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November 9, 2015

Ms. Michele Dermer
EPA Region 9, WTR-9
75 Hawthorne St.
San Francisco, CA 94105

Subject: Revised Plan to Abandon PG&E Test Injection/Withdrawal Well 1 And Return Observation Wells to Field Operator Permit No. R9UIC-CA5-FY13-1 King Island, San Joaquin County, California

Dear Ms. Dermer:

The enclosed Plan to Plug and Abandon Injection/Withdrawal (I/W) Well 1 and Return Observation Wells to Field Operator has been revised to address comments regarding the original plan dated October 23, 2015 provided in the EPA letter to PG&E dated November 6, 2015. The enclosed Plan includes the following revisions to address EPA comments 3a and 4:

- **Comment 3a**: In Attachment B, Revised I/W Well Abandonment Procedure, Step 6, the procedure was corrected to state that 58 cf (cubic feet) of mud would be pumped into the 9-5/8" casing.
- **Comment 4**: In Attachment C, Revised I/W Well Abandonment Schematic, the "Prepared By" and "Updated By" dates were corrected to be October 22, 2015.

PG&E responses to EPA comments 1, 2, 3b and 5 are as follows:

- **Comments 1 and 2**: PG&E will perform the internal mechanical integrity tests (MITs) on the I/W well and the Piacentine 1-27 well on the same day, scheduled for December 7, 2015. PG&E will further communicate with the EPA regarding the timing of this activity, providing EPA as much time as possible and as necessary to schedule its attendance.
- **Comment 3b**: PG&E will provide EPA as much time as possible and as necessary to schedule its oversight of cementing operations during I/W well plugging and abandonment.

- **Comment 5**: PG&E acknowledges EPA's comments on the logging procedure and log format of the pressure-temperature logging performed on the I/W well on July 10, 2015. The logging procedure and log format were appropriate for the research purpose of the logging.

Plugging and abandonment of the I/W well will occur between December 8 and 13, 2015. PG&E will further communicate with the EPA regarding the timing of this activity. Hal Moore with PG&E (contact details to follow) will be EPA's point of contact for the field activities.

If you have any questions regarding PG&E's responses and the schedule for field activities, or require additional information, please feel free to contact me at (415) 973-6270.

Sincerely,

Mike Medeiros
Manager, Renewable Energy Development

Cc: Mr. James Walker, EPA Consultant
Mr. Michael Woods, Division of Oil, Gas and Geothermal Resources
Ms. Anne L. Olson, Central Valley Regional Water Quality Control Board

Enclosure:

- Plan to Plug and Abandon PG&E Test Injection/Withdrawal Well 1 and Return Observation Wells to Field Operator. Includes:
    - Attachment A.1: Internal Mechanical Integrity Test Procedure – I/W Well
    - Attachment A.2: Internal Mechanical Integrity Test Procedure – Piacentine 1-27
    - Attachment B: Revised I/W Well Abandonment Procedure
    - Attachment C: Revised I/W Well Abandonment Schematic
    - Attachment D: I/W Well Pressure-Temperature Log (July 10, 2015)

Plan to:
Plug and Abandon PG&E Test Injection/Withdrawal Well 1 and Return Observation Wells to Field Operator

In Accordance with EPA Underground Injection Control (UIC) Permit No. R9UIC-CA5-FY13-1

PG&E Compressed Air Energy Storage Project
Compression Testing Program
King Island Gas Field, San Joaquin County, California

Revised November 9, 2015

Pacific Gas and Electric Company®

CERTIFICATION

This Plan has been prepared by Saeed Irani, P.E., as an employee of Saeed Irani and with expertise in petroleum engineering and well design; under the review and supervision of Mark Ausburn, P.G., as an employee of WorleyParsons, and with expertise in petroleum geology. Their signatures appear below. The findings, recommendations, specifications and/or professional opinions presented herein have been prepared in accordance with generally accepted professional geologic and engineering practice for similar projects, and within the scope of the project. There is no other warrantee, either express or implied.

