EXHIBIT JAL-1

Dr. Jonathan A. Lesser, Curriculum Vitae

CONTINENTAL ECONOMICS

Jonathan A. Lesser, Ph.D.

President

SUMMARY OF EXPERIENCE

Dr. Jonathan Lesser is the President of Continental Economics, Inc., and has 30 years of experience working for regulated utilities, governments, and as an economic consultant. He has extensive experience in valuation and damages analysis, from estimating the damages associated with breaking commercial leases to valuing nuclear power plants. Dr. Lesser has performed due diligence studies for investment banks, testified on generating plant stranded costs, assessed damages in commercial litigation cases, and performed statistical analysis for class certification. He has also served as an arbiter in commercial damages proceedings.

He has analyzed economic and regulatory issues affecting the energy industry, including cost-benefit analysis of transmission, generation, and distribution investment, gas and electric utility structure and operations, generating asset valuation under uncertainty, mergers and acquisitions, cost allocation and rate design, resource investment decision strategies, utility financing and the cost of capital, depreciation, risk management, incentive regulation, economic impact studies of energy infrastructure development, and general regulatory policy.

Dr. Lesser has prepared expert testimony and reports in cases before utility commissions in numerous US states; before the US Federal Energy Regulatory Commission (FERC); before international regulators in Latin America and the Caribbean; and in commercial litigation cases. He has also testified before the U.S. Congress, and legislative committees in numerous states on energy policy and market issues. Dr. Lesser has also served as an independent arbiter in disputes involving regulatory treatment of utilities and valuation of energy generation assets.

Dr. Lesser is the author of numerous academic and trade press articles. He is the coauthor of *Environmental Economics and Policy* (1997), *Principles of Utility Corporate Finance* (2011), and *Fundamentals of Energy Regulation* (2007; 2d ed., 2013). He is also a contributing columnist and Editorial Board member for *Natural Gas & Electricity*. Dr. Lesser is currently serving a three-year term as one of the Energy Bar Association "Deans" overseeing education programs on regulatory and ratemaking concepts.

AREAS OF EXPERTISE

- State, federal, and international electric rate regulation—cost of capital, depreciation, cost of service, cost allocation, pricing and rate design, incentive regulation, regulatory policy, wholesale and retail market design, and industry restructuring
- Commercial damages estimation and litigation
- Natural gas and oil pipeline rate regulation
- Natural gas markets
- Cost-benefit analysis
- Economic impact analysis and input-output studies
- Environmental policy and analysis
- Market power analysis
- Load forecasting and energy market modeling
- Market valuation and due diligence
- Antitrust

EDUCATION

- PhD, Economics, University of Washington, 1989
- MA, Economics, University of Washington, 1982
- BSc, Mathematics and Economics (with honors), University of New Mexico, 1980

EMPLOYMENT HISTORY

- 2009–Present: Continental Economics, Inc., President.
- 2004–2009: Bates White, LLC, Partner, Energy Practice.
- 2003–2004: Vermont Dept. of Public Service, Director of Planning.
- 1998–2003: Navigant Consulting, Senior Managing Economist.
- 1996–1998: Adjunct Lecturer, School of Business, University of Vermont.
- 1993–1998: Green Mountain Power Corporation, Manager, Economic Analysis.
- 1990–1993: Adjunct Lecturer, Dept. of Business and Economics, Saint Martin's College.

- 1986–1993: Washington State Energy Office, Energy Policy Specialist.
- 1984–1986: Pacific Northwest Utilities Conference Committee, Energy Economist.
- 1983–1984: Idaho Power Corporation, Load Forecasting Analyst.

SELECTED EXPERT TESTIMONY AND REPORTS

Utah Industrial Energy Consumers

- Proceeding before the Utah Public Service Commission Docket Nos. 13-035-184 and 13-034-196 (revenue requirement, cost allocation, and design of back-up service rates)

Paiute Pipeline Company

- FERC rate proceeding (*Re: Paiute Pipeline Company,* Docket No. RP14-540-000)

  Subject: Natural gas supplies and depreciation rates for transmission, storage, and general plant accounts.

Energy Michigan

- Proceeding before the Michigan Public Utilities Commission (*Re: Consumers Energy Corporation*, Case No. U-17429)

  Subject: Certificate of Convenience and Necessity for Consumers Power combined-cycle generating plant.

Constellation New Energy Inc. and Exelon Generation Company, LLC

- Proceeding before the Ohio Public Utilities Commission (*Re: Columbus Southern Power Company and Ohio Power Company*, Case Nos. 12-3254-EL-UNC)

  Subject: Design of competitive auction process and rate blending for AEP Ohio.

Shell Energy North America, LP

- FERC proceeding regarding natural gas pipeline fuel cost allocation (*Re: Rockies Express Pipeline, LLC,* Docket Nos. RP11-1844-000 & RP12-399-000)

Subject: Economic appropriateness of roll-in treatment of "lost and unaccountable" fuel

New York Association of Public Utilities

- FERC proceeding regarding formula transmission rate for Niagara Mohawk Power d/b/a National Grid (*Niagara Mohawk Power Co*., Docket No.

- FERC proceeding regarding formula transmission rate for Niagara Mohawk Power d/b/a National Grid (*Niagara Mohawk Power Co*., Docket No. EL12-101-000)

  Subject: Allowed rate of return and capital structure

Caribbean Utilities Company, Ltd.

- Rebuttal report on weighted average cost of capital methodology and recommendations for Caribbean Utilities Company, Ltd.

Utah Industrial Energy Users Coalition

- Proceeding before the Utah Public Service Commission (*Re: Rocky Mountain Power Corp*., Case No. U-11035-200)

  Subject: Appropriate methodology for embedded cost allocation for Rocky Mountain Power.

FirstEnergy Solutions Corp.

- Proceeding before the Ohio Public Utilities Commission (Case Nos. 12-2400-EL-UNC)

  Subject: Just and reasonableness of Duke Energy Ohio cost-recovery mechanism for capacity resources.

- Proceeding before the Ohio Public Utilities Commission (Case Nos. 12-426-EL-SSO)

  Subject: Dayton Power & Light Co., Electric Security Plan; financial integrity, anticompetitive cross-subsidization and need for structural separation

- Proceeding before the Michigan Public Service Commission (Case No. U-17032)

  Subject: Indiana & Michigan Power Co. proposed capacity charges for customers taking retail electric service.

- Proceeding before the Ohio Public Utilities Commission (Case Nos. 11-346-EL-SSO and 11-348-EL-SSO)

  Subject: Revised AEP Ohio energy security plan, benefits of retail market competition.

- Proceeding before the Ohio Public Utilities Commission (Case No. 10-2929-EL-UNC)

  Subject: Appropriate price for commercial retail electric suppliers to be charged by AEP Ohio for installed capacity under the PJM Fixed Resource Requirement tariff option.

Southwestern Electric Cooperative

- FERC proceeding regarding wholesale distribution rate application of Ameren Illinois (*Re: Midwestern ISO and Ameren Illinois*, Docket No. ER11-2777-002, et al.)

  Subject: Allowed rate of return and capital structure

Exelon Corporation

- Proceeding before the New Jersey Board of Public Utilities (Docket No. EO-11050309)

  Subject: PJM Capacity Market, Capacity Procurement, and Transmission Planning

Industrial Energy Users of Ohio

- Proceeding before the Ohio Public Utilities Commission (Case No. 08-917-EL-SSO)

  Subject: Determination of cost associated with "provider-of-last-resort" (POLR) service and AEP Ohio's use of option pricing models.

Southwest Gas Corporation

- FERC proceeding regarding rate application of El Paso Natural Gas Company (Docket No. RP10-1398-000)

  Subject: Development of risk-sharing methodology for unsubscribed and discount capacity costs.

Portland Natural Gas Shippers

- FERC rate proceeding regarding the rate application by Northern Border Pipeline Company (Re: Portland Natural Gas Transmission System, Docket No. RP10-729-000)

- FERC rate proceeding regarding the rate application by Northern Border Pipeline Company (Re: Portland Natural Gas Transmission System, Docket No. RP08-306-000)

  Subject: Natural gas supplies, economic lifetime, and depreciation rates.

Independent Power Producers of New York

- FERC proceeding (New York Independent System Operator, Inc., Docket No. ER11-2224-000)

  Subject: Reasonableness of the proposed installed capacity demand curves and cost of new entry values proposed by the New York Independent System Operator.

Maryland Public Service Commission

- Merger application of FirstEnergy Corporation and Allegheny Energy, Inc. (I/M/O FirstEnergy Corp and Allegheny Energy, Inc., Case No. 9233)

  Subject: Proposed merger between FirstEnergy Corporation and Allegheny Energy. Testimony described the structure and results of a cost-benefit analysis to determine whether the proposed merger met the state's positive benefits test, and included analysis of market power and merger synergies.

Alliance to Protect Nantucket Sound

- Proceeding before the Massachusetts Department of Public Utilities (Case No. D.P.U. 10-54)

  Subject: Approval of Proposed Long-Term Contracts for Renewable Energy With Cape Wind Associates, LLC.

Brookfield Energy Marketing, LLC

- FERC proceeding (*New England Power Generators Association, et al. v. ISO New England, Inc.,* Docket Nos. ER10-787-000, ER10-50-000, and EL10-57-000 (consolidated)).

Subject: Proposed forward capacity market payments for imported capacity into ISO-NE.

Public Service Company of New Mexico

- Proceeding before the New Mexico Public Regulation Commission (Case No. 10-00086-UT)

  Subject: Load forecast for future test year, residential price elasticity study.

M-S-R Public Power Agency

- FERC proceeding (*Southern California Edison Co.*, Docket No. ER09-187-000 and ER10-160-000)

  Subject: Allowed rate of return for construction work in progress (CWIP) expenditures for certain transmission facilities.

- FERC proceeding (*Southern California Edison Co.*, Docket No. ER10-160-000)

  Subject: Allowed rate of return for construction work in progress (CWIP) expenditures for certain transmission facilities.

Financial Marketers

- FERC proceeding (*Black Oak Energy, LLC v PJM Interconnection, L.L.C.*, Docket No. EL08-014-002)

  Subject: Allocation of surplus transmission line losses under the PJM tariff.

Southwest Gas Corporation and Salt River Project

- FERC proceeding regarding rate application of El Paso Natural Gas Company (Docket No. RP08-426-000)

  Subject: Analysis of proposed capital structure and recommended capital structure adjustments

New York Regional Interconnect, Inc.

- Proceeding before the New York Public Service Commission (Case No. 06-T-0650)

Subject: Analysis of economic and public policy benefits of a proposed high-voltage transmission line.

Occidental Chemical Corporation

- FERC Proceeding (*Westar Energy, Inc.* ER07-1344-000)

  Subject: Compliance of wholesale power sales agreement with FERC standards

EPIC Merchant Energy, LLC, et al.

- FERC Proceeding (*Ameren Services Company v. Midwest Independent System Operator, Inc.,* Docket Nos. EL07-86-000, EL07-88-000, EL07-92-000 (Consolidated)

  Subject: Allocation of revenue sufficiency guarantee costs.

Cottonwood Energy, LP

- Proceeding before the Public Utility Commission of Texas (*Application of Kelson Transmission Company, LLC for a Certificate of Convenience and Necessity for the Amended Proposed Canal to Deweyville 345 kV Transmission Line with Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, and Orange Counties*, Docket No. 34611, SOAH Docket No. 473-08-3341)

  Subject: Benefits of transmission capacity investments.

Redbud Energy, LP

- Proceeding before the Oklahoma Corporation Commission (*Request of Public Service Company of Oklahoma for the Oklahoma Corporation Commission to Retain an Independent Evaluator,* Cause No. PUD 200700418)

  Subject: Reasonableness of PSO's 2008 RFP design.

The NRG Companies

- FERC Proceeding (*ISO New England Inc. and New England Power Pool,* Docket No. ER08-1209-000)

  Subject: Compensation of Rejected De-list Bids Under ISO-NE's Forward Capacity Market Design

Dynegy Power Marketing, LLC

- FERC proceeding, *KeySpan-Ravenswood, LLC v. New York Independent System Operator, Inc.*, Docket No. EL05-17-000

  Subject: Estimation of damages accruing to Dynegy arising from a failure by the NYISO to accurately calculate locational installed capacity requirements in NYISO during the summer of 2002.

Constellation Energy Group

- FERC proceeding (*Maryland Public Utility Commission, et al., v. PJM Interconnection, LLC*, Docket No. EL08-67-000)

  Subject: "Just and reasonableness" of PJM's Reliability Pricing Mechanism.

Government of Belize, Public Utility Commission

- Proceeding before the Belize Public Utility Commission, *In the Matter of the Public Utilities Commission Initial Decision in the 2008 Annual Review Proceeding for Belize Electricity Limited.*

  Subject: Arbitration and Independent Expert's report, in dispute between the Belize PUC and Belize Electricity Limited in an annual electric rate tariff review, as required under Belize law.

