SAN DIEGO GAS & ELECTRIC COMPANY
SOUTHERN CALIFORNIA GAS COMPANY

PIPELINE SAFETY & RELIABILITY PROJECT (PSRP)

(A.15-09-013)

(SED DATA REQUEST- 3)

Date Requested: May 31, 2016
Date Responded: June 13, 2016

QUESTION 1:

A report signed by SDG&E's Chief Operations Officer demonstrating that line 1600 is fit for service at its current operating pressure.

RESPONSE 1:

Please see attachment: SED DR 3 Q1 - Line 1600 Fit for Service Report.

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Date Requested: May 31, 2016
Date Responded: June 13, 2016
Amended Response: August 2, 2016
Second Amended Response Submitted: April 27, 2017

The response to Question 2 has been amended, changes are noted in **red, bold and underline**.

QUESTION 2:

A segment by segment engineering analysis for the entire Line 1600 with any unknown pipeline characteristics identified and any assumed values detailed.

RESPONSE 2:

Some of the information provided in the attachment contains confidential information provided pursuant to G.O. 66-C and Cal. Pub. Util. Code § 583 **and D.16-08-024. Accordingly, a confidentiality declaration is included with the attachment.**

As part of the Maximum Allowable Operating Pressure (MAOP) validation process each segment was analyzed to determine the appropriate MAOP based on year of installation, pipe properties, class location, test records and historical operating pressures. The segment in the attached document (**SED DR 3 Q2 L1600 SEGMENTS_Corrected and Updated_Confidential.pdf**) highlighted in gray has an unknown wall thickness and grade and the corresponding engineered value is prefixed with a "DT" (Decision Tree) designation. In addition, as described in Question 1 above, an assessment and remediation of Line 1600 has been completed using In-Line-Inspection (MFL, TFI, Caliper) and External Corrosion Direct Assessment and deemed fit for service.

The attached table was previously provided in the response to SED DR 3, Question 2 Line 1600. Updates to the table in the Corrected and Updated Attachment are noted in red and reflect the replacement of a segment in October 2016 per Resolution SED-1.

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QUESTION 3:

Provide a detailed analysis of all segments that have been pressure tested, with traceable, verifiable, and complete test records.

RESPONSE 3:

SDG&E and SoCalGas interpret "traceable, verifiable and complete" to mean "reliable and accurate" and respond as follows:

See response to Question 2, above. Some of the information provided in the attachment contains confidential information provided pursuant to G.O. 66-C and Cal. Pub. Util. Code § 583.

As mentioned in SED DR 2, there are still some projects being entered into the database and once added this response will be updated.

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QUESTION 4:

A tangible map of Line 1600 illustrating the locations of all class 2, 3 and 4 and identified sites along the pipeline.

RESPONSE 4:

Some of the information provided in the attachment contains confidential information provided pursuant to G.O. 66-C and Cal. Pub. Util. Code § 583.

Attached is a map that depicts class 2, 3 segments and the identified sites along Line 1600. There are no class 4 segments.

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QUESTION 5:

Please provide SED the list of any and all preventative and mitigated measures in place to validate/ assure the integrity of Line 1600 at its current operating pressure.

RESPONSE 5:

There are several preventatives measures prescribed by 49 CFR 192 Subpart M – Maintenance including Patrolling (§ 192.705), Leakage Survey (§ 192.706), Line Markers (§ 192.707), Valve Maintenance (§ 192.745), Pressure and Limiting Station/Inspections and Testing (§ 192.741) that are conducted on the pipeline on a routine basis as well as Subpart I – Requirements for Corrosion Control. As part of Subpart O – Gas Transmission Pipeline Integrity, the pipeline is assessed and remediated on a continual basis. Line 1600 has been assessed through In-Line-Inspection and External Corrosion Direct Assessment and remediated accordingly. In addition the segments that have not been pressure tested in Class 3, Class 4 and High Consequence Areas (HCA) are surveyed on a bi-monthly basis.

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QUESTION 6:

What is SDG&E's anticipated time line to repurpose Line 1600 from a transmission pipeline to a distribution line?