WorleyParsons Group
Mark Ausburn, P.G.
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Saeed Irani, P.E.
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PG&E Test Injection/Withdrawal Well 1 Abandonment
Return Observation Wells to Field Operator
King Island Gas Field, San Joaquin County, California

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ATTACHMENTS

A.1 Internal Mechanical Integrity Test Procedure – I/W Well

A.2 Internal Mechanical Integrity Test Procedure – Piacentine 1-27

B Revised I/W Well Abandonment Procedure

C Revised I/W Well Abandonment Schematic

D I/W Well Pressure-Temperature Log (July 10, 2015)

PG&E Test Injection/Withdrawal Well 1 Abandonment
Return Observation Wells to Field Operator
King Island Gas Field, San Joaquin County, California

1. Introduction

This document is a plan to abandon PG&E Test Injection/Withdrawal Well 1 (I/W well) and return ownership of compression test observation wells Piacentine 1-27 and Piacentine 2-27 to the King Island Gas Field (the Field) operator. These wells were used during the Compression Testing Program (CTP) performed by PG&E to evaluate the feasibility of compressed air energy storage (CAES) at the King Island Gas Field in San Joaquin County, California. The I/W well was used as the injection/withdrawal well, the Piacentine 1-27 was used as a pressure and temperature monitoring well and the Piacentine 2-27 was geophysically logged to monitor the air bubble development. The Plan details are in accordance with the requirements of Environmental Protection Agency (EPA) Underground Injection Control (UIC) Permit No. R9UIC-CA5-FY13-1 (The Permit).

The CTP was conducted from February 14 to June 4, 2015. The Permit requires a post-test monitoring period of six to nine months. PG&E has elected to carry out the Plan at the end of the minimum post-test monitoring period (six-months), shortly after December 4, 2015.

2. EPA Requirements

The following EPA requirements applicable to this Plan, either stated in the Permit or in subsequent emails or letters to PG&E during the CTP or post-test monitoring period, are summarized in the table below:

Well	EPA Requirement	Reference
I/W Well	Internal mechanical integrity test (MIT) at the conclusion of the post-test monitoring period.	Permit: Part II.D.2.b.iii
	Plugging and abandonment of I/W well if bottomhole pressure (BHP) exceeds normal hydrostatic gradient at end of post-test monitoring period.	Permit: Appendix H UIC Permit Application: Attachment P, Section P-4
	Perforation and plugging with cement of key intervals with poor cement bonding.	EPA email to PG&E dated April 10, 2015
Piacentine 1-27	Internal MIT prior to conversion to production service.	Permit: Part II.D.2.b.iii
	Well ownership reverts to Field operator after conclusion of the post-test monitoring period. PG&E will work with Field operator to meet any EPA requirements after transfer of ownership.	Permit: Appendix H UIC Permit Application: Attachment P, Section P-4
Piacentine 2-27	Well ownership reverts to Field operator after conclusion of the post-test monitoring period. PG&E will work with Field operator to meet any EPA requirements after transfer of ownership.	Permit: Appendix H UIC Permit Application: Attachment P, Section P-4

3. Internal Mechanical Integrity Tests (MITs)

Internal MITs will be performed shortly after the conclusion of the post-test monitoring period on the I/W well and the Piacentine 1-27 on December 4, 2015. The internal MITs will be conducted in accordance with Permit Part II.D.2.a.i and follow the procedures provided in **Attachment A.1** (I/W well) and **Attachment A.2** (Piacentine 1-27).

4. I/W Well Abandonment

The I/W well will be plugged and abandoned shortly after completion of the internal MIT. A preliminary procedure for plugging and abandonment of the I/W well was provided in Attachment Q-1 of the UIC Permit Application titled: *Underground Injection Control Permit Application and Technical Attachments, PG&E Compressed Air Energy Storage*

Project, Compression Testing Program, King Island Gas Field, San Joaquin County, California, revised April 18, 2014 (PG&E, 2014). A proposed I/W well abandonment schematic was provided in Attachment Q-3 of the UIC Permit Application and Appendix G of the Permit.

A revised I/W well abandonment procedure and schematic have been prepared and are provided as **Attachments B and C**. Notable changes in the revised abandonment plan are listed below:

- Removal of mandrel containing Spartek downhole pressure-temperature sensor and delivery to PG&E.
- Run mill to bottom and clean out fill, if any.
- Revised depth interval for injection zone plug based on actual well completion.
- Revised depth interval for USDW plug based on EPA estimate of depth to base of USDW.
- Remedial squeeze plugging of interval 950′–984′. Remedial squeeze zone and surface casing shoe plugs are combined.
- Revised depth interval for fresh water plug based on California Division of Oil and Geothermal Resources (DOGGR) estimate of depth to base of fresh water.