Federal Energy Regulatory Commission

- Technical hearings on wholesale electric capacity market design.

  Subject: Analysis of proposal to revise RTO capacity market design developed by the American Forest and Paper Association.

Dogwood Energy, LLC

- Proceeding before the Missouri Public Service Commission, *In the Matter of the Application of Aquila, Inc., d/b/a Aquila Networks - MPS and Aquila Case No. EO-2008-0046, Networks - L&P for Authority to Transfer Operational Control of Certain Transmission Assets to the Midwest Independent Transmission System Operator, Inc.*, Case No. EO-2008-0046.

  Subject: Cost-benefit analysis to determine whether Aquila should join either the Midwest Independent System Operator (MISO) or the Southwest Power Pool (SPP).

Independent Power Producers of New York

- FERC proceeding (*Re: New York Independent System Operator, Inc.*, Docket No. ER08-283-000)

  Subject: Revisions to the installed capacity (ICAP) market demand curves in the New York control area, which are designed to provide economic incentives for new generation development.

Empresa Eléctrica de Guatemala

- Rate proceeding before the Comisión Nacional de Energía Eléctrica

  Subject: Rate of return for an electric distribution company

Electric Power Supply Association

- FERC proceeding (*Re: Midwest Independent Transmission System Operator, Inc.*, Docket No. ER07-1182-000)

  Subject: Critique of cost-benefit analysis by MISO Independent Market Monitor concluding that permanent establishment of Broad Constrained Area mitigation was appropriate.

Constellation Energy Commodities Group, LLC

- FERC proceeding regarding rate application for ancillary services by Ameren Energy (*Re: Ameren Energy Marketing Company and Ameren Energy, Inc.*, Docket Nos. ER07-169-000 and ER07-170-000)
- Subject: Analysis and testimony on appropriate "opportunity cost" rates for ancillary services, including regulation service and spinning reserve service. Case settled prior to testimony being filed.

Suiza Dairy Corporation

- Rate proceeding before the Office of Milk Industry Regulatory Administration of Puerto Rico.
- Subject: Analysis and testimony on the appropriate rate of return for regulated milk processors in the Commonwealth of Puerto Rico.

IGI Resources, LLC and BP Canada Energy Marketing Corp.

- FERC proceeding regarding the rate application by Gas Transmission Northwest Corporation (*Re: Gas Transmission Northwest*, Docket No. RP06-407-000)

Subject: Natural gas supplies, economic lifetime, and depreciation rates.

Baltimore Gas and Electric Co.

- Maryland Public Service Commission (Case No. 9099)

  Subject: Standard Offer Service pricing. Testimony focused on factors driving electric price increases since 1999, and estimates of rates under continued regulation

- Maryland Public Service Commission (Case No. 9073)

  Subject: Stranded costs of generation. Testimony focused on analysis of benefits of competitive wholesale power industry.

- Maryland Public Service Commission (Case No. 9063)

  Subject: Optimal structure of Maryland's electric industry. Testimony focused on the benefits of competitive wholesale electric markets. Presented independent estimates of the benefits of restructuring since 1999.

Pemex-Gas y Petroquímica Básica

- Expert report in a rate proceeding. Presented analysis before the Comisión Reguladora de Energía on the appropriate rate of return for the natural gas pipeline industry.

BP Canada Marketing Corp.

- FERC proceeding regarding the rate application by Northern Border Pipeline Company (*Re: Northern Border Pipeline*, Docket No. RP06-072-000)

  Subject: Natural gas supplies, economic lifetime, and depreciation rates.

Transmission Agency of Northern California

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER09-1521-000)

  Subject: Analysis of appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER08-1318-000)

  Subject: Analysis of appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER07-1213-000)

  Subject: Analysis of appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER06-1325-000)

  Subject: Analysis of appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER05-1284-000)

  Subject: Analysis of appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.

- FERC rate proceeding (*Re: Pacific Gas & Electric Company*, Docket Nos. ER03-409-000, ER03-666-000)

  Subject: Analysis and development of recommendation for the appropriate return on equity, capital structure, and overall cost of capital.

State of New Jersey Board of Public Utilities

- Merger application of Public Service Enterprise Group and Exelon Corporation (*I/M/O The Joint Petition Of Public Service Electric And Gas Company And Exelon Corporation For Approval Of A Change In Control Of Public Service Electric And Gas Company And Related Authorizations, BPU Docket No. EM05020106, OAL Docket No. PUC-1874-050*)

  Subject: Proposed merger between Exelon Corporation and PSEG Corporation. Testimony described the structure and results of a cost-benefit analysis to determine whether the proposed merger met the state's positive benefits test, and included analysis of market power, value of changes in nuclear plant operations, and merger synergies.

Sierra Pacific Power Corp.

- FERC proceeding regarding the rate application by Paiute Pipeline Company (*Re Paiute Pipeline Company* Docket No. RP05-163-000)

  Subject: Depreciation analysis, negative salvage, and natural gas supplies. Case settled prior to filing expert testimony.

Matanuska Electric

- Regulatory Commission of Alaska rate proceeding (*In the Matter of the Revision to Current Depreciation Rates Filed by Chugach Electric Association, Inc.*, Docket No. U-04-102)

  Subject: Analysis of the reasonableness of Chugach electric's depreciation study.

Duke Energy North America, LLC

- FERC proceeding (*Re: Devon Power, LLC*, et al., Docket No. ER03-563-030)

  Subject: Appropriate market design for locational installed generating capacity in the New England market to ensure system reliability.

Keyspan-Ravenswood, LLC

- FERC proceeding, *KeySpan-Ravenswood, LLC v. New York Independent System Operator, Inc.*, Docket No. EL05-17-000

  Subject: Estimation of damages arising from a failure by the NYISO to accurately calculate locational installed capacity requirements in New York City during the summer of 2002.

Electric Power Supply Association

- FERC proceeding (*Re: PJM Interconnection, LLC*, Docket No. EL03-236-002)

  Subject: Analysis and critique of proposed pivotal supplier tests for market power in PJM identified load pockets.

Vermont Department of Public Service

- Vermont Public Service Board Rate Proceedings
    - Concurrent proceedings: *Re: Green Mountain Power Corp.*, Dockets No. 7175 and 7176. Subject: Cost of capital and allowed return on equity under cost of service regulation, as well as under a proposed alternative regulation proposal.
    - *Re: Shoreham Telephone Company*, Docket No. 6914. Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.
    - *Re: Vermont Electric Power Company*, Docket No. 6860. Subject: Development of a least-cost transmission system investment strategy to

analyze the prudence of a major high-voltage transmission system upgrade proposed by the Vermont Electric Power Company.

- *Re: Central Vermont Public Service Company*, Docket No. 6867. Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.
- *Re: Green Mountain Power Corporation*, Docket No. 6866. Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.

Pipeline shippers

- FERC proceeding regarding the rate application of Northern Natural Gas Company (*Re: Northern Natural Gas Company*, Docket No. RP03-398-000)

  Subject: Gas supply analysis to determine pipeline depreciation rates as part of an overall rate proceeding.

Arkansas Oklahoma Gas Corp.

- Oklahoma Corporation Commission rate proceeding (*Re: Arkansas Oklahoma Gas Corporation*, Docket No. 03-088)

  Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.
- Arkansas Public Service Commission rate proceedings
  - *In the Matter of the Application of Arkansas Oklahoma Gas Corporation for a General Change in Rates and Tariffs*, Docket No. 05-006-U. Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.
  - *In the Matter of the Application of Arkansas Oklahoma Gas Corporation for a General Change in Rates and Tariffs*, Docket No. 02-24-U. Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.

Entergy Nuclear Vermont Yankee, LLC

- Vermont Public Service Board proceeding (*Re: Petition of Entergy Nuclear Vermont Yankee for a Certificate of Public Good*, Docket No. 6812)

  Subject: Analysis of the economic benefits of nuclear plant generating capacity expansion as required for an application for a Certificate of Public Good.

Central Illinois Lighting Company

- Illinois Commerce Commission rate proceeding (*Re: Central Illinois Lighting Company*, Docket No. 02-0837)

  Subject: Analysis and development of recommendations for the appropriate return on equity, capital structure, and overall cost of capital.

Citizens Utilities Corp.

- Vermont Public Service Board rate proceeding (*Tariff Filing of Citizens Communications Company requesting a rate increase in the amount of 40.02% to take effect December 15, 2001*, Docket No. 6596)

  Subject: Analysis of the prudence and economic used-and-usefulness of Citizens' long-term purchase of generation from Hydro Quebec, including the estimated environmental costs and benefits of the purchase.

Dynegy LNG Production, LP

- FERC proceeding (*Re: Dynegy LNG Production Terminal, LP*, Docket No. CP01-423-000). September 2001

  Subject: Analysis of market power impacts of proposed LNG facility development.

Missouri Gas Energy Corp.

- FERC rate proceeding (*Re: Kansas Pipeline Corporation*, Docket No. RP99-485-000)

  Subject: Gas supply analysis to determine pipeline depreciation rates as part of an overall rate proceeding.

Green Mountain Power Corp.

- Vermont Public Service Board rate proceedings
  - *In the Matter of Green Mountain Power Corporation requesting a 12.93% Rate Increase to take effect January 22, 1999*, Docket No. 6107. Subject: Analysis of the appropriate discount rate, treatment of environmental costs, and the treatment of risk and uncertainty as part of a major power-purchase agreement with Hydro-Quebec.
  - *Investigation into the Department of Public Service's Proposed Energy Efficiency Utility*, Docket No. 5980. Subject: Analysis of distributed utility planning methodologies and environmental costs.

- *Tariff Filing of Green Mountain Power Corporation requesting a 16.7% Rate Increase to take effect 7/31/97*, Docket No. 5983. Subject: Analysis of distributed utility planning methodologies and avoided electricity costs.
- *Tariff Filing of Green Mountain Power Corporation requesting a 16.7% Rate Increase to take effect 7/31/97*, Docket No. 5983. Subject: Valuation of a long-term power purchase contract with Hydro-Quebec in the context of a determination of prudence and economic used-and-usefulness.

United Illuminating Company

- Connecticut Dept. of Public Utility Control proceeding (*Application of the United Illuminating Company for Recovery of Stranded Costs*, Docket No. 99-03-04)

  Subject: Development and application of dynamic programming models to estimate nuclear plant stranded costs.

COMMERCIAL LITIGATION EXPERIENCE

- *Idaho Power Co. v. Glenns Ferry Cogeneration Partners, L.P.*, U.S. District Court, District of Idaho, Case No. 1:11-cv-00565-CWD. Expert report on damages associated with breach of power sales contract.

- *Vacqueria Tres Monjitas and Suiza Dairy, Inc. v. Jose O. Laboy, in his Official capacity, as the Secretary of the Department of Agriculture for the Commonwealth of Puerto Rico, and Juan R. Pedro-Gordian, in his official capacity, as Administrator of the Office of the Milk Industry Regulatory Administration for the Commonwealth of Puerto Rico,* U.S. District Court, District of Puerto Rico, Civil Case No. 04-1840. Expert testimony and report on country risk and failure to provide adequate compensation to fresh milk processors in Puerto Rico.

- *Lorali, Ltd., et al. v. Sempra Energy Solutions, LLC, et al.* District Court of Texas, 92nd Judicial Court, Hidalgo County, Cause No. C-356-10-A. Expert reports regarding liquidated damages associated with breach of retail electric supply contracts.

  DPL, Inc. and its subsidiaries v. William W. Wilkins, Tax Commissioner of Ohio, Case No. 2004-A-1437. Expert report on economic impacts of generation investment and qualification of electric utility investments as "manufacturing" investments for purposes of state investment tax credits.

- *IMO Industries v. Transamerica.* Estimated the appropriate discount rate to use for estimating damages over time associated with a failure of the insurance companies to reimburse asbestos-related damage claims and the resulting losses to the firm's value.

- *John C. Lincoln Hospital v. Maricopa County.* Performed statistical analysis to determine the value of a class of unpaid hospital insurance claims.

- *Catamount/Brownell, LLC. v. Randy Rowland.* Prepared an expert report on the damages associated with breach of commercial lease.

- *Lyubner v. Sizzling Platters, Inc.*. Performed an econometric analysis of damage claims based on sales impacts associated with advertising.

- *Pietro v. Pietro*. Estimated pension benefits arising from a divorce case.

- *Nat'l. Association of Electric Manufacturers v. Sorrell.* U.S. District Court for the District of Vermont. Expert report and testimony on the costs of labeling fluorescent lamps and the impacts of labeling laws on the demand for electricity.

ARBITRATION CASES

***TransCanada Hydro Northeast, Inc. v. Town of Littleton, New Hampshire*, (CPR File No. G-09-24).**

Subject: dispute regarding valuation for property tax purposes of a hydroelectric facility located on the Connecticut River.

