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DATE RECEIVED: JANUARY 7, 2011
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Exhibit Reference: SCG-5, Gas Engineering, Non-Shared Services

Subject: Pipeline Integrity Management-Distribution

Please provide the following:

1. Provide the 2010YTD expenses for Distribution Pipeline Integrity.

SoCalGas Response:

The 2010 expense data are not yet finalized and will be provided at a future date.

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2. On page RKS-33, SCG states, "...SoCalGas has developed a DIMP plan and will continually modify it as it enhances its system knowledge and identifies threats." Please provide a copy of the most recent version of the DIMP plan.

SoCalGas Response:

SoCalGas has actively participated in the development of the DIMP rule through various industry organizations and by direct comment to the federal DIMP docket (see the URL listed in question 5 of this Data Request). By law, SoCalGas must have its DIMP plan developed by August 2, 2011. Even though SoCalGas has been diligently working on this plan for a number of years, it continues to evolve and develop as more research and analysis is performed on its distribution assets and Rule implementation guidance is further understood. Attached is a copy of the plan.


Written DIM Plan.pdf

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3. On page RKS-33, SCG states, "...SoCalGas has developed a risk-based computational model in which engineering-based algorithms evaluate different distribution pipeline attributes to help analyze and to risk rank them." Please identify the "engineering-based algorithms," and provide a copy of this model along with a step-by-step explanation of how the inputs used in this model led to the projects specifically identified in SoCalGas' forecasts for 2010-2012.

SoCalGas Response:

The following description of the DREAMS application and process are also included in the capital workpaper for Budget Code 277 (BC277) as found in exhibit SCG-05-CWP, beginning on page RKS-CWP-79.

The program titled **D**istribution **R**isk **E**valuation **A**nd **M**onitoring **S**ystem (**DREAMS**) has been developed to provide the data necessary to address the DIMP elements for mains and services within the SoCalGas distribution system, resulting in Main and Service pipe segments in need of replacement to manage the risk of hazardous leaks. SoCalGas refers to "Unprotected Steel" and "PE" pipe made from early generation resins known to have an increased susceptibilty to slow crack growth as non-state-of-the-art (NSOA) materials. In addition, this program is applicable to all other PE segments that may leak due to material or installation threats. These two materials make up 73.4% of the SoCalGas buried gas distribution infrastructure mileage.*
**Based on 2009 figures reported to DOT and using the average service length to derive total mileage for services*

The scope of the **DREAMS** applications and processes are as follows:

- Holistic, company-wide, standardized approach to segmenting Distribution main piping based on original installation work order, pipe material, and pipe size.
- Dynamic risk ranking algorithms based on known segment information, reported pipe condition, segment-specific leakage history, and known operating conditons. Risk ranking will update as pipe age, condition, and leakage history changes.
- Applicable only to NSOA mains and services. NSOA pipe is defined as:
    - Unprotected Steel (meaning not under cathodic protection (CP))
    - PE pipe installed prior to 1985
    - Any other PE pipe with a leak history of integrity-relevant leaks
- Associated and complementary mapping process for identification and tracking of defined Distribution main segments.
- Data scrubbing process used for identifying and clearing conflicting records and data, as well as adding missing, critical data from paper records when needed.
- Data enhancement process using aerial mapping products for capturing population density, proximity to main, and surface information.
- Associated business processes for managing replacement project planning, generating business reports and metrics.

Response to Question 3 (Continued)

Project Justification

SoCalGas has a long history of continuously improving system integrity management processes in an effort to maintain the safety of the distribution system. Historically, the company has managed various system integrity programs and developed risk management models tailored to the needs of the organization based on the system knowledge and operating experience of the day. This work is another step in our efforts to further refine and enhance the way we manage system integrity, and the risks associated with potential leak migration from the buried Distribution piping system.

With unprotected steel and polyethylene materials making up 73.4% of the system mileage for SoCalGas, a comprehensive and holistic model was desired to ensure consistency of evaluation and relative comparison of operating risks system-wide. Continuously improving our integrity managemement tools provide the means to meet new regulatory requirements while taking advantage of GIS technology advancements planned within the organization.