In their letter to PG&E dated February 9, 2015, EPA stated that the quality of cement bonding in the I/W well is sufficient to provide adequate isolation of USDWs above 3,840 feet (EPA calculated depth base of USDW) from the injection zone and injected fluids. EPA further stated that the cement bond above 3,785 feet varies from good to poor and must be addressed. EPA's concern regarding the interval between 3,785 feet and the surface casing shoe at 630 feet is that formation fluid might migrate from higher to lower salinity USDW zones through poorly bonded intervals.

In response to EPA's request for a remedial cementing operation procedure, PG&E performed a salinity analysis using open hole geophysical logs and a re-evaluation of the cement bond log over specific intervals between the surface casing shoe at 630 feet and the base of USDW at 3,840 feet. The results of these analyses were presented in a salinity evaluation report prepared by Digital Formation and a cement bond log (CBL) analysis report prepared by Cresent. These reports were submitted to EPA along with a cover letter dated March 31, 2015 providing a summary of the results and concluding that the current cement bond is adequate to prevent fluid migration between zones of different salinities and remedial cementing should not be performed.

In an email to PG&E dated April 10, 2015, EPA approved the PG&E Cementing Plan dated March 31, 2015 for the period of air injection operations. However, EPA indicated that during I/W well plugging and abandonment, key intervals with poor bonding should be perforated and plugged with cement.

PG&E still believes that the current cement is adequate to provide long-term isolation of USDW zones. In addition, temperature and noise logging performed on June 18, 2015 and temperature logging performed on July 10, 2015 (**Attachment D**) showed no evidence of fluid migration in the interval of EPA concern. Notwithstanding this evidence, PG&E is prepared to perforate and plug with cement the depth interval of 950-984 feet, which shows what appears to be the poorest bond signature, though not indicative of "free pipe".

In accordance with Permit Part II.F.4, PG&E will submit a plugging and abandonment report on Form 7520-14 within 60 days after plugging the I/W well. The report shall be certified as accurate by the person who performed the plugging operation.

5. Observation Wells Ownership Transfer to Field Operator

After the well re-work is completed, ownership of the Piacentine 1-27 will be transferred back to the Field operator. If a full-field development project does not proceed, ownership of the Piacentine 2-27 will be transferred back to the Field operator. Both wells will remain under DOGGR jurisdiction after the transfer back to the Field operator.

6. Well Monitoring and Quarterly Reporting to EPA

PG&E will collect continuous digital wellhead pressure and temperature data on the I/W well and Piacentine 1-27, and monthly digital bottomhole pressure data on the I/W well, until the end of the post-test monitoring period on December 4, 2015. Monthly bottomhole pressure surveys will be performed on the I/W well through November 2015. The data will be presented in the third and fourth quarter 2015 reports, to be submitted to EPA by October 28, 2015 and January 28, 2015, respectively. The Piacentine 2-27 is fully cased and cemented and not perforated and will not be monitored during or after the post-test monitoring period.

7. References

PG&E, 2014. Underground Injection Control Permit Application and Technical Attachments, PG&E Compressed Air Energy Storage Project, Compression Testing Program, King Island Gas Field, San Joaquin County, California, revised April 18, 2014.

ATTACHMENT A.1

Internal Mechanical Integrity Test Procedure – I/W Well

PG&E

PG&E Test Injection/Withdrawal Well No. 1

Location: X=1734880.641 Y= 577346.753 (NAD 27, Zone III)
Section 27, T 3N, R 5E, San Joaquin County, California.
Elevation: -3.75′ ground. +8.25' KB (NGVD 29)

Take all measurements from KB which is 12' above ground.

Present Condition

TD:4815' MD PD: 4813′ MD
Casing: 13-3/8″, 54.5#, J-55 surface casing cemented at 630
9-5/8″, 40#, J-55 & N-80 intermediate casing cemented at 4716'.
5-1/2" premium wire wrap liner gravel packed from 4687' to 4814'
Baker Model SC packer at 4614′.
Tubing: 5-1/2″, 17#, J-55, LT&C with seal bore assembly stabbed into Baker SC packer at 4614′. SPSRO down hole pressure gauge at 4610′.