Served as neutral on a three-person arbitration panel.

***Belize Electricity Limited v. Belize Public Utilities Commission* (Claim No. 512 of 2008)**.

Subject: Proceeding before the Supreme Court of Belize alleging that the Final Decision by the Belize Public Utilities Commission setting electric rates and tariffs for the 2008-2009 period were unreasonable and non-compensatory.

Prepared independent report on behalf of the Belize Supreme Court for arbitration of the dispute.

SELECTED BUSINESS CONSULTING EXPERIENCE

- For Fortis-TCI, prepared report on the economic impacts of the electric industry in the Turks and Caicos.

- For the COMPETE coalition, prepared a report on the economic impacts of state subsidized electric generating plants.
- For a confidential client, provided analysis on rate of return and capital structure, as well as key business and financial risks, for renegotiation of a long-term power-purchase agreement.
- For the Manhattan Institute, prepared a comprehensive report on the economic impacts of shutdown of the Indian Point Nuclear Facility.
- For Energy Choice Now, prepared a report on the economic benefits of retail electric competition in Michigan.
- For the COMPETE Coalition, prepared a report on how electric competition creates economic growth.
- For an industry group, developed econometric models of the impacts of shale gas production on U.S. natural gas and electric prices.
- For an environmental advocacy group, critically evaluated the financial implications of operating restrictions for an off-shore wind generating facility stemming from requirements under the U.S. Endangered Species Act.
- For a major investor-owned utility in the US, prepared a new system of short-term peak and energy forecasting models.
- For a major wholesale electric generation company, prepared comprehensive economic impact studies for use in FERC hydroelectric relicensing proceedings.
- For a major investor-owned utility in the Southwest US, prepared a detailed econometric model and wrote a comprehensive report on residential price elasticity that was required by regulators.
- For a major investor-owned utility in the Southwest US, developed a methodology to value nuclear plant leases that incorporated future uncertainty regarding greenhouse gas regulations.
- Faculty member, PURC/World Bank International Training Program on Utility Regulation and Strategy, University of Florida, Public Utility Research Center, Gainesville, FL, 2008 – 2009. Courses taught:
    - Sector Issues: Basic Techniques–Energy
    - Sector Issues in Rate Design: Energy
    - Sector Issues in Rate Design: Energy–Case Studies
    - Transmission Pricing Issues
- For a major solar energy firm, evaluated costs and benefits of alternative solar technologies; assisted with siting and transmission access issues.

- For the South African Department of Minerals and Energy, recommended pricing methods and regulatory accounts to ensure that petroleum product prices appropriately reflected costs and to enhance the incentives for industry investment "Final Report for Task 141. "
- For industrial customers in the State of Vermont, prepared a position paper on the impacts of demand side management funding on electric rates and competitiveness.
- For a major New York brokerage firm, performed a fairness opinion valuation of a gas-fired electric generating facility.
- For electric utilities undergoing restructuring, developed comprehensive economic models to value buyer offers associated with nuclear power plant divestitures.
- For a large municipal electric utility in Florida, analyzed real option values of alternative proposed purchased generation contracts whose strike prices were tied to future natural gas and oil prices, and developed contract recommendations.
- For a municipal electric utility in Florida, developed an analytical model to determine risk-return tradeoffs of alternative generation portfolios, identify an efficient frontier of generation asset portfolios, and recommended asset purchase and sale strategies.
- For Central Vermont Public Service Corp. and Green Mountain Power Corp., developed analyses of distribution capacity investments accounting for uncertainty over future peak load growth.
- For a major electric utility in Latin America, developed risk management strategies for hedging natural gas supplies with minimal up-front investment; prepared training materials for utility staff; and wrote the utility's risk management Policies and Procedures Manual.
- For a major nuclear plant owner and operator in the U.S., prepared reports of the economic benefits of nuclear plant operation and development.
- For the Electric Power Supply Association, prepared numerous policy papers addressing wholesale electric market design and competition.
- For the California Energy Commission, developed a new policy approach to renewables feed-in tariffs and developed portfolio analysis models to develop an "efficient frontier" of generation portfolios for the state.
- For a major nuclear plant owner and operator, assessed the likelihood of relicensing a specific nuclear plant in New England, given state regulatory concerns over on-site spent fuel storage.

- For a large investor-owned utility in the Southeast, analyzed alternative environmental compliance strategies that directly incorporated uncertainty over future emissions costs, environmental regulations, and alternative pollution control technology effectiveness.
- For a Special Legislative Committee of the Province of New Brunswick, served as an expert advisor on the development of a deregulated electric power market.
- For the Bonneville Power Administration, developed models to assess the economic impacts of local generation resource development in Washington State and Oregon.
- For an electric utility in the Pacific Northwest, assisted in negotiations surrounding relicensing of a large hydroelectric generating facility.
- Served as an expert advisor for the Northwest Power Planning Council regarding future power supplies, load growth, and economic growth.

PROFESSIONAL ACTIVITIES

- Reviewer, *Energy*
- Reviewer, *The Energy Journal*
- Reviewer, *Energy Policy*
- Reviewer, *Journal of Regulatory Economics*
- Editorial Board Member, *Natural Gas & Electricity*

PROFESSIONAL ASSOCIATIONS

- Energy Bar Association
- Society for Benefit-Cost Analysis

PUBLICATIONS

Peer-reviewed journal articles

- Lesser, J., "The High Cost of Low-Value Wind Power," *Regulation*, Spring 2013, pp. 22-27.
- Lesser, J., "Wind Generation Patterns and the Economics of Wind Subsidies," *The Electricity Journal* 26, Jan/Feb. 2013, pp. 8-16.
- Lesser, J., "Gresham's Law of Green Energy," *Regulation*, Winter 2010-2011, pp. 12-18.

- Lesser, J., and E. Nicholson, "Abandon all Hope? FERC's Evolving Standards for Identifying Comparable Firms and Estimating the Rate of Return," *Energy Law Journal* 30 (April 2009): 105-132.
- Lesser, J. and X. Su. "Design of an Economically Efficient Feed-in Tariff Structure for Renewable Energy Development." *Energy Policy* 36 (March 2008) 981–990.
- Lesser, J. "The Economic Used-and-Useful Test: Its Origins and Implications for a Restructured Electric Industry." *Energy Law Journal* 23 (November 2002): 349–82.
- Lesser, J., and C. Feinstein. "Electric Utility Restructuring, Regulation of Distribution Utilities, and the Fallacy of 'Avoided Cost' Rules." *Journal of Regulatory Economics* 15 (January 1999): 93–110.
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- "The Need for a Texas Capacity Market," Presentation to the Gulf Coast Power Association, April 9, 2013.
- "The Regulatory Compact and Pipeline Competition," presentation to the Energy Bar Association, Western Chapter, Annual Meeting, San Francisco, CA, February 22, 2013.
- "Public Policy and Energy Markets: Good Intentions Gone Astray," presentation to the Independent Power Producers of New York, Fall Conference, September 13, 2012.
- "EPA Regulation of Generator Emissions – Key Market Issues," Energy Bar Association, Annual Meeting, April 28, 2012.
- "Competitive Energy Markets: How are they Working?" Constellation Executive Energy Forum, November 2, 2011.
- "The Failures of Transmission Planning and Policy," Harvard Electric Policy Group, February 25, 2010.
- "Financing the Smart Grid," Energy Bar Association Seminar, Washington, DC, December 4, 2009.
- "Renewable Power: At the Crossroads of Economics and Policy," Presentation to the Utilities State Government Organization, Newport, Rhode Island, July 13, 2009.
- "The Stimulus Act and Laws they Didn't Teach You in Law School," presentation to the 27th National Regulatory Conference, Williamsburg, VA, May 19, 2009.
- "Rate Recovery for Capital Intensive Generation: Rate Base and Construction Work in Progress," Law Seminars International, Las Vegas, NV, February 5, 2009.
- "Financial Risks Faced by Regulated Utilities: Implications for the Cost of Capital and Ratemaking Policies," Law Seminars International, Las Vegas, NV, February 7, 2008.
- "Alternative Regulatory Structures and Tariff Mechanisms: Practical approaches to providing low-cost, environmentally responsible energy and how to avoid some dangerous pitfalls." Western Energy Institute, October 1, 2007.
- "Economics and Energy Regulation." Law Seminars International, Washington, DC, March 15-16, 2007.
- "Energy in the Northeast: Resource Adequacy & Reliability." Law Seminars International, Boston, MA, October 16–17, 2006.
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- "Electricity and Natural Gas Regulation: An Introduction." Law Seminars International, Washington, DC, March 17–18, 2005.

EXHIBIT JAL-2

Impact of Proposals on Operating Expenses

2015 TEST YEAR - EXPENSE RECOMMENDATIONS

Program	PG&E Request ($000)	Deferred Authorization ($000)	Initial Shareholder Responsibility ($000)	Recommended Preauthorization ($000)	10 Year Amortization if Authorized ($000)
Transmission Pipe					
Traditional ILI	$14,521	$14,521	$-	$-	$14,521
Non-Traditional ILI	$146	$146	$-	$-	$146
ILI Casings	$3,545	$3,545	$-	$-	$3,545
Traditional ILI DE&ER	$13,310	$13,310	$-	$-	$13,310
Non-Traditional ILI DE&ER	$-	$-	$-	$-	$-
External Corrosion Direct Assessment	$26,227	$26,227	$-	$-	$26,227
Internal Corrosion Direct Assessment	$15,328	$15,328	$-	$-	$15,328
Stress Corrosion Cracking Direct Assessment	$2,857	$2,857	$-	$-	$2,857
Hydrostatic Testing	$179,245	$179,245	$-	$-	$179,245
Hydrostatic Testing - LNG/CNG	$2,548	$-	$-	$2,548	$2,548
Earthquake Fault Crossings	$4,494	$4,494	$-	$-	$4,494
Geo-Hazard Threat Identification	$211	$211	$-	$-	$211
Root Cause Analysis	$1,052	$1,052	$-	$-	$1,052
Risk Analysis Process Improvements	$6,263		$-	$6,263	$6,263
Programs to Enhance Integrity Management	$7,315		$-	$7,315	$7,315
Public Awareness	$4,344		$-	$4,344	$-
Inoperable and Hard to Operate Valves	$242			$242	$242
Class Location Programs	$7,270	$7,270	$-	$-	$7,270
Water and Levee Crossing	$1,372		$-	$1,372	$1,372
Shallow Pipe Program	$3,073	$3,073	$-	$-	$3,073
Gas-Gathering Program	$0		$-	$-	$-
Work Required by Others Program	$739	$-	$739	$-	$-
Storage	$638	$-	$-	$638	$638
Facilities					
ECA Phase 1	$15,633	$15,633	$-	$-	$15,633
ECA Phase 2	$8,682		$8,682	$-	

Program	PG&E Request ($000)	Deferred Authorization ($000)	Initial Shareholder Responsibility ($000)	Recommended Preauthorization ($000)	10 Year Amortization if Authorized ($000)
Hydrostatic Testing C&P	$455	$-	$-	$455	$455
Hydrostatic Testing M&C	$5,471	$-	$-	$5,471	$5,471
Critical Documents	$11,573	$-	$11,573	$-	
Data Acquisition & Metrics	$1,583	$-	$1,583	$-	$-
Physical Security	$1,055	$-	$-	$1,055	$-
Becker Upgrade	$-	$-	$-	$-	$-
Gas Quality M&C	$2,110	$-	$-	$2,110	$-
Gill Ranch O&M	$2,306	$-	$-	$2,306	$-
Routing Spending C&P	$8,440	$-	$-	$8,440	$-
Routing Spending M&R	$8,390	$-	$-	$8,390	$-
Corrosion Control					
Cathodic Protection	$3,964	$3,964	$-	$-	$3,964
Corrosion Investigations	$5,455	$5,455	$-	$-	$5,455
Close Interval Survey	$8,759	$8,759	$-	$-	$8,759
AC &DC Interference	$3,080	$3,080	$-	$-	$3,080
Casings	$48,504	$48,504	$-	$-	$48,504
Internal Corrosion	$8,784	$8,784	$-	$-	$8,784
Atmospheric Corrosion	$20,437	$20,437	$-	$-	$20,437
Gas Transmission System O&M	$104,090	$-	$-	$104,090	$104,090
Program Management Office	$6,330	$-	$-	$6,330	
Gas Systems Operations	$47,740	$-	$-	$47,740	
Information Technology	$16,342	$-	$-	$16,342	
Other GT&S Support Plans	$20,254	$-	$-	$20,254	
TOTAL	**$654,177**	**$385,895**	**$22,577**	**$245,705**	**$514,289**