Unprotected Steel System Background

Prior work on the steel system looked at the metallurgy of the various vintages of materials used within the system, along with the various coatings used over the years. This work established a lack of well-defined correlations to material families due to the many and varied variables acting upon the system that result in the development of leaks. It also reinforced the practice of focussing on areas where leaks tend to cluster. Economic models were use in the past based on repair vs replacement costs using general corrosion-rate prediction models. However, this approach lacked consideration of specific pipeline condition information and standardization of the overall approach to segmentation of the system. Recent data analysis has established baseline average system performance by decade of Distribution Main inventory providing a performance basis by which individual segments can be measured. This information, along with leakage history and reported pipe condition, is utilized to identified high-risk segments.

Polyethylene System Background

With over four decades of service from the early polyethylene installations, performance data has demonstrated that early polyethylene materials are subject to slow crack growth and require system integrity management to manage leakage risk associated with potential leak migration. PHMSA Advisories ADB-99-01 and ADB-07-01 also reinforce the need for system monitoring of this type. Additional company research has determined that, while overall the systems are performing well, the combination of various factors can result in leaks. This research has also demonstrated that the actual in-service age of these plastic systems is not the primary consideration in determining which segments are most likely to leak, similar to unprotected steel. Many variables acting upon the distribution system, including variations in the base plastic resin, design and manufacturing factors, installation variables, and operating

Response to Question 3 (Continued)

Conditions, combine in varying degrees to affect the overall performance of each individual segment within the system. Recent data analysis has established baseline average system performance based on time periods related to significant changes in materials performance, providing a performance basis by which individual segments can be measured. This information, along with leakage history and reported pipe condition, is utilized to identified high-risk segments. It has also allowed for normalization of risk factors to the performance of the unprotected steel pipe inventory.

Overall System Integrity Management

As system data and knowledge of materials increases from continued research, new insights emerge. Currently, there is no cost-effective way of determining the many contributing factors impacting the integrity of Distribution systems without first experiencing a leak history or, in some cases, exposing the pipe. For this reason, recent work has focussed on further analysis of leak history data and data trends. Changing and evolving business systems and operating environments also impact legacy data availability and consistency, presenting a need for data scrubbing and enhancement. These objectives have been achieved through the **DREAMS** business process, culminating in an inventory of Main segments and connected Services that require replacement as part of a cost-effective Pipeline Integrity and risk management strategy.

Forecast Methodology

Currently, the **DREAMS** database has been populated with approximately 12% (2,062 miles) of the estimated 17,193 miles of NSOA main segments in the SoCalGas Distribution system. When the mains are replaced, the services connected to these mains will also be replaced, effectively increasing the total miles of NSOA materials removed from the system. Of this inventory that has been assessed through the new DREAMS analysis process, 339 miles of Main have been identified as "high-risk" and qualify for replacement. From this fixed data, we project the total inventory of "high-risk" main to be on the order of 1,185 miles (or 6.9% of the total inventory of NSOA Main). In addition, it is estimated that 25.4 miles of Main will be added to the "high-risk" category annually due to various factors impacting its integrity over time.

Schedule

Current routine replacement of main will account for approximately 44 miles of Distribution Main replaced annually. With this level of activity it would take over 7 years to replace the current inventory of main already identified for replacement, and 60 years to replace the projected total inventory.

As a prudent operator seeking to align with the objectives of the new DIMP regulations, an incremental increase in spend will accelerate this to a more reasonable 20-year program. At this increased rate of replacement, the 1,185 mile inventory of "high-risk" Mains and Services, along

Response to Question 3 (Continued)

with the additional miles estimated that will be added to the program annually, will be worked down to an equilibrium level of maintenance (where replacement rate equals the rate of pipe segments qualifying for replacement under DREAMS) after approximately 20 years.

Attached below are copies of the algorithms used within the DREAMS application. Following are the steps taken to establish DREAMS segments.

Segment Definition Process and System Maintenance

1. In the Mapping Application - define the continuous Main segment by tracing the mapped pipe through the DREAMS Microstation or GIS mapping process to define the extents and endpoints for the original Installation work order.
2. In DREAMS - record the overall length of the Main and enter the segment information into DREAMS.
3. In the Mapping Application - post the segment I.D. from DREAMS into the Mapping Database.
4. From Aerial Photography – capture local operating environment and area information.
5. In DREAMS – record local operating environment and area information.
6. In DREAMS – search for leak data records that could be associated with the defined segment; scrub the leak information and mapping records to correct any data errors that are discovered.
7. In DREAMS – attach leak repair records to the defined Main segment in the month after the repair.