RESPONSE 6:

SDG&E and SoCalGas propose that the planning and construction work associated with de-rating Line 1600 from a transmission pipeline and repurposing it as part of the distribution system will be done coincident with planning and construction work associated with the new 36-inch diameter pipeline (Line 3602) proposed in Application (A.) 15-09-013. The total time to complete the repurposing construction work is estimated at approximately 9 months.

Construction work associated with repurposing Line 1600 is proposed to commence approximately 6 months prior to the estimated completion date of Line 3602. Once Line 3602 is in service, another 2 to 3 months of work are required to complete the final steps necessary to allow the pressure of Line 1600 to be reduced and begin operating as a distribution pipeline.

Repurposing Line 1600 is one of the last steps in the overall project timeline and will be completed approximately 42 months after a Final Decision is issued in this proceeding. A high level schedule of the project is shown in Attachment VIII of the Prepared Direct Testimony of Neil Navin served in A.15-09-013.

https://www.sdge.com/sites/default/files/regulatory/A.15-09-013%20Prepared%20Direct%20Testimony%20of%20N.%20Navin%203-21-16_0.pdf

SAN DIEGO GAS & ELECTRIC COMPANY
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(A.15-09-013)

(SED DATA REQUEST- 3)

Date Requested: May 31, 2016
Date Responded: June 13, 2016

QUESTION 7:

Please submit a detailed operational plan for Line 1600 if it operates as a distribution line.

RESPONSE 7:

As discussed in the Prepared Direct Testimony of Neil Navin served in A.15-09-013, Line 1600 is proposed to be repurposed to operate as a distribution line with a MAOP of 320 psig which corresponds to a hoop stress of less than 20% of Specified Minimum Yield Strength (SMYS). The line will generally remain in the same basic physical configuration as currently exists with some modifications to further integrate it into the distribution system including pressure regulation/limiting features and distribution interconnections. Additional interconnection points with the new Pipeline Safety & Reliability Project natural gas transmission line (Line 3602) will also be constructed.

The repurposed Line 1600 will be integrated into SDG&E's distribution operations and be operated and maintained consistent with current established codes, standards and operating practices for SDG&E's distribution pipelines. These include all operations and maintenance (O&M) activities required in General Order 112 and associated codes for distribution lines. O&M activities include maintaining cathodic protection, periodic patrolling including leak patrols, valve inspection and maintenance, pressure regulator inspection and maintenance and other operational activities such as locate and mark in response to 811 "call before you dig" requests. Historical asset and O&M records would continue to be maintained as required and O&M data going forward would be included with that associated with the distribution system.

Please refer to the Prepared Direct Testimony of Neil Navin in the link below:
https://www.sdge.com/sites/default/files/regulatory/A.15-09-013%20Prepared%20Direct%20Testimony%20of%20N.%20Navin%203-21-16_0.pdf

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QUESTION 8:

Please provide estimated time to hydrostatically test the entire length of Line 1600.

RESPONSE 8:

Depending on whether tests are conducted during peak summer and/or winter periods, it is estimated that the hydrotesting effort for the entire length of Line 1600 will take between 2 ¾ years and 4 ¼ years to complete once the decision is made to move forward.

Hydrotesting of Line 1600 is a complicated task with many considerations that will need to be carefully planned for. A primary consideration is how to maintain service to existing customers that are served directly from this line while the line is being hydrotested. Analysis shows that the line cannot be tested in one test, but must be broken up in numerous smaller test segments that are tested independently. The timing of the tests is also an important consideration as taking segments out of service for testing impacts system capacity which is especially important during peak winter and summer demand periods.

Given the time required to complete the hydrotest and the fact that the hydrotesting of Line 1600 is the "No Project Alternative" in A.15-09-013, it is imperative that the process associated with arriving at a decision related to A.15-09-013 be started and completed in a timely manner. The proposed Pipeline Safety & Reliability Project is to comply with California Public Utilities Code Section (P.U. Code) 958 and Commission Decision (D.) 11-06-017 to implement SDG&E's and SoCalGas' Pipeline Safety Enhancement Plan (PSEP), which per P.U. Code Section 958, requires action to be taken as soon as practicable.