EXHIBIT JAL-3

Impact of Proposals on Capital Expenses

2015-2017 CAPITAL EXPENDITURES - RECOMMENDATIONS					
Program	PG&E Request ($000)	Deferred Authorization ($000) [1]	Initial Shareholder Responsibility ($000) [1]	Recommended Authorization ($000)	Reduced ROE If Authorized
Transmission Pipe					
Vintage Pipeline Replacement	$596,507	$596,507	[2]	$-	$596,507
Shallow Pipe	$73,906	$73,906	$-	$-	$73,906
Hydrostatic Testing	$70,301	$70,301	$-	$-	$70,301
Valve Automation	$174,643	$158,633	$16,010	$-	$158,633
Earthquake Fault Crossing	$16,103	$16,103	$-	$-	$16,103
Geohazard Threat Identification	$24,642	$24,642	$-	$-	$24,642
Work Required by Others	$79,088	$-	$79,088	$-	$-
Traditional In-Line Inspections	$269,005	$269,005	$-	$-	$269,005
Non-Traditional In-Line Inspections	$29,436	$29,436	$-	$-	$29,436
Class Location	$61,453	$61,453	$-	$-	$61,453
Water and Levy Crossing	$24,202	$-	$-	$24,202	$24,202
Gas Gathering	$4,987	$-	$-	$4,987	$4,987
Storage	$32,466		$-	$32,466	$32,466
Facilities					
Burney Compressor Replacement	$54,175	$54,175	$-	$-	$54,175
Los Medanos Compressor Replacement	$28,150	$28,150	$-	$-	$28,150
Simple Station Rebuilds	$74,120	$74,120	$-	$-	$74,120
Complex Station Rebuilds	$25,192	$25,192	$-	$-	$25,192
Routing Spending C&P	$101,151	$-	$-	$101,151	
Routing Spending M&C	$63,105	$-	$-	$63,105	
Other Capital Expenditures	$118,172	$-	$-	$118,172	
Corrosion Control					
CP-Replace	$10,010	$10,010	$-	$-	$10,010
CP -New	$25,193	$25,193	$-	$-	$25,193
AC & DC Interference	$44,387	$44,387	$-	$-	$44,387
Coupon Test Stations	$18,474	$18,474	$-	$-	$18,474
Casings	$55,248	$55,248	$-	$-	$55,248
Internal Corrosion	$2,038	$2,038	$-	$-	$2,038
Gas System Operations	$420,754		$-	$420,754	
Information Technology	$69,955		$-	$69,955	
Other GT&S Support Plans	$52,193		$-	$52,193	
TOTAL	**$2,619,056**	**$1,636,973**	**$95,098**	**$886,985**	**$1,698,628**
[1] Excluded from 2015 rates.					
[2] Costs of replacing all pipeline segments hydrotested in Phase 1 at ratepayer expense should be disallowed.					

EXHIBIT JAL-4

GTS-RateCase2015_DR_IS_004-Q001

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_004-Q01		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_004-Q01		
Request Date:	June 6, 2014	Requester DR No.:	004
Date Sent:	June 20, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Various	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: WITNESS NIKOLAS STAVROPOULOS, CHAPTER 1 – INTRODUCTION AND POLICY

QUESTION 1

On Page 1-9, Lines 22 to 27, PG&E states that "[i]dentifying the right amount and pace of work requires a thorough risk assessment and risk ranking. In addition, the appropriate level of risk tolerance must be established …There will always be risk in any gas system and gas operators will always be able to do more to reduce risk. However, risk reduction has to be balanced with other considerations, including resource availability and affordability."

(a) Please elaborate on PG&E's meaning behind the term "risk tolerance."

(b) Does PG&E have any standard it aims to follow that focuses on risk tolerance? If so, please explain in detail the standard.

(c) How does PG&E consider or weigh risk tolerance when making decisions for what projects to undertake?

(d) How has the concept of risk tolerance been applied in program development?

(e) How does risk tolerance relate to budget?

(f) Please provide an example how risk tolerance aids PG&E to determine it will undertake a project within the 2015 GT&S rate period.

(g) Please provide an example how risk tolerance aids PG&E to determine it will not undertake a project within the 2015 GT&S rate period.

ANSWER 1

(a) PG&E has not formally defined the term "risk tolerance." PG&E's 2015 Gas Transmission and Storage (GT&S) Rate Case Chapter 2 testimony, Section 3 states, "The forecasted risk reductions represents an appropriate balance of providing the greatest level of risk reduction in the shortest amount of time that can be accommodated based on resource and execution constraints."

(b) PG&E does not have a standard that that specifically guides risk tolerance. PG&E has a process that evaluates current mitigations and allows PG&E to understand the overall status and strength of current controls or mitigations for an identified risk. The table below demonstrates the criteria used to identify and report the status.

Red	Current controls are not sufficient, action required
Amber	Current controls are not sufficient, new controls being implemented and in progress
Green	Controls in place are sufficient
Black	Evaluation of mitigations is in progress and status is unknown

Please see PG&E's response to GTS-RateCase2015_DR_ORA_040-Q11 for a discussion of "de minimis" current residual risk score.

(c) In preparing PG&E's 2015 GT&S forecast, PG&E -balanced risk reduction, resource availability, affordability and operational constraints by forecasting programs that, taken together at the scope and pace proposed, based on PG&E's risk and investment planning process, provide the greatest level of risk reduction and cost efficiency in the shortest amount of time that can be accommodated based on resource and execution constraints, thus achieving an appropriate balance of risk reduction and risk tolerance.

(d) PG&E developed the 2015-2017 work portfolio by:

1. Identifying and assessing risks for all gas assets (the Gas Risk Register);
2. Analyzing and proposing mitigation options based on the Risk Register output and Asset Management Plans; and
3. Scoring and then ranking the mitigation programs and projects, taking into consideration system and resource constraints.

The scope and the pace of the programs presented in the 2015 GT&S Rate Case were proposed to achieve the greatest amount of risk reduction for the investment made given the constraints to perform the work and thus achieving an appropriate balance of risk reduction and risk tolerance.as stated in testimony on page 2-4, lines 14-21.

(e) PG&E did not use a budget target to determine the forecast proposed in this application. PG&E is presenting a forecast to achieve the greatest amount of risk reduction for the investment made given the constraints to perform the work and after determining whether there is a less costly, or more affordable, way to achieve the same level of risk reduction. The development of the final portfolio of work was an iterative process and as the forecast was refined, rate impacts were calculated and assessed. For additional detail about how the forecast was refined see PG&E's response to TURN_001-Q01. If the California Public Utilities Commission (CPUC) provides fewer revenues than proposed resulting in a reduced budget, the trajectory of risk-reduction will be slower, resulting in a higher level of risk remaining over a longer period of time and thus exposing PG&E to a greater risk tolerance level.

(f) An example how risk tolerance aided PG&E to determine it will undertake a project or program within the 2015 GT&S rate period includes the In-Line Inspection program (ILI). ILI is the most reliable pipeline integrity assessment tool currently available to gas pipeline operators to assess the internal and external condition of transmission line pipe. ILI enables a pipeline operator to learn about the condition of its pipelines and to predict the integrity of those pipelines into the future to address time dependent as well as other threats to pipeline integrity. As seen in Figure 2-2 on page 2-20 of PG&E's 2015 GT&S Rate Case testimony, ILI mitigates each of the threat groupings in American Society of Mechanical Engineers (ASME) B31.8S including stable and resident threats, time independent threats, as well as time-dependent threats. PG&E's forecast for ILI in the rate case period is intended to reduce the risks posed by threats addressed by ILI for approximately 57 percent of the population living within the potential impact radius of PG&E's natural gas transmission pipelines. Given the amount of risk the In-Line Inspection program is able to mitigate PG&E placed an enhanced emphasis on this program.

(g) An example how risk tolerance aided PG&E to determine it will reduce the scope of a program within the 2015 GT&S rate period includes the Gas Gathering program. The Gas Gathering forecast was reduced as a result of PG&E's operational asset and risk management process primarily driven by the risk profile of the program. Relative to other programs proposed during the 2015 GT&S rate case period, Gas Gathering is represented by a lower program or project risk score, and thus the forecast was reduced through PG&E's risk based investment prioritization process as referenced in TURN_001-Q01Atch14. Because of the amount of risk the Gas Gathering program mitigates PG&E chose to absorb the risk tolerance of a reduced Gas Gathering program forecast.

EXHIBIT JAL-5

GTS-RateCase2015_DR_IS-007-Q002

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedShippers_007-02		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedShippers_007-Q02		
Request Date:	July 10, 2014	Requester DR No.:	No. 7
Date Sent:	July 24, 2014	Requesting Party:	Indicated Shippers
PG&E Witness:	Various	Requester:	Evelyn Kahl

QUESTION 2

On Page 1-10 Lines 21 and Lines 24 to 25, PG&E states that it "used industry benchmarking … to identify the appropriate level of residual risk and the appropriate pace to achieve the desired level of risk reduction."

(a) What is the numeric and quantified "desired level of risk reduction" that PG&E identified through industry benchmarking?

(b) What is the numeric and quantified "desired level of risk reduction" that is PG&E's goal to achieve by December 31, 2017?

(c) Did PG&E calculate an overall "desired level of risk reduction" as described on Page 1-10 Line 25?

(i) If the answer is "yes," please provide in electronic format all supporting data, analysis, models, and workpapers that PG&E relied on to calculate the desired level of risk reduction.

(d) Please provide a quantitative estimate of the residual risk balance.

(e) Has PG&E determined the total impact on risk reduction using the "Heat Map" and the risk estimation methodology as described in its Risk Management Procedure (Procedure No. RMP-01, Revision 8, provided in response to IP-2-85 (Confidential Attachment 1) and the Risk Evaluation Tool (Provided in response to IP-2-003, Attachment 1)?

(i) If the answer is "yes," please provide all supporting data, analysis, models, and workpapers PG&E relied on to make that determination.

(ii) If the answer is "no," has PG&E performed any empirical analysis of the risk reductions of its proposed mitigation programs?

(A) If the answer is "yes," please provide all supporting data and analysis, including all models, and workpapers PG&E used.

(f) If PG&E has not made any empirical determinations of the risk reduction benefits of its proposed programs, explain the analytical basis by which PG&E selected the specific programs with which it would "balance" other objectives, such as affordability and ability of ratepayers to absorb rate increases?

(g) What is PG&E's definition or understanding of "desired level of risk reduction" as used in the testimony on Page 1-10 Line 25?

(i) Does PG&E's definition or understanding of "desired level of risk reduction" differ from PG&E's explanations provided in the answers to Indicated Shippers' Questions 02-03(a) and 02-16(e)? If yes, please explain the differences in detail.

(h) What is PG&E's definition or understanding of "the appropriate level of residual risk" as used in the testimony on Page 1-10 Line 25?

(i) What is the numeric and quantified "appropriate level of residual risk" that PG&E identified through industry benchmarking?

(j) What is the numeric and quantified "appropriate level of residual risk" that is PG&E's goal to achieve by December 31, 2017?

ANSWER 2

(a) PG&E did not identify a "desired level of risk reduction" through industry benchmarking. PG&E used industry benchmarking to identify best practices. PG&E also does not numerically quantify risk reduction on a system level. PG&E forecasted risk reductions that represent an appropriate balance of providing the greatest level of risk reduction in the shortest amount of time that can be accommodated based on resource and execution constraints.

(b) PG&E also does not numerically quantify risk reduction on a system level. Chapters in testimony discuss, for specific programs, the relative amount of risk and the pace at which PG&E will address that risk. See the 2015 GT&S testimony Chapters 4A, 4B, 5, 6, and sections C-1 and C-2 in Chapter 7 for examples of the relative amount of risk and pace of risk reduction for specific programs..

(c) See response to part (b) above.

(d) PG&E does not quantify a residual risk balance at a system level. To see risks ranked and estimated risk reduction, see the Risk Register presented in GTS-RateCase2015_DR_TURN_001-Q01Atch03CONF.

(e) The heatmaps do not provide a total quantified level or risk reduction; however, it is a visual representation of our risk portfolio. Risk is reduced as they move toward the bottom left quadrant of the heatmap. Risk Management Procedure RMP-01 is not used explicitly in the development of the enterprise risk heat maps. Rather, RMP-01 is used specifically for determining transmission pipe segment risk to prioritize integrity management work. Further, RMP-01 is using a relative risk methodology and as such cannot be used to quantify risk reduction.

(f) See response to part (e) above.

(g) There is no definition to a specific "desired level of risk reduction". PG&E aims to provide the greatest level of risk reduction in the shortest amount of time while considering resource and execution constraints. See response to GTS-RateCase2015_DR_IndicatedProducers_004-Q01, part (a), where a discussion on risk tolerance is referenced.

   i. It does not differ from the explanation provided in Indicated Producers _002-Q003 part (a) and Q016 part (e).