As additional information is added to the record and as the pipe segments age, the Segment Risk Score is maintained and updated by the DREAMS application.

"High Risk" Segment Management Process

1. The list of Segments scoring over 100 are provided to the Region Technical Services Office for economic cost analysis, prioritization, scheduling, and planning.
2. Steel Segments that are planned for the addition of CP are handed off to the CP group.
3. Segments that are identified for replacement are worked through the normal business process for pipeline replacement.
4. Segments that are pending further action are placed on shortened leakage survey cycles.


Steel Algorithm.pdf


Plastic Algorithm R07152010.pdf

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4. On page RKS-33, SCG states, "Based on the risk ranking, SoCalGas will take mitigation measures to reduce the threat, thus enhancing the integrity and safety of its distribution system." Please provide a detailed explanation of the "risk ranking" and a copy of any and all risk assessments performed, and all "risk rankings" assigned to all DIMP projects identified for 2010-2012.

SoCalGas Response:

The "risk ranking" is simply a measure of the relative risk of one segment of Main to another based on the combined material, installation, environmental, and current population and infrastructure attributes surrounding each segment. The "risk ranking" is a tool to maintain a focus of operational resources on replacement and CP project planning activities and increased system maintenance on the areas of the system most prone to the development of hazardous leakage, while providing sufficient flexibility for operations to respond to the needs of customers, and constraints and restrictions placed on construction activities by the cities in which SoCalGas operates. Due to the dynamic nature of the operational environment, the risk score is allowed to be placed secondary to operational constraints, while maintaining an increased focus on leak management for all segments defined as "high risk". For this reason, a segment with a lower "risk ranking" may be replaced before a segment with a higher "risk ranking". The advantage, however, lies in the overall reduction in the population of segments that are performing below the norm for the given population of pipe.
The risk assessment is performed by the DREAMS application. No secondary assessment is needed.

See attached list of DIMP Projects and their associated risk rankings.


DREAMS
Segments.pdf

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5. On pages RKS-35 to RKS-36, SCG states, "PHMSA reports that the average cost for a large operator to replace bare steel pipe could be from $53 to $77 per foot, a range of almost 1.5 times the low estimate. SoCalGas' experience shows that in its service territory the actual range could be as much as three times the low estimate." Provide a copy of the PHMSA report and a citation to the cost estimate, and provide all calculations and supporting documents used to determine SCG's higher costs.

SoCalGas Response:

The PHMSA report that is referenced above and in Mr. Stanford's testimony is titled "*Regulatory Impact Analysis: Final Report"* (PHMSA-RSPA-2004-19854-0255) and can be found in the federal docket folder for the "Integrity Management Program for Gas Distribution Pipelines" at the following URL:

http://www.regulations.gov/#!documentDetail;D=PHMSA-RSPA-2004-19854-0255.

A convenience copy of this document is included below.

PHMSA-RSPA-2004-1
9854-0255.pdf

The referenced cost range of replacing bare steel of $53 to $77 per foot is based on two different citations from the *Regulatory Impact Analysis: Final Report*. The first is found in Table 11 - *Key Assumptions Impacting Costs* on page 41. The entry in the second row in the "Costs" section states that the Costs to replace steel w/ coated steel has an Assumed Value of $77/foot". This is the upper limit of the quoted range. Below is the relevant excerpt from Table 11.

Costs**	Assumed Value
Costs to replace cast iron (high density underground)	$90/foot
Costs to replace steel w/ coated steel	$77/foot
Costs to replace steel w/ plastic	$25/foot
Costs to replace steel w/ plastic (high density underground)	$45/foot

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Response to Question 5 (Continued)

The second citation is from page 53, Table 14 – *Estimated Costs of Integrity Management Program Mitigation*. This table indicates that replacing additional Bare Steel mains is assumed to cost $279,145/mile (approximately $53/foot). Below is the relevant excerpt from Table 14 of the Report.