Detailed information on potential timelines associated with hydrotesting Line 1600 can be found in subpart attachment VI contained within Attachment B of the Prepared Direct Testimony of Neil Navin:
https://www.sdge.com/sites/default/files/regulatory/A.15-09-013%20Prepared%20Direct%20Testimony%20of%20N.%20Navin%203-21-16_0.pdf

Additional discussion can also be referenced starting on page 5-35 of the Proponent's Environmental Assessment submitted in A.15-09-013:
https://www.sdge.com/sites/default/files/regulatory/FINAL%20PSRP%205%20-%20Discussion%20of%20Impacts.pdf

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QUESTION 9:

Please explain why SDG&E is not suggesting a pressure testing or kind for kind replacement plan of line 1600 in accordance with Public Utilities Code 958.

RESPONSE 9:

As discussed in the report provided in response to Question 1 above, although in-line inspection results demonstrate that Line 1600 is fit for service, Line 1600 lacks a post-construction pressure test and as such, it must be pressure tested or replaced in compliance with P.U. Code Section 958 and D.11-06-017.

To enhance the safety of their integrated natural gas transmission system and comply with the requirements of P.U. Code Section 958 and D.11-06-017, SDG&E and SoCalGas filed A.15-09-013 for approval of the Pipeline Safety & Reliability Project (Proposed Project), which involves: 1) construction of a new, approximately 47-mile long, 36-inch diameter natural gas transmission pipeline and associated facilities (Line 3602), and 2) once the new line is constructed, lowering the pressure of existing Line 1600 for use as a distribution line, thereby increasing its safety margin.

The Proposed Project will: 1) enhance the safety of existing Line 1600 and modernize the system with state-of-the-art materials, 2) improve system reliability and resiliency by minimizing dependence on a single pipeline, and 3) enhance operational flexibility to manage stress conditions by increasing system capacity.

As described in greater detail in the Prepared Direct Testimonies of SDG&E/SoCalGas witnesses Doug Schneider (pages 9 – 16) and Travis Sera (pages 3 – 12), the results of the in-line inspection, along with knowledge of the manufacturing methods and overall operating history of Line 1600, led SDG&E and SoCalGas, as knowledgeable operators of their gas system, to conclude that the long-term safety of Line 1600 would be better addressed through de-rating of this legacy pipeline, rather than through a pressure test and continued operation at transmission pressure.

Volume II of A.15-09-013 is the PEA, in which SDG&E and SoCalGas considered, among other things, an in-kind replacement of Line 1600. The Line 1600 In-Kind Replacement Alternative would remove and replace the existing Line 1600 with a new 16-inch diameter pipeline, which is located in the center of its approximately 20-foot-wide right of way (ROW), according to easement documents. The replacement pipeline would be installed within the existing 20-foot-wide ROW; however, to accommodate construction equipment for the pipeline in a reasonably

safe manner, a minimum of 40 to 50 feet would be required and between 50 to 100 feet in some areas. Because of the identified constraints, construction of the Line 1600 In-Kind Replacement Alternative is likely infeasible from an environmental, social, economic, and site suitability perspective. As discussed in more detail in the PEA (Chapter 5, pages 5-9 through 5-11), the Line 1600 In-Kind Replacement Alternative did not meet the Proposed Project objectives and would potentially have greater environmental and social impacts that the Proposed Project. As such, it was eliminated from consideration.

The prepared direct testimony and PEA may be found on SDG&E's website:
http://www.sdge.com/regulatory-filing/15786/pipeline-safety-reliability-project

Line 1600 Fitness for Service Report
Prepared in Response to SED Data Request 3

I. PURPOSE

The California Public Utilities Commission (CPUC) issued a data request on May 31, 2016 requesting, among other items, a report signed by SDG&E's Chief Operations Officer (or as clarified via email correspondence: Vice President of System Integrity and Asset Management) demonstrating that Line 1600 is fit for service at its current operating pressure. The purpose of this document is to provide the requested signed report to document that Line 1600 is fit for service at its current maximum operating pressure of 640 psig.

II. BACKGROUND

A. Transmission Integrity Management of Line 1600

Pipelines are inspected and maintained through operating and maintenance procedures on a routine basis. Under current federal regulations and as part of the Transmission Integrity Management Plan (TIMP) of San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) (together, the Utilities), additional assessments are conducted to identify potential threats to safe pipeline operation. These threats are categorized by nine potential failure modes, which are grouped by three time factors: (1) Time Dependent; (2) Time Independent; and (3) Stable.[1] Time dependent threats are generally those related to corrosion and include external corrosion, internal corrosion, and stress corrosion cracking. Time independent threats include third-party/mechanical damage, incorrect operational procedure, and weather related and outside forces such as earthquakes and landslides. Stable threats are manufacturing related, welding/fabrication related, or equipment related. Specific integrity assessments conducted to target manufacturing related threats under the stable category are discussed below.