(h) "The appropriate level of residual risk" is the level of risk that PG&E is willing to accept given a comprehensive risk assessment of its gas transmission and storage assets and inputs from stakeholders and subject matter experts while considering constraints. The determination of the appropriate level of risk tolerance has not been accomplished at this point by PG&E or other stakeholders.

(i) PG&E does not numerically quantify residual risk at a system level. Chapters in testimony discuss, for specific programs, the pace at which PG&E proposes to mitigate associated risk. See the response to GTS-RateCase2015_DR_IndicatedProducers_002-Q003, part (a)(iii), where specific examples in testimony of the relative amount of risk and pace of risk reduction are referenced.

(j) See response to part (h) and part (i) above.

EXHIBIT JAL-6

GTS-RateCase2015_DR_IP_002-Q003

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-003		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q003		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	April 10, 2014	Requesting Party:	Indicated Producers
PG&E Witness:		Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

CHAPTER 1 – INTRODUCTION AND POLICY

QUESTION 3

On Page 1-2, Lines 5 to 7, PG&E states it has forecasted the needed work "to achieve the appropriate level of risk reduction over a reasonable timeframe and at a reasonable cost."

a. What is PG&E's definition of "appropriate level of risk reduction?"

   i. What factors were weighed in the determination of the "appropriate level of risk reduction?"

   ii. What relative weight was given to each factor identified in (i)?

   iii. Did the determination of the "appropriate level of risk reduction" differ between the transmission and storage system? If so, please explain.

   iv. Did the determination of the "appropriate level of risk reduction" differ among transmission projects?

   v. How was shareholder risk factored into the determination of the appropriate level of risk reduction?

b. What is PG&E's definition of "reasonable timeframe"?

   i. What factors were weighted in determining a "reasonable timeframe?"

   ii. What relative weight was given to each factor identified in (i)?

   iii. Did the determination of the "reasonable timeframe" differ among transmission projects?

   iv. How was shareholder risk factored into the determination of a reasonable time frame?

c. What is PG&E's definition of "reasonable cost"?

   i. What factors were weighted in determining a "reasonable cost?"

   ii. What relative weight was given to each factor identified in (i)?

iii. Did the determination of the "reasonable cost" differ among transmission projects?

iv. How was shareholder risk factored into the determination of a reasonable time frame?

ANSWER 3

a. As stated throughout the 2015 Gas Transmission and Storage (GT&S) prepared testimony and more specifically on page 2-4, lines 14 – 21, PG&E provides a forecast to fund programs to lower the current risk profile of PG&E's natural gas transmission pipelines and gas storage assets over the rate case period and sets the stage for further risk reduction in the future.

i. PG&E defines "appropriate" and "reasonable" in the context of this rate case as the balance achieved through the proposed forecasted programs which, taken together at the scope and pace proposed, provide the greatest level of risk reduction in the shortest amount of time that can be accommodated based on resource and execution constraints. These constraints include, for instance, the need to maintain the ability to deliver gas to customers while work is performed and the need for a qualified and trained workforce to perform the work.

The 2015-2017 work portfolio was developed by:

1) Identifying and assessing risks for all gas assets (the Gas Risk Register);
2) Analyzing and proposing mitigation options based on the Risk Register output and Asset Management Plans; and
3) Scoring and then ranking the mitigation programs and projects, taking into consideration system and resource constraints.

ii. See PG&E's response to GTS-RateCase2015_DR_ORA_017-Q06 for an explanation of the weighting used to assess risks. Weighting risk reduction across asset types and financial consequences are all addressed in the many documents that comprise the response to GTS_RateCase2015_DR_TURN_001-Q01 and GTS_RateCase2015_DR_TURN_001-Q01Supp01. PG&E proposes to meet with Indicated Producers to review the process in greater detail similar to meetings held with TURN and ORA.

iii. Yes, the various factors that were used to determine the appropriate levels of risk reduction, reasonable timeframe and cost for programs across the transmission and storage system can be found throughout the prepared testimony. See, for example, the 2015 GT&S testimony Chapters 4A, 4B, 5, 6, and sections C-1 and C-2 in Chapter 7.

iv. See answer to (iii) above.

v. Shareholder risk was not explicitly factored into the appropriate level of risk reduction. Shareholder risk is implied in the Financial consequence category of the Risk Register, but the focus of the Asset Family Owners and the subject matter experts in preparing the Risk Register was on the potential financial cost itself. See GTS-RateCase2015_DR_ IndicatedProducers_002-Q003Atch01, page 3, for the PG&E enterprise risk management definition of Financial consequence.

   Financial consequences, aside from what the project or program costs to deliver, are not considered when deciding which projects or programs to implement. See GTS-RateCase2015_DR_TURN_001-Q01Atch13 for a document covering the risk-based prioritization methodology used by Gas Operations Investment Planning to prioritize work across Asset Families. Also see discussion in subpart c. below.

b. See PG&E's responses to parts (i) through (iv) below.

   i. PG&E generally uses the following to establish timeframes – the level of risk being mitigated, the ability of the gas operating system to continue to operate while the mitigation work is performed, the availability of qualified resources to perform the work and, in some instances, age of the assets, compliance requirements and the historical pace of work. In addition, one factor in determining the scope and pace of work included in this rate case was the location of the population living and working near the transmission and storage assets. See discussion in testimony at pages 2-22 through 2-25. The timeframe established for the work included in the 2015 GT&S testimony varies based on the risk and proposed mitigation program. Some timeframes are finite, such as the Valve Automation Program, discussed in 2015 GT&S testimony on page 4A-67 to 4A-72. Other programs, like Public Awareness (see pages 4A-72 to 4A-77) are ongoing.

   ii. PG&E did not relatively weigh factors that determine "reasonable timeframe," but as described in (b)(i) above did prioritize work using likelihood and consequence scoring and by applying constraints to work completion. These steps are described in GTS-RateCase2015_DR_TURN_001-Q01Atch13, as explained in (a)(v) above.

   iii. Determination of reasonable timeframe differed amongst transmission projects. For discussion of the various factors for establishing reasonable timeframes and costs for the 2015-2017 rate case, review the "proposed scope" and "alternatives considered" sections for each program in 2015 GT&S Chapters 4A and 4B. See, for example, pages 4A-16 to 4A-19 for alternatives considered for in-line inspection, or page 4A-36, which discusses alternative pace considerations for hydrostatic testing. In Chapter 5, review Section D, Asset Improvement Plans. In Chapter 6, see Section F, Project and Program

Descriptions. In Chapter 7, see Section D, part 4, Improved Corrosion Control Practices.

iv. Shareholder risk was not explicitly factored into establishing a reasonable timeframe for work. However, the consequence criteria applied to the risk register does include a Financial consequence category that is weighted at 30%. (See GTS-RateCase2015_DR_ TURN_001-Q01Supp01Atch04, Appendix 6, for a listing of each of the consequence categories considered.) The criteria included in the financial category attempts to estimate total cost of any specific risk event. The category itself is a range inclusive of all negative financial consequences and does not specify who ultimately would bear the cost of a risk event. See RateCase2015_DR_IndicatedProducers_002-Q003Atch01, page 3, for the PG&E enterprise risk management definition of Financial consequence.

c. A reasonable cost is the most amount of risk reduction for the investment made given the constraints to perform the work and after determining if there is a less costly or more affordable, way to achieve the same result. In preparing the whole portfolio PG&E discussed risk reduction and affordability. PG&E's final product represents a portfolio of work reduced in scope and cost from initial proposals, but that still sufficiently addresses the most important risks.

i. The factors to establish reasonable costs are described, generally, above in part (c) – amount of risk reduction, constraints on the work, and identification of less costly ways to achieve the same result. Some work is not risk-based, such as Work Required by Others, New Business, and work performed to meet compliance requirements.

ii. Relative weights were not assigned to each reasonable cost factor. For more insight into how PG&E determined that the costs proposed in the 2015 GT&S testimony were reasonable, see, for example, each of the Alternatives Considered sections for all of Chapter 4A, 4B. In Chapter 11, a general discussion of how technologies are selected and alternatives considered can be found on page 11-9, lines 5 through 24, and a discussion of alternatives considered for the Supervisory Control and Data Acquisition Replacement project can be found on pages 11-18, line 27, to 11-19, line 7. See also the Support for Request sections in 2015 GT&S testimony Chapter 6, Section A4, on page 6-7, lines 4-10; Chapter 7, Section A3, on page 7-5 to 7-6; and Chapter 8, Section A3, on page 8-3, lines 8-11.

iii. The determination of reasonable costs does differ among the programs and projects described in 2015 GT&S testimony. See, for example, the Alternatives Considered discussion in 2015 GT&S testimony on pages 4A-16 through 4A-19 for making transmission lines capable of in-line inspection or "piggable." The testimony explains cost considerations with respect to risk reduction.

iv. Shareholder risk was not explicitly factored in the development of work timeframes. However, as discussed above in the response to part (a)(v), it is implied in the Financial consequence category of the risk evaluation process.

EXHIBIT JAL-7

GTS-RateCase2015_DR_IP_002-Q012

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-012		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q012		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	April 17, 2014	Requesting Party:	Indicated Producers
PG&E Witness:		Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

CHAPTER 1 – INTRODUCTION AND POLICY

QUESTION 12

On Page 1-8, Lines 18 to 19, PG&E states that its "asset management strategy looks to optimize the balance among cost, performance and risk …."

a. What is the relative weight of each of cost, performance and risk in pursuing this strategy?

b. How does PG&E optimize a balance among cost, performance, and risk?

c. Please provide in electronic format any documents, models, methodologies, or any other related source that supports how PG&E optimizes this balance.

ANSWER 12

a. The balance being discussed between cost, performance and risk was achieved through PG&E's Gas Operation's asset and risk management processes rather than a specific weighing of each component, although the development of the risk register does assign a mathematical percentage to the consequences related to safety (40%) as well as reliability and financial consequences (30% each). See GTS-RateCase2015_DR_IndicatedProducers_002-Q03Atch01 pages 2 and 3 for an explanation of the weightings and the individual components and also Chapter 2 on pages 2-16 and 2-17, for a discussion of the process.

   Instead, PG&E sought to make the most of its limited resources in developing its forecast by focusing on reducing the most and highest risk possible during the rate case period as well as establishing an appropriate trajectory for additional risk reduction in the future while considering operational and resource constraints. See Chapter 2, pages 2-4, lines 18-21.

b. During the forecast development process, PG&E evaluated the portfolio for risk reduction, given resource and system constraints such as the need to serve customers, and the impact on resulting customer rates. In this process, the balancing of risk reduction, performance and cost were balanced in several ways. First, we worked to ensure the mitigation programs selected were the most effective at mitigating the identified risks. Second, we allocated funding to the mitigation programs designed to reduce the higher risks. Third, we analyzed the resource and system constraints in an effort to ensure we can execute the mitigating programs efficiently. Last, we took into account the impact of the proposed forecast on customer rates. This resulted in the final base revenue forecast being reduced from earlier forecasts. We believe that PG&E's final forecast provides an optimal balance between risk reduction, given system and resource constraints, and the limited ability of customers to absorb rate increases.

c. Many of the documents provided in response to TURN Data Request 001 discuss PG&E's process for optimizing cost, performance and risk. See for example the following three documents. The first two contain detailed discussions of this process; the third depicts portfolio cost reduction over time:

- "Gas Operations Investment Planning" procedure (see attachment GTS-RateCase2015_DR_TURN_001-Q01Atch13);
- Utility Procedure: TD-4011P-01, "Gas Operations Asset Management Systems Risk Management" (see attachment GTS-RateCase2015_DR_TURN_001-Q01Supp01Atch04); and
- "Overview of 2015 GT&S Forecast Revisions" (see attachment GTS-RateCase2015_DR_TURN_001-Q01Atch14).

EXHIBIT JAL-8

GTS-RateCase2015_DR_IP_002-Q113

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-113		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q113		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	April 3, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Sara Peralta	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 7 – CORROSION CONTROL

QUESTION 113

Please provide the annual costs from 1993 to 2012, broken out into expenses and capital expenditures for each year, for the total cost of all of PG&E's corrosion control programs.

ANSWER 113

Annual costs from 2009 to 2012, broken out into expense and capital expenditures for each year, are shown below. Detailed corrosion control program costs are not available prior to 2009 due to the previous decentralized nature of the program.

As noted in PG&E's testimony in Chapter 3, page 3-3, PG&E's forecast for 2015-2017 reflects a comprehensive review of threats and risks to the GT&S system portfolio, and the development of specific mitigation programs. Consequently, the format of PG&E's forecast by such mitigation programs is different from the format of forecasts and testimony in prior Gas Transmission and Storage Rate Cases. In light of PG&E's focus on asset risk management, it is difficult to directly align historical recorded costs with the planned activities of some programs. Corrosion control work has historically been combined with other work categories and, therefore, it is not always possible to specifically identify corrosion control costs for prior years as described in PG&E's testimony in Chapter 7, page 7-15 and 7-16.