Note: The annulus is full of 4% KCl water with corrosion inhibitor plus biocide.

Annulus Mechanical Integrity Test

1. **Notify EPA 48 hours in advance.**

2. **Move in United Well Control Test unit. Connect test unit to 9-5/8″ X 5-1/2″ annulus valve. Move in a vacuum truck with clean fresh water.**

3. **Install a memory electronic gauge for monitoring tubing pressure. Pressure up 9-5/8″ X 5-1/2″ annulus to 2500 psig and hold for 1/2 hour. Monitor annulus and tubing pressures electronically. Measure and record the volume of water necessary to achieve the test pressure and water temperature used for the test. In addition have the company man manually record pressure readings of both annulus and tubing every 5 minutes during the entire test. Company man signs and dates both printed electronic charts and manual pressure tabulation. Send electronic copies, and signed paper copies of the test to EPA.**

4. **Redo the test if the pressure drops by more than 5% during the test interval.**

5. **Have the testing contractor provide the last calibration report for the test gauge.**

6. **At the conclusion of the test, blowdown the annulus pressure to atmospheric conditions and shut-in the well.**

October 23, 2015

ATTACHMENT A.2

Internal Mechanical Integrity Test Procedure – Piacentine 1-27

IRANI ENGINEERING, INC.
PETROLEUM ENGINEER
2625 FAIR OAKS BOULEVARD, SUITE 10
SACRAMENTO, CALIFORNIA 95864
916-482-2847
FAX 916-482-7514

Princeton Natural Gas, LLC

Piacentine No. 1-27

Location: 3490′ North and 990′ East from southwest corner of Section 27, T 3N, R 5E, MDB&M, San Joaquin Co., California.
Elevation: -6' ground, USGS. +7' KB.
Take all measurements from KB which is 13′ above ground.
Keep hole full at all times.
Check operation of BOE daily

Present Condition (Producing)

TD 4900' MD PD: 4715′ (bridge plug)
Casing: 8-5/8", 24#, J-55, cemented to surface @ 627'.
5-1/2″, 15.5#, K-55, cemented at 4900′. Top of cement in the annulus is at 4175′.
Tubing: 2-3/8″, 4.7#, J-55, EUE tubing With Baker Model R-3 packer at 4611′, Wireline re-entry sub below packer at 4612′, Baker Model R nipple (1.781″ID) at 4606′, and Baker Model L sleeve (1.875″ ID, F profile) at 4573′.
Perforations: 4670′-4682′. Open
4684′-4690′, 4700′-4705′. Cement squeezed.
4720′-4724′, 4750′-4764′. Cement squeezed, Below bridge plug at 4715′.
Note: Annulus is full of 4% KCl water treated with biocide and corrosion inhibiter.

Annulus Mechanical Integrity Test

1. **Notify EPA 48 hours in advance.**

2. **Move in United Well Control Test unit. Connect test unit to 5-1/2″ X 2-3/8″ annulus valve (2-1/16″ valve). Move in a vacuum truck with clean fresh water.**

3. **Install a memory electronic gauge for monitoring tubing pressure. Pressure up 5-1/2″ X 2-3/8″ annulus to 2500 psig and hold for 1/2 hour. Monitor annulus and tubing pressures electronically. Measure and record the volume of water necessary to achieve the test pressure and water temperature used for the test. In addition have the company man manually record pressure readings of both annulus and tubing every 5 minutes during the entire test. Company man signs and dates both printed electronic charts and manual pressure tabulation. Send electronic copies, and signed paper copies of the test to EPA.**

4. **Redo the test if the pressure drops by more than 5% during the test interval.**

5. **Have the testing contractor provide the last calibration report for the test gauge.**

6. **At the conclusion of the test, blowdown the pressure to atmospheric conditions and shut-in the well.**

October 22, 2015

ATTACHMENT B

Revised I/W Well Abandonment Procedure

IRANI ENGINEERING
PETROLEUM ENGINEER
2625 FAIR OAKS BLVD., SUITE 10
SACRAMENTO, CALIFORNIA 95864
916-482-2877
FAX 916-482-7514

PG&E

PG&E Test Injection-Withdrawal Well No. 1

Location: Section 27, T 3N, R 5E, MDB&M San Joaquin County, California.
X=1734880.641 Y= 577346.753 (NAD 27, Zone III)
Elevation: -3.75′ ground. +8.25' KB (NGVD 29)

Take all measurements from KB which is 12' above ground.
Check operation of BOE day.
Keep hole full at all times.