B. Threat Categories and Manufacturing-Related Anomalies on Line 1600

Line 1600 was originally constructed in 1949 and exists today of predominantly electric flash-welded (EFW) pipe, a small percentage of electric resistance welded (ERW) pipe, and a section of 14-inch diameter seamless pipe. Electric flash welding of long seams is an obsolete form of pipe manufacturing where the longitudinal edges of heat-softened pipe are forced together to form a welded

[1] American Society of Mechanical Engineers (ASME) B318.S-2004, section 2.2.

bond. Excess extruded material is then trimmed away, forming the classic "box-like" appearance of a flash-welded seam. This process was only utilized by a single pipe manufacturer – A.O. Smith Corporation, and production of pipe utilizing flash-welded seams was discontinued by 1969. Process control, material chemistry, and manufacturing-related factors all contribute to electric flash weld seam weld quality issues and related anomalies.[2]

The anomalies associated with EFW pipe are similar in many respects to the pre-1970 ERW manufacturing processes, where low frequency direct current welding of the long seam and manufacturing process issues combined to create a number of well-documented integrity concerns, including hook cracking, cold welds, non-metallic inclusions, susceptibility to selective seam corrosion, and variety of other related issues.[3] Hook cracks associated with the EFW seam welds have been observed on Line 1600. Integrity management of Line 1600 includes (but is not limited to) monitoring of conditions such as selective seam corrosion, corrosion coincident with hook cracks, or other forms of interaction between threats such as third-party damage at otherwise stable defect locations.

C. Line 1600 Integrity Assessment History

In accordance with 49 CFR §§ 192.921(a)(3) and 192.937(c)(1), two TIMP related assessments have been conducted on Line 1600: External Corrosion Direct Assessment (ECDA) in 2007 and in-line inspection (ILI, also known as "smart pigging") from 2012-2015.

D. External Corrosion Direct Assessment

The baseline assessment of pipe segments within high consequence areas (HCA) on Line 1600 was completed on February 23, 2007. Inspections were performed over approximately 20.7 miles, resulting in 11 examinations to investigate the likelihood of active external corrosion. External corrosion and third-party damage were not observed during examinations and no repairs were required.

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[2] Anomalies refer to unexamined pipe features which are classified as potential deviations from sound pipe material, welds, or coatings. All engineering materials contain anomalies which may or may not be detrimental to material performance.

[3] J.F. Kiefner and E.B. Clark, *History of Line Pipe Manufacturing in North America* (Kiefner 1996 Report), ASME CRTD-Vol. 43 (1996).

E. In-Line Inspection

TIMP reassessment of Line 1600 was conducted utilizing a series of ILI surveys from December 2012 to December 2015. The majority pipe segments between the launcher and receiver (*i.e.*, HCA and non-HCA segments) were inspected using two types of ILI (*i.e.*, "smart pig") technologies:

- Axial magnetic flux leakage (MFL), which is sensitive to volumetric flaws, such as metal loss caused by corrosion or third-party damage, and
- Circumferential magnetic flux leakage (CMFL) (a.k.a. transverse field inspection or TFI), which is sensitive to certain types of long seam flaws, such as selective seam corrosion and hook cracking.

1. In-Line Inspection Phases

ILI of Line 1600 was performed in three separate phases, primarily due to the break in geometric continuity created by the reduction in pipeline diameter from 16-inch down to 14-inch diameter (near the middle of the pipeline at Lake Hodges), and back up again to 16-inch diameter for the remainder of the pipeline. The phases are numbered from 1 to 3 in the chronological order of inspection. The inspection lengths, ILI tools utilized, and dates for each inspection phase are listed in Table 1 below.