Capital Expenditures ($)

Program Description	2009 Recorded	2010 Recorded	2011 Recorded	2012 Recorded
CP Systems - Replace	$ 1,032,995	$ 1,604,562	$ 3,400,067	$ 3,205,442
CP Systems - New	$ 2,297,336	$ 2,446,534	$ 576,714	$ 779,392
Coupon Test Stations	$ 80,615	$ 696,002	$ 999,572	$ 943,112
AC Interference Mitigation	$ -	$ -	$ 120,849	$ 268,088
DC Interference Mitigation	$ -	$ 66,118	$ 664,634	$ 936,396
Casings	$ 5,932	$ 44,682	$ 62,462	$ 2,029,729
Internal Corrosion	$ 76	$ 90	$ 47,661	$ 32,026
Total Corrosion Control	**$ 3,416,954**	**$ 4,857,988**	**$ 5,871,957**	**$ 8,194,186**

Expense ($)

Program Description	2009 Recorded	2010 Recorded	2011 Recorded	2012 Recorded
Cathodic Protection Rectifier	$ -	$ -	$ -	$ 11,443
Cathodic Protection Monitoring	$ 636,953	$ 714,766	$ 800,538	$ 927,973
Cathodic Protection Resurvey	$ 43,323	$ 92,510	$ 94,061	$ 48,300
Cathodic Protection Troubleshooting	$ 21,932	$ 5,436	$ 8,840	$ 3,410
CP Corrective Maintenance	$ 433,522	$ 401,941	$ 425,614	$ 640,252
CP Systems - Replace	$ -	$ 1,264	$ -	$ -
Coupon Test Stations	$ -	$ -	$ -	$ -
Corrosion Investigations	$ 756,806	$ (447)	$ 1,009,677	$ 2,287,863
Close Interval Survey	$ -	$ -	$ -	$ -
AC Interference	$ -	$ -	$ (393)	$ -
DC Interference	$ -	$ -	$ -	$ 84
Casings	$ -	$ -	$ 209,574	$ 3,415,928
Internal Corrosion	$ -	$ -	$ -	$ -
Atmospheric Corrosion Inspection and Mitigation	$ 24,976	$ 283,404	$ 296,507	$ 1,114,912
Total Corrosion Control	**$ 1,917,511**	**$ 1,498,874**	**$ 2,844,417**	**$ 8,450,164**

EXHIBIT JAL-9

GTS-RateCase2015_DR_IP_002-Q114

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-114		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q114		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	April 2, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Sara Peralta	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 7 – CORROSION CONTROL

QUESTION 114

On Page 7-5, Lines 11 to 12, PG&E admits its corrosion control program has been subject to "a number of regulatory audit findings and self-reported non-compliance issues …."

a. How many regulatory audit findings was PG&E's corrosion control program subject to from 2008 to 2014?

b. What was the reason for each instance from 2008 to 2014 PG&E's corrosion control program was subject to a regulatory audit finding?

c. What measures has PG&E implemented to lower the probability of its corrosion control program being subject to regulatory audit findings?

d. Please provide in electronic format all documents from 2008 to 2014 PG&E received from each regulatory agency that has conducted an audit of the corrosion control program. These documents should include, but should not be limited to, the reason the regulatory agency conducted the audit and the conclusion the regulatory agency reached after conducting the audit.

e. How many self-reported non-compliance issues was PG&E's corrosion control program subject to from 2008 to 2014?

f. What was the reason for each instance from 2008 to 2014 PG&E's corrosion control program was subject to a self-reported non-compliance issue?

g. What measures has PG&E implemented to lower the probability of its corrosion control program being subject to self-reported non-compliance issues?

h. Please provide in electronic format all documents from 2008 to 2014 related to PG&E's self-reported non-compliance issues. These documents should include, but should not be limited to, the reason PG&E experienced the self-reported non-compliance issues and the results or improvements PG&E made after the self-reported non-compliance issues.

ANSWER 114

Attachments 24, 25, 32 and 46 to this response have been marked CONFIDENTIAL and are submitted pursuant to Non-Disclosure Agreement because they include confidential employee information.

Attachments 56 and 57 to this response have been marked CONFIDENTIAL and are submitted pursuant to Non-Disclosure Agreement because they include confidential business sensitive information.

a. Although PG&E has not had any specific corrosion control program audits, PG&E has had division and district audits performed by the California Public Utilities Commission (CPUC) which generated corrosion related audit findings. See attachments list below for all regulatory audit findings related to PG&E's corrosion control program from 2008 to 2014.

File Description	Attachment Name
2008East Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch01
2008Central Coast Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch02
2008Fresno Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch03
2008De Anza Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch04
2008LosMedanosRioVista Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch05
2008Milipitas-HollisterAudit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch06
2008Mission Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch07
2008NorthValley Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch08
2008Sacramento Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch09
2008Stockton Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch10
2008San Jose Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch11
2008Yosemite Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch12
2009Diablo Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch13
2009East Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch14
2009Kettleman Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch15
2009Mcdonald Island & Tracy Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch16
2009North Coast South Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch17
2009North Coast North Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch18
2009San Francisco Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch19
2009Topock Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch20
2010Central Coast Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch21
2010De Anza Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch22
2010East Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch23
2010Kern Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch24CONF
2010Mission Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch25CONF
2010North Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch26
2010North Valley Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch27
2010Peninsula Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch28
2010Sacramento Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch29
2010San Jose Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch30
2010Stockton Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch31
2010Yosemite Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch32CONF
2011Hollister Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch33
2011Humboldt Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch34
2011Milpitas Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch35
2012Diablo Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch36
2012East Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch37
2012Fresno Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch38
2012Kettleman Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch39
2012San Francisco Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch40
2013Burney Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch41
2013De Anza Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch42
2013Hinkley Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch43
2013Meridian Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch44
2013Mission Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch45
2013North Bay Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch46CONF
2013Peninsula Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch47
2013San Jose Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch48
2013Tracy and McDonald Island Audit and Response	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch49

b. See response to part (a) above for the regulatory audit letters which includes the reason for each instance from 2008 to 2014 that PG&E's corrosion control program was subject to a regulatory audit finding.

c. See response to part (a) above for PG&E's responses to the regulatory audit letters which include the measures that were taken or planned to be taken to lower the probability of its corrosion control program being subject to regulatory audit findings. Additionally, PG&E addresses the measures it has taken to lower the probability of audit findings in Chapter 7 of the 2015 Gas Transmission and Storage (GT&S) testimony by outlining how it is improving its overall corrosion control program through increased and enhanced inspection and mitigation through a centralized programmatic structure.

d. See response to part (a) above for PG&E's documents pertaining to PG&E's audit findings related to the corrosion control program.

e. For all self-reported non-compliance issues related to PG&E's corrosion control program from December 2011 through 2014 see table below. PG&E has no self-reported non-compliance issues prior to December 2011 since Resolution ALJ-274, which establishes a formal process for an operator to submit a self-report non-compliance, did not exist prior to that time.

File Description	Attachment Name
Self-Report6	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch50
Self-Report11	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch51
Self-Report16	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch52
Self-Report28	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch53
Self-Report31	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch54
Self-Report34	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch55
Self-Report45	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch56CONF
Self-Report49	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch57CONF
Self-Report55	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch58
Self-Report57	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch59
Self-Report65	GTS-RateCase2015_DR_IndicatedProducers_002-Q114Atch60

f. See response to part (e) above for PG&E's self-reported non-compliance notifications which include the reason for each instance from 2011 to 2014 that PG&E made a self-reported non-compliance notification related to the corrosion control program.

g. See response to part (e) above for PG&E's self-reported non-compliance notifications which include the measures that were taken or planned to be taken to lower the probability of its corrosion control program being subject to self-reported non-compliance issues. Additionally, PG&E addresses the measures it has taken to lower the probability of audit findings in Chapter 7 of the 2015 GT&S testimony by outlining how it is improving its overall corrosion control program through increased and enhanced inspection and mitigation through a centralized programmatic structure.

h. See response to part (e) above for PG&E's for documents pertaining to PG&E's self-report non-compliance issues related to the corrosion control program.

EXHIBIT JAL-10

GTS-RateCase2015_ORA_073-13, Att.1, p.1,

and 55 "Analysis" §§1-12

Executive Summary

At the request of Pacific Gas and Electric (PG&E), Exponent Failure Analysis Associates (Exponent) has performed a technical assessment of PG&E's corrosion control program. The objectives of the assessment were: 1) to determine the extent to which PG&E's Gas Operations organization is meeting the spirit and intent of California Public Utilities Commission (CPUC), Pipeline and Hazardous Materials Safety Administration (PHMSA), PHMSA FAQs and PG&E procedures, existing corrosion control processes, and practices; and 2) to assess the overall adequacy and health of the corrosion control program, identifying and reporting on gaps in the program. These objectives are being accomplished by performing the following two phases of work:

Phase I: Corrosion Control Program Procedural Compliance Assessment
Phase II: Corrosion Control Program Comparison of Best Practice

This report discusses the results of the Phase II work.

Phase II of this assessment consisted of a review of federal code and California Public Utilities Commission General Order (GO) 112-E requirements, PHMSA Frequently Asked Questions (FAQs) and guidance documents, and best practices as defined by benchmarking and review of industry standards (NACE, ASME, etc.). Comparisons were made to current and future PG&E guidance documents available as of October 2013 for specific corrosion activities such as pipe-to-soil monitoring, rectifier monitoring and maintenance, internal corrosion, atmospheric corrosion, and others. This work was conducted during the period of October 2013 through March 2014. The scope of the assessment included distribution, local transmission, backbone transmission, storage and gas gathering. Phase II was not a field audit, and program assessments are based upon guidance document review alone.

To facilitate Phase II review and analysis, each activity was sub-divided into seven subtopics: general guidance/scope, acceptance criteria, design, monitoring scope, locations, and frequency, troubleshooting and remediation, operator qualification and training, and documentation and recordkeeping. Each subtopic has been assigned a modified RAG (*i.e.*, BRAG Black/Red/Amber/Green) status and corresponding quality metric (see Table 1) based upon guidance document compliance with federal code, CPUC, and PHMSA requirements and consistency with industry best practices. The complete topic and subtopic status findings are presented in Table 2 – 4.

Table 1 Modified RAG or "BRAG" status key showing color, associated meaning, and quality metric.

Color	Meaning	Quality Metric
n/a	Not applicable	n/a
Black	Guidance documentation is non-compliant	0
Red	Guidance documentation is minimally compliant and/or minimally aligned with best practices	1
Amber	Guidance documentation is compliant and partially aligned with best practices	2
Green	Guidance documentation is compliant and aligned with best practices	3

Note: For a topic with seven assessed subtopics, the target quality metric is 21. For topics with fewer than seven assessed subtopics (*i.e.*, certain subtopics are assigned n/a indicators), the target quality metric is scaled accordingly. Topic and subtopic quality metrics are presented in terms of a percentage.

Based upon analysis of current guidance documents, the corrosion control program status findings are as follows (Figure 1):

- 15% of the assessed subtopics (10/66) were deemed non-compliant with federal code.
- 65% of the assessed subtopics (43/66) exhibited room for improvement with respect to compliance with federal code and/or alignment with best practices.
- 20% of the assessed subtopics (13/66) were deemed compliant with federal code and aligned with best practices.

Based upon analysis of future guidance documents, the corrosion control program status findings are as follows (Figure 2):

- 8% of the assessed subtopics (5/65) were deemed non-compliant with federal code.
- 63% of the assessed subtopics (41/65) exhibited room for improvement with respect to compliance with federal code and/or alignment with best practices.
- 29% of the assessed subtopics (19/65) were deemed compliant with federal code and aligned with best practices.

Review of future versus current PG&E guidance documents revealed that the number of non-compliant subtopics dropped from 15% to 8% (*i.e.*, 10/66 to 5/65).

Status indicators were quantified via a "quality metric" in order to compare and rank PG&E's corrosion control program health by topic and subtopic. The target quality metric for a given topic and subtopic is 100%. As shown graphically in Figure 3, the following trends were observed with respect to topic (*i.e.*, programmatic) BRAG status:

- Based upon analysis of current guidance documents:
    - General Cathodic Protection (20%) and Alternating Current (AC) Interference (29%) rank lowest in terms of quality metric.

  - Rectifiers (81%), P/S Monitoring (67%), and 10%ers (67%) rank highest in terms of quality metric.
- Based upon analysis of future guidance documents:
  - Alternating Current Interference (29%) and Direct Current (DC) Interference (40%) rank lowest in terms of quality metric.
  - Internal Corrosion (90%) and 10%ers (78%) rank highest in terms of quality metric.