Type of Operator and Activity	Cost	Miles of main or Number of services Impacted, or labor hours required	Total Annual Cost in Year 1 ($ Million)	Total Annual Cost in Year 2 and On ($ Million)
Large Operators				
Replacing additional pipe --				
- ≤8" cast iron mains	$475,200/mile	24.2 miles	$0	$11.5
-Cast iron services	$2,200/service	90.3 services	$0	$0.2
-Bare steel mains	$279,145/mile	17.5 miles	$0	$4.9
-Bare steel services	$2,200/service	1,064 services	$0	$2.3

The statement related to SoCalGas' actual costs is based on historical cost data. Due to the diversity of SoCalGas' service territory, costs can vary from location to location. Based on annualized averages over the period of 2005 through 2009, steel pipe replacement costs have averaged approximately $108 per foot, with an average value of $137 per foot in 2009.

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6. On page RKS-36, SCG states, "...PHMSA states that it expects the group of 201 large operators to collectively replace 17.5 miles of bare steel main per year... In order to address the DIMP threat of leakage, SoCalGas is proposing a more robust replacement rate which again drives up the program cost estimates."

    a. Is SoCalGas one of the 201 large operators identified by PHMSA?
    b. How much more robust is SoCalGas' proposed replacement rate than PHMSA's proposed replacement rate. Please provide a listing of all factors and supportive reasons explaining why SoCalGas needs to deviate from PHMSA's expectations and propose a more robust replacement rate.

SoCalGas Response:

a. The actual operators names are not included in PHMSA's *Regulatory Impact Analysis: Final Report*, page 15, Section 6 - *Industry Information*, but based on the narrative and definitions, SoCalGas' status as the nation's largest gas distribution utility by total number of services* and total miles of pipe*, as well as SoCalGas' consistent filing of its annual DOT reports, it can be assumed with a high degree of confidence that SoCalGas is included as one of the Large Operators.
(* Source: PHMSA website at URL:
http://phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnextfmt=print

b. SoCalGas' DIMP-driven distribution main replacement program is applicable to its NSOA main. This category of main includes unprotected steel pipe (without cathodic protection), PE pipe installed prior to 1985, and any other PE pipe with history of integrity-related leakage. It is estimated that there are over 17,000 miles of these types of pipe remaining in the SoCalGas distribution system.

PHMSAs DIMP-related pipe-replacement assumptions specifically address the replacement of cast iron main, bare steel main, and plastic main with no mention of steel pipe without cathodic protection (CP). Under DIMP, an operator is required to tailor its program to the integrity threats it identifies. Thus, SoCalGas' replacement program has been developed to focus on the main segments that demonstrate specific integrity issues, such as propensity for leakage. The SoCalGas program goes beyond the PHMSA assumptions by including replacement of coated steel pipe with no CP. Our data shows that some steel pipe without CP can have a higher likelihood, under certain conditions, to develop corrosion leakage than some bare steel main and therefore should be included in SoCalGas' comprehensive DIMP program.

Response to Question 6 (Continued)

SoCalGas' current routine replacement of main will account for approximately 44 miles of Distribution Main replaced annually. With this level of activity, it would take over 7 years to replace the current inventory of main already identified for replacement, and 60 years to replace the projected total inventory of "high risk" mains.

As a prudent operator seeking to align with the objectives of the new DIMP regulations, an incremental increase in spending will accelerate this to a more reasonable 20-year program. At this increased rate of replacement, the estimated 1,185 mile inventory of high-risk mains, along with the additional miles estimated that will be added to the program annually, will be worked to a maintenance equilibrium level (where replacement rate equals the rate of pipe segments qualifying for replacement under DREAMS) after approximately 20 years.

PHMSA's stated objective of the Distribution Integrity Management regulations is to "enhance safety by identifying and reducing pipeline integrity risks". They state "The IM approach was designed to promote continuous improvement in pipeline safety by requiring operators to identify and invest in risk control measures beyond core regulatory requirements". In § 192.1007 (e) the final rule specifies the means by which the IM program must be measured, as follows:

§ 192.1007 (e) Measure performance, monitor results, and evaluate effectiveness. (1) Develop and monitor performance measures from an established baseline to evaluate the effectiveness of its IM program...These performance measures must include the following: (i) Number of hazardous leaks either eliminated or repaired as required by § 192.703(c) of this subchapter".

SoCalGas believes the requested additional level of replacement, which is necessary to replace high-risk main over a 20-year period, is necessary for compliance with these requirements of the rule, and for achieving the objective of enhanced safety. The DIMP rules might well require that high-risk main be replaced in fewer than 20 years to meet the objective of enhanced safety; replacement of high-risk mains over 20 years is the maximum that can be reasonably considered to comply with the intent of the DIMP regulations.