Present Condition

TD: 4815′ MD (4756′ VD) PD: 4814′ MD (4755′ VD)
Casing: 13-3/8″, 54.5#, J-55 surface casing cemented at 630′
9-5/8″, 40#, J-55 & N-80 intermediate casing cemented at 4716' (4665′ VD).
5-1/2" premium wire wrap liner gravel packed from 4716' (4665′ VD) to 4814'(4755′).
Tubing: 5-1/2", 15.5#, J-55, LT&C, LT&C thread with seal assembly stabbed into SC packer at 4614′ (4569′).

Note: A downhole permanent pressure gauge is at 4610′ (4565′ VD). There is ¼″ cable that runs outside of tubing and it is affixed to the tubing with 5-1/2" Cross Coupling Cable Protectors at every connection. The cable goes through the outlets in the tubing hanger and tubing head top flange and is connected to an instrument junction box at surface.

Note: There is 4% KCl water with corrosion inhibitor and biocide in the annulus. This is a directional well with maximum angle of 20 degrees.

Note: Base of Fresh Water is 210′ (per DOG)

Note: Base of USDW is estimated at 3842′ MD (3840′VD)

Note: We will squeeze section 950′-984′with cement as required by EPA. The cement volume will be 5 times more than the volume of this section (34′ of 12-1/4″ X 9-5/8″ annulus has a volume of 10.65 CF. We will use 58 CF of cement, 50 sacks, for the squeeze job).

Abandonment Program

1. **Move in Workover rig. Kill tubing with 10 ppg mud. Disconnect 1/4″ cable from the instrument junction box. Remove the cable fittings. Cut 1/4″ cable. Remove X-mas tree. Install BOE and test to 3000 psig. Notify EPA and if EPA requires notify DOG to witness the BOE test. Remove the cable fittings above the tubing hanger.**

2. **Pull up tubing. Cut the cable below the tubing hanger. Pull seal assembly out of SC packer at 4637′MD. Circulate and change hole to 10 ppg mud. Pull out 5-1/2″ tubing while cutting the 1/4″ cable from the outside of the tubing. Lay down tubing. Do not remove the gauge from its mandrel. Deliver the gauge and mandrel to Hal with PG&E.**

IRANI ENGINEERING
PETROLEUM ENGINEER
2625 FAIR OAKS BLVD., SUITE 10
SACRAMENTO, CALIFORNIA 95864
916-482-2877
FAX 916-482-7514

3. **Pick up 2-3/8″, 4.7#, J-55, EUE work string tubing and 4.5″ mill. Run mill to bottom and clean out fill if any. Change hole to 10 ppg fresh mud. Pull out and lay down mill. Run open-ended tubing to 4814′. Reverse hole clean.**

4. **<u>Zone Plug</u>: Equalize 240 sacks Class G cement (over 300 lineal feet) at 4814′ MD. Wait on cement for 6 hours. Locate top of cement plug which must be above 4514′ MD (100′ above the top of SC-1 packer). Notify EPA to witness the cementing operation.**

5. **<u>USDW Plug</u>: Equalize 150 sacks Class G cement premixed 2% CaCl2 (over 400 lineal feet) at 3942′ MD (100′ below USDW which is at 3842′ MD). Wait on cement for 4 hours. Locate top of cement plug which must be above 3742′ MD. Notify EPA to witness the cementing operation.**

6. **<u>Cement squeeze zone 984′ and Shoe plug combined</u>: United perforate 4 JH at 984′. With open-ended tubing at 984′, equalize 250 sacks Class G cement (over 690 lineal feet of cement). Pull tubing out. Pump 58 cf of mud into 9-5/8″ casing. This will cause 58 cf of slurry to be squeezed in the formation at 984′. Wait on cement for 4 hours. Locate top of cement plug which must be above 530′ (100′ above the shoe of 13-3/8″ casing). Notify EPA to witness the cementing operation.**

7. **<u>Base of Fresh Water Plug</u>: Equalize 135 sacks of Class G cement premixed 3% CaCl2 (over 370 lineal feet) at 310′ (DOGGR determined that the base of fresh water is at 210′). Wait on cement for 4 hours. Top of cement plug should be at surface. Notify EPA to witness the cementing operation.**