Similarly, the following trends were observed with respect to subtopic BRAG status (Figure 4):

- Based upon analysis of current guidance documents:
  - Overall, General Guidance/Scope (30%) and Monitoring Scope, Location, and Frequency (37%) rank lowest in terms of quality metric.
  - Overall, Operator Qualification and Training (67%) and Documentation and Recordkeeping (64%) rank highest in terms of quality metric.
- Based upon analysis of future guidance documents:
  - Overall, General Guidance/Scope (43%) and Troubleshooting and Remediation (52%) rank lowest in terms of quality metric.
  - Overall, Operator Qualification and Training (74%) and Acceptance Criteria (71%) rank highest in terms of quality metric.

Analysis

The following section provides modified RAG status findings as well as detailed comments concerning analysis findings.

1. General Cathodic Protection

Subtopic	Current[1]	Future[2]
General Guidance/Scope	n/a	n/a
Acceptance Criteria	n/a	n/a
Design	Black	Red
Monitoring Scope, Locations, and Frequency	Black	Amber
Troubleshooting and Remediation	Black	Red
Operator Qualification and Training	Red	Red
Documentation and Recordkeeping	Amber	Amber

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Summary:

N/A (Reason 1)

Subtopic: Acceptance Criteria

Summary:

N/A (Reason 3)

Subtopic: Design

Current Status	Future Status
Black	Red

Summary:

PG&E does not specifically call out the requirement for electrical isolation of buried pipelines from other underground metallic structures, as instructed in 49 CFR 192.467(a). PG&E addresses this gap in future document TD-4181S (Section 5.2), which mirrors the language of the federal code. PG&E also does not caution against the installation of insulating devices in combustible atmospheres in the current documentation, per 49 CFR 192.467(e). This gap will also be addressed by TD-4181S (Section 5.2), which mirrors the language of the federal code.

- *Each buried or submerged pipeline must be electrically isolated from other underground metallic structures, unless the pipeline and the other structures are electrically interconnected and cathodically protected as a single unit. [49 CFR 192.467(a)]*

- *An insulating device may not be installed in an area where a combustible atmosphere is anticipated unless precautions are taken to prevent arcing. [49 CFR 192.467(e)]*

In addition, PG&E does not currently provide guidance that operators must (a) compile a list of all electrical isolation locations (b) inspect and test these locations, and (c) define the circumstances under which these locations must be inspected, as indicated by PHMSA Part 192 Guidance (p. 80).

- *The operator should compile a list of all its electrical isolation locations and must inspect and test them. The operator must define the circumstances under which inspections are required. [PHMSA Part 192 Guidance, p. 80]*

PG&E in-progress documents TD-4181S (Section 5.2) and TD-4181P-002 (Section 2.3) address testing and location recording, respectively. In-progress guidance does not, however, address the need to define circumstances under which locations must be inspected. Some specific examples include: utilizing a minimum 12” separation distance between pipe and other structures and applying an acceptance criteria for insulating fittings, such as 100 kΩ with an applied voltage of 500V.

- *Where impractical, and where adequate provisions for corrosion control have been made, the minimum clearance of 12 in. (300 mm) between the outside of any pipe installed underground and the extremity of any other underground structure specified in para 434.6(c) may be reduced. [ANSI/ASME B31.4, 461.1.1(c)]*
- *If isolation joints are to be installed, the insulation resistance shall be checked. Isolation joints can be considered as satisfactory if the resistance is greater than 100 kΩ with an applied voltage of 500 volts. [BS EN 12499, 7.2]*
- *Details of neighboring buried structures should be obtained. [BS EN 13636, 6.2]*
- *Materials and construction practices that create electrical shielding should not be used on the pipeline. Pipelines should be installed at locations where proximity to other structures and subsurface formations do not cause shielding. [NACE SP0169, 4.2.3]*
- *Design may also consider temporary measures to prevent corrosion during the construction of the structure and until the commissioning of the permanent cathodic protection system. [BS EN 12954, 7.13]*
- *Steel pipelines shall be electrically isolated from cast iron, ductile iron, or nonferrous metal pipelines and components. [ASME B31.8, 862.114(a)]*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Black	Amber

Summary:

PG&E does not currently address the monitoring requirement of 49 CFR 192.465(e), which mandates the reevaluation of unprotected pipelines at three year intervals for previously identified pipe. This monitoring requirement is, however, addressed for newly discovered pipe.

In-progress standard TD-4181S cites 49 CFR 192.465(e), addressing this deficiency. This was recently identified in a PG&E self-report dated February 11, 2014.

Via content in D-S0353 and TD-4181S, PG&E is aligned with 49 CFR 192.459 and industry standards concerning the inspection of exposed buried pipe. PG&E guidance is inconsistent with PHMSA PI-74-009, which indicates that service risers should be monitored once each calendar year. This deficit is partially validated by 49 CFR 192.465(a) and PHMSA PI-73-025, which make exceptions for separately protected short sections of mains or transmission line. Lastly, PG&E does not provide guidance concerning corrosion rate quantification. For example, API 1160 suggests using buried coupons or linear polarization resistance measurements to determine corrosion conditions along a pipe segment.

- *After the initial evaluation required by §§ 192.455(b) and (c) and 192.457(b), each operator must, not less than every 3 years at intervals not exceeding 39 months, reevaluate its unprotected pipelines and cathodically protect them in accordance with this subpart in areas in which active corrosion is found. The operator must determine the areas of active corrosion by electrical survey. However, on distribution lines and where an electrical survey is impractical on transmission lines, areas of active corrosion may be determined by other means that include review and analysis of leak repair and inspection records, corrosion monitoring records, exposed pipe inspection records, and the pipeline environment. [49 CFR 192.465(e)]*
- *The frequency for monitoring the cathodic protection applied to service risers is covered by Section 192.465. [PHMSA Part 192 Guidance, p. 41]*
- *The operator must survey at least 10% of their isolated short sections of mains, transmission lines, and services on a sampling basis. (A company with 10 towns or districts which is reading one town or district each year is not surveying on a sampling basis, 10% of each town or district must be surveyed with a different 10% being surveyed each year so that the entire system is tested in each ten year period.) [PHMSA Part 192 Guidance, p. 43]*
- *Actual external corrosion rates at specific locations along a segment also may be determined by means of buried coupons or linear polarization resistance measurements. These measurements should be taken at sufficient locations to represent the corrosion conditions along the segment. [API 1160, 9.2.2]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Black	Red

Summary:

PG&E does not currently address the remediation requirement of 49 CFR 192.465(e) for previously identified unprotected pipe. 49 CFR 192.465(e) mandates the cathodic protection of unprotected pipelines inspected at three year intervals in areas in which active corrosion is found. In-progress standard TD-4181S cites 49 CFR 192.465(e), addressing this deficiency. While PG&E complies with the requirements of 49 CFR 192.483 concerning external corrosion remediation, it is not clear if the station-specific acceptability criteria in TD-4430P-02 (Attachment 7) meets the distribution pipeline requirements laid out in 49 CFR 192.487. In addition, PG&E does not indicate that the evaluation strategies for stations provided in TD-4430P-02 (specifically, RSTRENG analysis for maximum corrosion depths between 20 to 80 % of actual wall thickness and repair/replacement for corrosion depths greater than or equal to 80% of wall thickness) apply to the rest of the pipeline system. Although future guidance provides generalized versus localized corrosion and graphitization details consistent with code, it omits details found in current guidance, such as: update documentation when CP facilities are down, or take on-potential readings at leak locations. This was recently identified in a PG&E self-report dated February 11, 2014.

- *After the initial evaluation required by §§ 192.455(b) and (c) and 192.457(b), each operator must, not less than every 3 years at intervals not exceeding 39 months, reevaluate its unprotected pipelines and cathodically protect them in accordance with this subpart in areas in which active corrosion is found. [49 CFR 192.465(e)]*
- *Except for cast iron or ductile iron pipe, each segment of generally corroded distribution line pipe with a remaining wall thickness less than that required for the MAOP of the pipeline, or a remaining wall thickness less than 30 percent of the nominal wall thickness, must be replaced. However, corroded pipe may be repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe. Corrosion pitting so closely grouped as to affect the overall strength of the pipe is considered general corrosion for the purpose of this paragraph. [49 CFR 192.487(a)]*
- *Except for cast iron or ductile iron pipe, each segment of distribution line pipe with localized corrosion pitting to a degree where leakage might result must be replaced or repaired. [49 CFR 192.487(b)]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Red	Red

Summary:

PG&E's OQ documentation and records retention appears to be consistent with federal code and ASME B31Q. However, PG&E does not appear to have written definitions of qualified corrosion persons, which should include a list of criteria defining what qualifications are required (see PHMSA Part 192 Guidance, p. 11). This requirement is partially satisfied via topic-specific qualification guidance, but basic corrosion personnel competency requirements are not spelled out. In reviewing industry best practices, other operators encourage and/or require corrosion personnel to obtain NACE certification. PG&E does not currently implement this requirement.

- *The operator must have a written definition of a qualified person, which should include a list of criteria defining what qualifications are required. The description should identify the positions or individuals carrying out or directing the various aspects of the corrosion control program. The qualified person(s) may include contractor personnel. These* *persons should have knowledge of the physical sciences, principles of engineering and mathematics acquired by education and/or practical experience and shall be qualified to engage in the practice of corrosion control, as applicable, for external, internal and atmospheric corrosion. The operator must also specify what documentation is needed to substantiate this qualification. Each operator shall maintain current qualification records for these individuals. [PHMSA Part 192 Guidance, p. 11]*

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Amber	Amber

Summary:

Current and proposed PG&E guidance is aligned with 49 CFR 192.491. Best practices provide detailed specifics concerning cathodic protection recordkeeping. PG&E should consider incorporating these documentation recommendations into proposed guidance. These include:

- *Relative to the determination of the need for external corrosion control, the following should be recorded: corrosion leaks, breaks, and pipe replacements; and pipe and external coating condition observed when a buried structure is exposed. [NACE SP0169, 11.2]*
- *Relative to structure design, the following should be recorded: external coating material and application specifications; and design and location of isolating devices, test leads and other test facilities, and details of other special external corrosion control measures taken. [NACE SP0169, 11.3]*
- *Relative to the design of external corrosion control facilities, the following should be recorded: results of current requirement tests; results of soil resistivity surveys; location of foreign structures; and interference tests and design of interference bonds and reverse current switch installations. Scheduling of interference tests, correspondence with corrosion control coordinating committees, and direct communication with the concerned companies. Record of interference tests conducted, including location of tests, name of company involved, and results. [NACE SP0169, 11.4]*
- *Full construction details and installation procedures of the CP system should be documented to ensure that the system will be installed in accordance with this part of ISO 15589. These should include: procedures for the installation of d.c. voltage sources, groundbeds, cables, test facilities, cable connections to the pipeline, procedures for all tests required to demonstrate that the quality of the installation meets the requirements, construction drawings including but not limited to plot plans, location of CP systems and test facilities, cable routing, single-line schematics, wiring diagrams and groundbed construction and civil works, and procedures to ensure safe systems of work during the installation and operation of the CP system. [ISO 15589-1, 13.1.2]*
- *After the successful commissioning of the CP system, the following shall be compiled in a commissioning report: as-built layout drawings of the pipeline including neighboring structures or systems that are relevant to the effective CP of the pipeline; as-built drawings, reports and other details pertaining to the CP of the pipeline; records of the*

interference tests (if any) carried out on neighboring structures; the voltage and current at which each CP system was initially set and the voltage and current levels to be used during future interference tests. The location and type of interference-current sources (if any); records of the pipe-to-soil potentials at all monitoring stations before and after the application of CP. [ISO 15589-1, 13.2]

- *Relative to the installation of external corrosion control facilities, the following should be recorded: For installation of CP facilities - Impressed current systems: location and date placed in service; number, type, size, depth, backfill, and spacing of anodes; specifications of rectifier or other energy source; and cable size and type of insulation. Galvanic anode systems: location and date placed in service; number, type, size, backfill, and spacing of anodes; and wire size and type of insulation. For installation of interference mitigation facilities - Details of interference bond installation: location and name of company involved; resistance value or other pertinent information; and magnitude and polarity of drainage current. Details of reverse current switch: location and name of companies; type of switch or equivalent device; and data showing effective operating adjustment. Details of other remedial measures. [NACE SP0169, 11.5]*
- *An operating and maintenance manual shall be prepared to ensure that the CP system is well documented and that operating and maintenance procedures are available for operators. This document shall consist of a description of the system and system components, the commissioning report, as-built drawings, manufacturer's documentation, a schedule of all monitoring facilities, potential criteria for the system, monitoring plan, monitoring schedules and requirements for monitoring equipment, monitoring procedures for each of the types of monitoring facilities installed on the pipeline, and guidelines for the safe operation of the CP system. [ISO 15589-1, 13.4]*
- *Relative to the maintenance of external corrosion control facilities, the following information should be recorded: Maintenance of CP facilities: repair of rectifiers and other DC power sources; and repair or replacement of anodes, connections, wires, and cables. Maintenance of interference bonds and reverse current switches: repair of interference bonds; and repair of reverse current switches or equivalent devices. Maintenance, repair, and replacement of external coating, isolating devices, test leads, and other test facilities. [NACE SP0169, 11.7]*
- *Records sufficient to demonstrate the evaluation of the need for and the effectiveness of external corrosion control measures should be maintained as long as the facility involved remains in service. Other related external corrosion control records should be retained for such a period that satisfies individual company needs. [NACE SP0169, 11.8]*
- *As-built drawings shall be retained for each impressed current cathodic protection installation. These drawings shall show details and location of components of the cathodic protection system with respect to the protected structure(s) and to major physical landmarks. As-built drawings and records of impressed current systems should include but not be limited to the following information: location and date placed in service, specifications of rectifier or other energy sources, quality, type, location and spacing of anodes, type of anode backfill material, point of attachment of negative lead(s), cable size and type of insulation, right-of-way information, direct current interference facilities. [OCC 1, 6.2.2.1]*
- *Similar requirements can be found in reference AS 2832.1*

2. Pipe-to-Soil Monitoring

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Red
Acceptance Criteria	Red	Red
Design	Red	Red
Monitoring Scope, Locations, and Frequency	Green	Green
Troubleshooting and Remediation	Amber	Amber
Operator Qualification and Training	Green	Green
Documentation and Recordkeeping	Green	Green

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Red

Summary:

PG&E uses multiple electrical survey methodologies to ensure adequate cathodic protection. These include, but are not limited to, P/S potential monitoring, close interval survey, coupon test station monitoring, and soil resistivity measurements. While PG&E *installs* test leads on either side of insulated fittings (O-16, p. 3), PHMSA Guidance (p. 74) instructs that pipe-to-soil readings shall be *taken* on both sides of an insulator.

