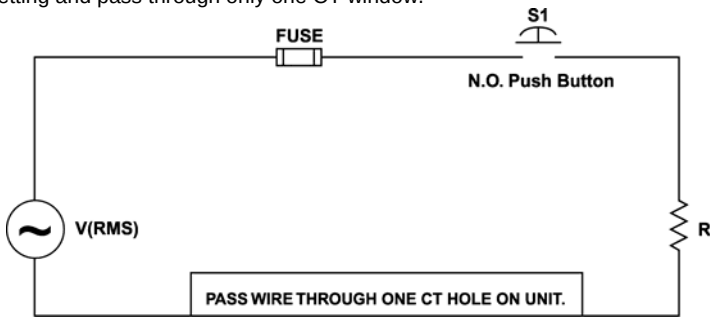
1. Rotate the MODE SELECT switch to GF.
2. Press and hold the RESET button. Adjust the DISPLAY/PROGRAM knob until “Loc” appears on the display.
3. Release the RESET button.
4. Turn MODE SELECT switch to RUN.

The program is now locked, but all settings can be viewed. The unit can be unlocked by following the same steps except adjust the DISPLAY/PROGRAM knob to “unL” in step 2.

GROUND FAULT TESTING PROCEDURE

A ground fault test must be performed before installing the 777-P2 as required by UL1053 and NEC, ANSI/NFPA 70.

1. Disconnect power.
2. Hook up the three line voltages to L1, L2, and L3 as required by the installation instructions.
3. Program the desired parameters into the unit. For test purposes, set MULT to 1 and GF to the minimum allowed setting.
4. Construct the circuit, using an AC power supply. This circuit simulates a ground fault condition by generating a current in one of the phases. Alternate test circuits may be used. The only requirement is the current through the current transformer must be between 115% and 150% of the GF setting and pass through only one CT window.



5. The values of V and R will be determined by the current required to generate a GF trip condition: I = Vrms/R, where I = 115% of GF setting.
6. Place the unit in the RUN position, apply 3-phase power and allow the NO contact to close.
7. Energize the test circuit by pushing and holding the test pushbutton until the unit trips (within 8.5 seconds). The display should show “GrF” and the NO contacts should be open. Release the NO pushbutton.
8. The results of the test are to be recorded on the test form provided below. The form should be kept by those in charge of the building’s electrical installation in order to be available to the authority having jurisdiction.
9. Confirm programmed parameters and proceed with installation instructions.

GROUND FAULT TEST RESULTS*

Date	Performed by	Results	Location

*A copy of this form should be retained by the building’s electrical foreman.

777-P2 SPECIFICATIONS

Functional Specifications	
Programmable Operating Points	
LV- Low Voltage Threshold	170–524V (450–649)*
HV- High Voltage Threshold	172–528V (451–660V)*
VUB- Voltage Unbalance Threshold	2-25% or 999 (disable)
MULT- # of Conductors or CT Ratio (XXX:5)	1–10, 100, 150, 200, 300, 400, 500, 600, 700, 800
OC- Overcurrent Threshold **	(20–100A) ÷ MULT or 80–140% of CT Primary
UC- Undercurrent Threshold **	(0, 10–98A) ÷ MULT or 40–140% of CT Primary
CUB- Current Unbalance Threshold	2–50% or 999 (disable)
TC- Overcurrent Trip Class[3]	2-60, J2-J60, L00-L60, oFF
RD1- Rapid Cycle Timer	0-999 seconds
RD2- Restart Delay After All Faults Except Undercurrent (motor cool-down timer)	2–500 minutes
RD3- Restart Delay After Undercurrent (dry-well recovery timer)	2–500 minutes, A (Automatic)
#RU- Number of Restarts After Undercurrent	0, 1, 2, 3, 4, A (Automatic)
ADDR- RS485 Address	A01–A99
#RF-Number of Restarts After All Faults Except Undercurrent[4]	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA (Automatic)
COM- Communication setting	C00-C07
UCTD- Undercurrent Trip Delay	2–999 seconds
GF- Ground Fault Current Threshold**	(3-20A) ÷ MULT or 12-40% of CT Primary or oFF
Trip Times	
Ground Fault Trip Time	Trip time
101%-200% of Setpoint	8 seconds ±1 second
201%-300% of Setpoint	4 seconds ±1 second
301%-400% of Setpoint	3 seconds ±1 second
401% or Greater	2 seconds ±1 second
Current Unbalance Trip Times	
% Over Setpoint	Trip time
0%	30 seconds
1%	15 seconds
2%	10 seconds
3%	7.5 seconds
4%	6 seconds
5%	5 seconds
6%	4 seconds
11%	3 seconds
15%	2 seconds
Input Characteristics	
Input Voltage (3-phase)	200–480VAC (Model 777-P2) 500–600VAC (Model 777-575-P2)
Frequency	50/60 Hz
Motor Full Load Amp Range	
3-phase, (looped conductors required)	1–20A
3-phase (direct)	20–90A
3-phase (external CTs required)	80–800A

[3] If a “J” is included in the trip class (TC) setting, jam protection is enabled.
[4] If "oc" is displayed in the #RF setting, overcurrent will be included as an automatic restart after RD2 expires. Otherwise, a manual reset is required after an OC fault.

Output Characteristics	
Output Contact Rating SPDT (Form C)	Pilot duty rating: 480VA @ 240VAC, B300 General purpose: 10A @ 240VAC
Expected Life	
Mechanical	1 x 10^6 operations
Electrical	1 x 10^5 operations at rated load
General Characteristics	
Environmental	
Temperature Range	Ambient Operating: -20° to 70°C (-4° to 158°F) Ambient Storage: -40° to 80°C (-40° to 176°F)
Pollution Degree	3
Class of Protection	IP20 (Finger Safe)
Relative Humidity	10-95%, non-condensing per IEC 68-2-3
Accuracy at 25°C (77°F)	
Voltage	±1%
Current	±3% (<100A direct)
Timing	±0.5 second
Ground Fault	±15% (< 100A)
Repeatability	
Voltage	±0.5% of nominal voltage
Current	±1% (<100A direct)
Maximum Input Power	10 W
Safety Marks	
UL	UL508, UL1053
CE	IEC 60947-1, IEC 60947-5-1
Standards Passed	
Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity (RFI), Conducted	IEC 61000-4-6, Level 3 10V
Radio Frequency Immunity (RFI), Radiated	IEC 61000-4-3, Level 3 10V/m
Fast Transient Burst	IEC 61000-4-4, Level 3, 3.5 kV input power
Surge	
IEC	61000-4-5 Level 3, 2kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Vibration	IEC 68-2-6, 10-55Hz, 1mm peak-to-peak, 2 hours, 3 axis
Shock	IEC 68-2-27, 30g, 3 axis, 11ms duration, half-sine pulse
Mechanical	
Dimensions	3.0" H x 3.6" W x 5.1" D
Terminal Torque	7 in.-lbs.
Enclosure Material	Polycarbonate
Weight	1.2 lbs
Maximum Conductor Size Through 777-P2	0.65" with insulation

NOTE: The 777-P2 can be programmed prior to installation by connecting a 9V battery. Disconnect power prior to using the battery cable and follow all safety warnings.
*575 Volt Model
** Do not program the unit above the thermal rating for the CTs.

For warranty information, please see **Terms and Conditions** at
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