8. **Cut 9-5/8″ and 13-3/8″ casing 5′ below ground. Weld steel plate on stub. Abandon well.**

October 22, 2015

ATTACHMENT C

Revised I/W Well Abandonment Schematic

Proposed Abandonment Schematic

PG&E Test Injection-Withdrawal Well No. 1

COMMENTS

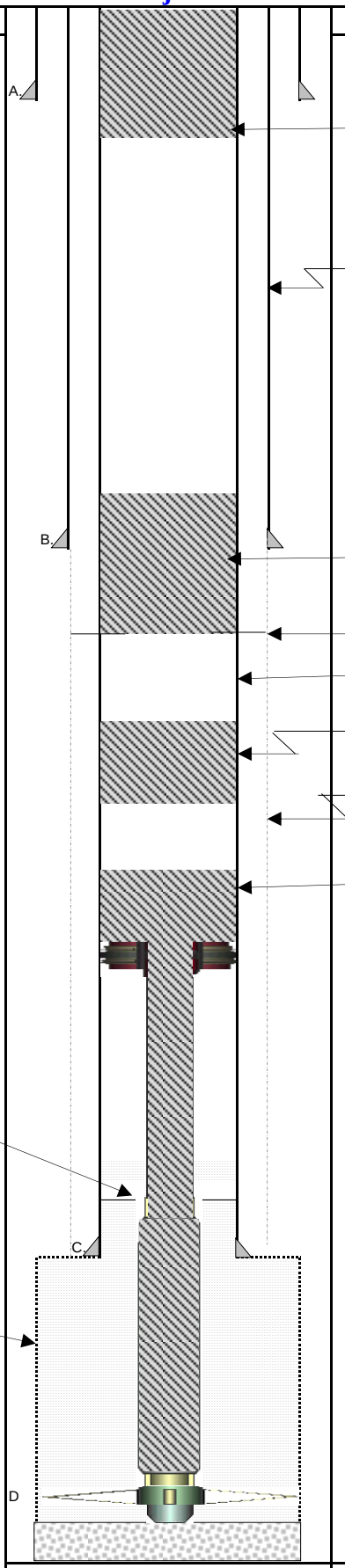
Base of Fresh Water at 210'

USDW 3842'

Capay Shale 4660'

Top of gravel pack 4686' MD

8-3/4" hole under-reamed to 17"



EQUIPMENT DESCRIPTION

20" Casing @ 60' cemented to surface

Cement plug from surface - 310'

13-3/8#, 54.5#, J-55 ST&C

13-3/8" Casing @ 630' cemented to Surface

Cement plug from 530' to 984'

Shot 4 JH @ 984' and squeezed w cement

9-5/8", 40#, J&N production casing

Cement plug from 3742' - 3942'

12-1/4" Hole

Cement plug from 4514' - 4814'

2. Baker SC-1 Packer 4614' md = 4569' vd
3. Upper Extension
4. Sliding Sleeve
5. Seal Bore
6. Lower Extension
7 Blank 5-1/2", 17#, N-80

9-5/8" Casing @ 4,716' MD =4665' VD Cemented to surface

8 5-1/2" premium wire wrap screen (6" OD) from 4686' to 4814'

9 O-ring seal sub

10 Circ Shoe & Centralizer

11 Total depth at 4814'MD = 4755' VD

PBTD: 4815' MD 4756' TVD

PG&E
PROPOSED ABANDONMENT DIAGRAM

FIELD	NA		
WELL #	PG&E Test I-W Well No. 1		
Ground MSL -(	-3.75		
KB	6'		
LOCATION	Sec. 27, T 3N, R 5E, MDB&M		

DIRECTIONAL DATA

MAX ANGLE	20	THRU ZONE	4815'
KOP	3490'	HOLE TYPE	Directional

SURFACE EQUIPMENT

TREE	
SWAB CAP SIZE & THRD	
TOP TREE FLANGE	
TUBING SPOOL FLANGE	

TUBING DETAIL

	1st or LS	SS or Btm of Taper
SIZE		
WEIGHT		
GRADE		
DEPTH		
THREAD		
NEW/USED		
COATING		
SCSSV		
Min. I.D.		