Table 1 – In-line Inspection Phases for Line 1600

Phase	Inspection Length (miles)	Inspection Extent	ILI tools	Assessment Date
1	29.1	Rainbow Metering Station to Lake Hodges	• Axial MFL • Geometry	12/5/2012
			• Circumferential MFL	2/6/2013
2	20.1	Lake Hodges to Mission Base	• Axial MFL • Geometry	12/19/2013
			• Circumferential MFL	3/20/2014
3	0.5	Lake Hodges	• Axial MFL • Geometry	12/10/2015

2. In-Line Inspection Findings

The final reports for each of the ILI phases for Line 1600 identified anomalies: Phase 1 found 1,471; Phase 2 found 1,226; and Phase 3 found 85. Reported anomaly types and quantities for each phase are listed in Table 2 below. Due to differences in tool sensitivities, some of the anomalies listed for the CMFL tool for Phases 1 and 2 contain anomalies that were detected by the AMFL and Geometry tools (*i.e.*, anomalies were counted twice).

Table 2 – In-Line Inspection Reported Anomalies

	Phase 1		**Phase 2**		**Phase 3**
Reported Anomaly Type	**AMFL and Geometry**	**CMFL**	**AMFL and Geometry**	**CMFL**	**AMFL and Laser Deform.**
Crack-like	0	3	0	14	0
Deformation	47	116	28	33	0
Long Seam	123	265	100	198	0
Manufacturing	18	20	134	40	6
Metal loss	343	536	148	531	79
TOTAL	**531**	**940**	**410**	**816**	**85**

3. In-Line Inspection Based Repairs

For Phase 1 and Phase 2, a total of 62 direct examinations (excavations) of Line 1600 were conducted to validate the anomalies reported by the smart pigs. 19 examinations were either directly confirmed as hook cracking, or determined to likely be hook crack related. 6 examinations were performed at locations where crack-like anomalies were reported, and hook cracking was confirmed in all 6 locations. 13 examinations were performed at locations where manufacturing related metal loss was detected at the longitudinal seam, and hook cracking was confirmed at 4 locations, and determined to be likely for the remaining 9 locations. Phase 3 is comprised of 14inch diameter seamless pipe, and does not contain manufacturing related seam anomalies similar to those described above for inspection Phases 1 & 2.

Findings from all direct examinations conducted as part of Phases 1, 2, and 3 resulted in the following remediation activities:

- 10 cylindrical replacements (totaling approximately 290 feet) to remediate[4] 1 mechanical damage defect and mitigate[5] 140 flaws (approximately 77% were longitudinal seam weld and base metal flaws related to the pipe manufacturing process),
- 39 repair bands to remediate 17 defects due to both mechanical/third-party damage and 68 nearby flaws (approximately 87% were longitudinal seam weld and base metal flaws resulting of the pipe manufacturing process), and
- 84 grind repairs to mitigate workmanship and base metal flaws resulting from the construction and manufacturing process.
- No repairs were required as a result of the Phase 3 inspection.

III. CURRENT STATE OF LINE 1600

All TIMP immediate and scheduled anomalies have been repaired.[6] The remediation activities detailed above have resulted in a maximum re-assessment interval of 7 years for Line 1600.[7] Assessment data from both ILI technologies demonstrate that for the remaining anomalies in Line 1600, adequate safety margins exist and the line is safe for operation at its current maximum allowable operating pressure (MAOP) of 640 psig, which equates to a stress level of 39% of the specified minimum yield strength (SMYS) of the original 1949 vintage 16-inch diameter pipe. The current MAOP at 640 psig reflects that fact that in 2011, the Utilities proactively reduced the pressure on Line 1600 to 80% of the historic MAOP of 800 psig (a 10% SMYS drop from the historic operating stress of 49% SMYS at 800 psig) in order to increase the margin of safety on the line. The pressure reduction and resulting increased margin of safety serve as the basis for the confidence that the Utilities have in the current integrity of the pipeline. Line 1600, like all pipelines, has the threat of excavation damage and other time independent threats.

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[4] "Remediate" is defined as an operation or procedure that transforms an unacceptable condition to an acceptable condition by eliminating the causal factors of a defect.

[5] "Mitigate" is defined as the limitation or reduction of the probability of occurrence or expected consequence for a particular event.

[6] *See* Part 192.933.

[7] A maximum interval of 7 years has been established in accordance with Part 192.939.

IV. PIPELINE SAFETY ENHANCEMENT PLANS' ONE-TIME OPPORTUNITY TO REPLACE LINE 1600

Although ILI results demonstrate that Line 1600 is fit for service, Line 1600 lacks a post-construction pressure test and must be pressure tested or replaced in compliance with California Public Utilities Code Section 958 and Commission Decision 11-06-017. The State directive to pressure test or replace Line 1600 creates a unique and arguably one-time opportunity to permanently address the long-term risks associated with operating this 1949 vintage, non-state-of -the-art pipeline through the replacement of Line 1600's transmission function with a new pipeline. Line 1600 contains the largest mileage of flash-welded pipeline in the transmission system, and conversion of Line 1600 to distribution service has the potential to both create a significant reduction of EFW transmission service mileage and advance the Utilities' goals to reduce risk and drive system improvement, consistent with State directives.

The Utilities have a long-standing history of working toward solutions that reduce or eliminate the risks associated with different families of pipe. For example, over the course of the Utilities' operating history, they implemented several major efforts to eliminate both cast iron pipe and copper pipe within the system. Under the Distribution Integrity Management Program (DIMP), the Utilities are currently targeting Aldyl-A plastic pipe with known risk factors in order to reduce the risk of failures on the distribution system. Line 1003 is a non-state-of-the-art pipeline that contains approximately 16 miles of EFW pipe segments and was formerly operated in transmission service. In an effort to enhance system safety, Line 1003 was converted to distribution service in the same manner that is proposed in this proceeding for Line 1600. Line 1600, while safe for service, should be similarly considered for such risk reduction efforts, especially in light of the fact that Line 1600 has a known hook cracks along its EFW long seam. Given that Line 1600 contains the largest mileage of A.O. Smith pipe on the system, operates at a transmission service level, and is located in HCAs, it would be prudent for the Utilities to take this opportunity to significantly and permanently reduce long-term risks associated with this vintage, non-state-of -the-art pipe by permanently lowering its operating pressure.

For Line 1600, and generally for pipelines with similar risk factors, the Utilities have established a 20-year time frame as a reasonable expectation to evaluate either repurposing of transmission lines to distribution service or replacement. This timeframe is based upon engineering judgment, and depends upon a number of factors that would ultimately include coating degradation,

cathodic protection performance, time-dependent threat growth, leakage maintenance program demands, and time-independent threat rates. Future inspections may identify additional anomalies, which will likely require remediation and pressure reductions. A pressure test does not address all of the integrity threats of a pipeline, and given what is known about Line 1600, it is prudent to remove it from transmission service, which would establish a greater safety margin and increase the safety profile of the system.

While the Utilities are confident in the ability of ILI technologies to detect seam flaws that can potentially result in failures, if Line 1600 is pressure tested instead of replaced under the Pipeline Safety Enhancement Plan, on-going integrity assessments under the TIMP will be required to monitor remaining seam anomalies for potential future in-service growth and/or interaction with any conditions that may activate potential failure in what are otherwise stable flaws. Moreover, assessment methodologies that primarily target the likelihood of failure component of risk do not substitute for the universal risk benefits afforded through pressure reduction, since a defect's likelihood of failure, consequence of failure, and overall future risk are all positively impacted (*i.e.*, reduced) through pressure reduction.

APPENDIX A

Verification of Douglas M. Schneider, PE

I, Douglas M. Schneider, state as follows:

1. I am currently the Vice President of System Integrity & Asset Management at SoCalGas and SDG&E.

2. I am a registered Professional Engineer with a Master's Degree in Business Administration from California State University, Fullerton, and a Bachelor of Arts degree in Chemistry from Rutgers University.

3. I am currently SoCalGas and SDG&E's highest ranking gas system professional engineer licensed in the State of California (PE# CR1081).

4. I have reviewed the report detailing the fitness for service of Line 1600 at the current maximum allowable operating pressure of 640 psig.

5. In my professional judgment, although Line 1600 is fit for service at the current maximum allowable operating pressure of 640 psig, Line 1600 should be replaced and repurposed to distribution service rather than pressure tested in order to comply with California Public Utilities Code Section 958 and Commission Decision 11-06-017.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 13th day of June 2016, at Fullerton, California.

/s/ Douglas M. Schneider

DOUGLAS M. SCHNEIDER
Vice President - System Integrity & Asset Management

SOUTHERN CALIFORNIA GAS COMPANY
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