	O. D. (in.)	I. D. (in.)	LENGTH (ft)	DESCRIPTION
1.				
2.	8.6"	6"	4.56"	Baker SC-1 Packer
3.	7.63'	6.696"	5.99'	Upper Extension
4.	8.13"	6"	2.12'	Baker Model S Sliding Sleeve
5.	7.63"	6"	1.7'	Baker Seal Bore
6.	7"	6.366"	19.63'	Lower Extension
7.	5.5"	4.892"	38.30'	Blank 5-1/2", 17#, N-80
8.	6"	4.892	122.68'	51/2" Wire wraped screen
9.	5.5"	3.5"	2.63'	O-ring seal sub
10.	5.5"	N/A	1.9'	shoe
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				

CASING DETAIL

#	SIZE	WGHT	GRADE	THRD	DEPTH
A	20"	53#	NA		0' - 60'
B	13-3/8"	54.5	J-55	LT&C	0' - 630'
C	9-5/8""	40#	J&N	LT&C	0' - 4,716'
D	5-1/2"	17#	N-80	LT&C	4614'-4686'
E	6"	17#	N-80	LT&C	liner 4686'-4814'
F					
G					
H					
I					
J					
K					
L					
M					
N					

Prepared By:	Saeed Irani	Date	October 22, 2015
Updated By:	Saeed Irani	Date	October 22, 2015
		Printed on	November 6, 2015

Completed:

File:
C:\Users\Mark\Desktop\EPA plan_rev 6-Nov-2015\[PG&E Test I-W Well No. 1 Abandonment WBD_Oct-2015_revised_6-Nov-2015.xls]Proposed Abandonment Schematic

ATTACHMENT D

I/W Well Pressure-Temperature Log (July 10, 2015)

SURFACE PRESSURE RECORDS

Date	Time	Tubing Pressure	Tubing Temperature	Casing Pressure	Casing Temperature	Choke Size	Gas Rate	Oil Rate	Water Rate	Gas Gravity	Oil Gravity	Gas Cum	Oil Cum	Water Cum	Hours
2/8/2010	0:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0
2/8/2010	0:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	0:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	0:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	1:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	1:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	1:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	1:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	2:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	2:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	2:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	2:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	3:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	3:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	3:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	3:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	4:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	4:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	4:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	4:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	5:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	5:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	5:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	5:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	6:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	6:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	6:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	6:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	7:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	7:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	7:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	7:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	8:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	8:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	8:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	8:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	9:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	9:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	9:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	9:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	10:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	10:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	10:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	10:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	11:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	11:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	11:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	11:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	12:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	12:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	12:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	12:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	13:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	13:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	13:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	13:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	14:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	14:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	14:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	14:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	15:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	15:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	15:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	15:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	16:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	16:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	16:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	16:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	17:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	17:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	17:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	17:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	18:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	18:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	18:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	18:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	19:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	19:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	19:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	19:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	20:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	20:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	20:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	20:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	21:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	21:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	21:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	21:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	22:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	22:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	22:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	22:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	23:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	23:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	23:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/8/2010	23:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	0:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	0:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	0:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	0:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	1:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	1:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	1:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	1:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	2:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	2:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	2:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	2:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	3:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	3:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	3:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	3:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	4:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	4:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	4:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	4:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	5:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	5:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	5:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	5:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	6:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	6:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	6:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	6:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	7:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	7:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	7:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	7:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	8:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	8:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	8:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	8:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	9:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	9:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	9:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	9:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	10:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	10:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	10:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	10:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	11:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	11:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	11:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	11:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	12:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	12:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	12:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	12:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	13:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	13:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	13:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	13:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	14:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	14:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	14:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	14:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	15:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	15:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	15:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	15:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	16:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	16:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	16:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	16:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	17:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	17:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	17:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	17:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	18:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	18:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	18:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	18:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	19:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	19:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	19:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	19:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	20:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	20:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	20:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	20:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	21:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	21:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	21:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	21:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	22:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	22:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	22:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	22:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	23:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	23:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	23:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/9/2010	23:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	0:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	0:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	0:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	0:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	1:00	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	1:15	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	1:30	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	1:45	1,100	0	1,100	0	0	0	0	0	0	0	0	0	0	0.25
2/10/2010	2:00	1,100	0	1,100