- *The pipe-to-soil readings should be taken on both sides of an insulator during annual cathodic protection monitoring or when it is deemed necessary. [PHMSA Part 192 Guidance, p. 74]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Red	Red

Summary:

PG&E meets the requirements in 49 CFR 192.463(a) (which references Appendix D) concerning P/S monitoring acceptance criteria. However, selected other operators were found to use a −850 mV off criterion, which provides a direct measurement of the amount of protection on the pipe.

PG&E provides guidance on possible IR drop contributions and how to minimize them in order to adhere to 49 CFR 192 Appendix D. These include: using high impedance voltmeters, placing the reference electrode close to the pipe, and moistening the ground where the P/S measurement is being taken (O-16, p. 12). However, PG&E does not calculate an IR drop but, rather, relies on the fact that the 850 mV criterion was developed with an IR drop allowance of 50 mV. PHMSA has previously cited operators (PHMSA Docket No. CPF 4-2013-1010) for utilizing this approach. PG&E's future standard TD-4181S instead advises that corrosion engineering must be consulted to determine if and how to consider IR drops in measurement circuits. Consequently, future PG&E guidance does not provide a methodology by which IR drop will be considered. In addition, PG&E does not recommend applying temperature corrections to potentials, as needed, or performing measurements to confirm the validity of IR drop corrections.

- *Centerpoint Energy Gas Transmission Company (CEGT) is utilizing the Appendix D(I)(A)(1) criteria of a negative (cathodic) voltage of at least 0.85 volts (-850 mV) but fails to fully consider IR drop as required under section II of the Appendix for a valid interpretation of the voltage measurement. Where CEGT utilizes the Appendix D section (I)(A)(1) criteria of -850 mV, CEGT personnel acknowledged that IR drop was not considered if the read is more negative than -900 mV. CEGT's practice is to add an additional -50 mV to the -850 mV criteria and look for a minimum of -900 mV criteria. However, this approach of assuming an IR drop of 0.50 V everywhere along the system fails to account for areas where IR drop exceeds 50 mV. CEGT could not demonstrate that the IR drop was limited to .50 V along their pipeline system. In fact records show that is some areas the IR drop exceeded 50mV. Therefore, CEGT's use of a 50 mV buffer and only taking action when 'On' potentials are more positive than -900 mV does not give a valid interpretation of the voltage measurement that would meet the applicable requirement. [PHMSA Docket No. CPF 4-2013-1010]*
- *Temperature correction must be applied to reference electrode potentials when variations in ambient temperatures during the survey significantly affect potentials. [NACE SP0207, 4.4.6]*
- *Measurements shall be made and recorded to confirm that IR drop correction is valid. [NACE SP0207, 5.3.1]*

Additionally, PG&E provides an overprotection criterion of −1600 mV while ISO 15589-1 suggests a limiting critical potential of −1200 mV to avoid the detrimental effects of hydrogen production and/or a high pH at the metal surface. Lastly, ISO 15589-1 suggests using a potential more negative than −950 mV when there are known or suspected quantities of sulfate-reducing bacteria (SRB).

- *To prevent damage to the coating, the limiting critical potential should not be more negative than -1,200 mV referred to CSE, to avoid the detrimental effects of hydrogen production and/or a high pH at the metal surface. [ISO 15589-1, 5.3.2.1]*
- *For pipelines operating in anaerobic soils and where there are known, or suspected, significant quantities of sulfate-reducing bacteria (SRB) and/or other bacteria having detrimental effects on pipeline steels, potentials more negative than -950 mV referred to CSE should be used to control external corrosion. [ISO 15589-1, 5.3.2.1]*

Subtopic: Design

Current Status	Future Status
Red	Red

Summary:

PG&E's P/S monitoring design practices are consistent with federal code and PHMSA guidelines. However, selected gaps were observed between PG&E and industry best practices. PG&E's current practice is to have approximately one monitoring location per mile on existing pipeline. In addition, current PG&E guidance specifies that evaluations are required when reducing the P/S monitoring location frequency; future guidance requires only approval (that is, does not specifically require evaluation). Other operators utilize P/S monitoring intervals as conservative as 1/4 mile.

Industry standards also outline specific areas in which P/S measurements should be considered. PG&E calls out many of these, but does not address monitoring at stray current areas, waterway crossings, valve stations, etc. per NACE SP0169 (Section 4.5.1). BS EN 12954 (Section 8.5) also states that test stations should be located in easily accessible places, protected against risk of damage (falling rocks, shocks) and set up in such a way as to make them easy to find, none of which are currently addressed in PG&E guidance.

- *The number of monitoring points may be reduced with written approval from corrosion engineering. [TD-4181S, 6.3.1.a]*
- *Test stations for potential, current, or resistance measurements should be provided at sufficient locations to facilitate CP testing. Such locations may include, but are not limited to, the following: pipe casing installations, metallic structure crossings, isolating joints, waterway crossings, bridge crossings, valve stations, galvanic anode installations, road crossings, stray-current areas, and rectifier installations. [NACE SP0169, 4.5.1]*
- *Locations at which test points should be considered include the following: (a) at rail crossings, road crossings and at waterways (b) at steel casings, on the casing and on the structure (c) adjacent to insulating joints and at structure terminations (d) at highly corrosive soil locations (e) at likely sources and discharge points of stray currents (f) adjacent to air/electrolyte interfaces (g) at close proximity to foreign structures and at crossings with foreign structures. [AS 2832.1, 4.5.3]*
- *Test stations should be located in easily accessible places, protected against risk of damage (falling rocks, shocks) and set up in such a way as to make them easy to find. They should be outside hazardous areas in order to avoid any risk due to sparking. If a test station is to be installed in areas classified as hazardous in accordance with EN 60079-10, it shall conform to the certification and operational requirements of the zone. [BS EN 12954, 8.5]*

Note: O-16 is inconsistent with O-10 concerning transmission P/S monitoring spacing for new construction (2500 ft. versus 1 mile); this issue appears to be resolved in future guidance documents.

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Green	Green

Summary:

PG&E is consistent with 49 CFR 192.465(a) and PHMSA Guidance with respect to P/S monitoring frequency. Specifically, they monitor P/S potentials at least once a year (and often more frequently). Industry standards such as BS EN 12954, ISO 15589-1, and AS 2832.1 require different P/S monitoring frequencies in areas of low and high population density. Although PG&E does not implement monitoring in this fashion, current and future PG&E practices are generally more conservative than industry standards. One exception is monitoring of structures subject to stray current in rural areas, which require two reads per year according to AS 2832.1.

- *Maximum time intervals between cathodic protection surveys, hydrocarbon pipelines and hazardous fluids:*
  - *Suburban: 0.5 years*
  - *Rural: 1 years*
  - *Offshore: 5 [AS 2832.1, Table 10.1]*
- *Maximum time intervals between cathodic protection surveys, structures subject to stray direct traction current:*
  - *Suburban: 0.5 years*
  - *Rural: 0.5 years [AS 2832.1, Table 10.1]*

As suggested by AS 2832.1, PG&E carries out short and long resurveys to ensure that the gas distribution test locations selected for monitoring cathodic protection effectiveness are at locations where the level of protection is the lowest for the CPA.

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Amber	Amber

Summary:

PG&E's current 30 day target remediation time frame for down CPAs is consistent with 49 CFR 192.465(d) and ISO 15589-1. Proposed document TD-4181P-001 introduces a longer 60 day remediation time frame for distribution and transmission lines compared to the previous 30 day limit. ISO 15589-1 states that significant positive shifts in pipeline potential shall be corrected within 30 days.

- *Inoperative rectifiers shall be repaired and returned to service as soon as possible, typically within 30 days. [ISO 15589-1, 12]*

TD-4181S introduces a maximum allowable time limit of 12 months not to exceed 15 months for resolution of follow-up action plans. This is an improvement over current guidance, which does not provide a maximum allowable time limit for follow-up action plan resolution.

Subtopic: Operator Qualification and Training

Current Status	Future Status
Green	Green

Summary:

PG&E provides OQ 03-03 *Rectifier Reads*, 03-06 *Pipe-to-Soil Reads*, 03-07 *Cathodic Protection Maintenance*, 03-08 *Galvanic Anode Maintenance*, and 03-10 *Rectifier Maintenance*. This is consistent with PHMSA Part 192 Guidance, which states that a pipe-to-soil survey meets the requirements of 49 CFR 192.457(b) and 192.465(e) provided that it is carried out by or under the direction of a person qualified by experience and training in pipeline corrosion control methods.

As the content of the PG&E OQ documents was not reviewed, PG&E should consider ensuring that their OQ procedures are consistent with applicable ASME B31Q tasks, which includes specific line items such as: Measure Structure-to-Electrolyte Potential, Measure Soil Resistivity, Inspect and Monitor Galvanic Ground Beds/Anodes, Installations and Maintenance of Mechanical Electrical Connections, Conduct Close Interval Survey, Installation of Exothermic Electrical Connections, Inspect or Test Cathodic Protection Bonds, etc.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Green	Green

Summary:

49 CFR 192.491(c) dictates that cathodic protection monitoring data (*i.e.*, records related to 49 CFR 192.465(a)) must be retained for the life of the pipeline. O-16 (p. 14) meets this requirement by stating that P/S potential measurements must be retained for the life of the facility. PG&E's in-progress standard TD-4180 states that corrosion control records must be maintained as described by 49 CFR 192.491. Additionally, PG&E is *electronically* storing P/S measurement data in approved database management systems (O-16, p. 15). Best practices dictate that the name of the person making the measurements and the measurement date should be noted in the P/S records (API 1632, 4.4.5), which is consistent with current and future PG&E practices. However, PG&E does not explicitly record which instruments are used for P/S monitoring (and any subsequent calibration adjustments), as specified by AS 2832.1.

- *Records shall be maintained to keep information on instruments used to conduct specific tests and any subsequent calibration adjustments. [AS 2832.1, 3.1]*

3. Bonds

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Red
Acceptance Criteria	n/a	n/a
Design	Red	Red
Monitoring Scope, Locations, and Frequency	Black	Green
Troubleshooting and Remediation	n/a	n/a
Operator Qualification and Training	Red	Green
Documentation and Recordkeeping	Amber	Amber

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Red

Summary:

PHMSA Part 192 Guidance suggests having developed procedures for identifying critical and non-critical bonds (as defined in the same document). PG&E's current standards and work procedures do not address critical and non-critical bonds. Proposed PG&E protocols provide these definitions for backbone transmission, but not gas distribution or local transmission.

- *The operator should have developed procedures for determining whether or not structure protection would be jeopardized if any of its reverse current switches, diodes, or interference bonds devices failed and should be able to identify which of these devices present on its system are considered critical and which are not. [PHMSA Part 192 Guidance, p. 56]*

Subtopic: Acceptance Criteria

Summary:

N/A (Reason 2). See *P/S Monitoring, Acceptance Criteria.*

Subtopic: Design

Current Status	Future Status
Red	Red

Summary:

Current and proposed PG&E protocols do not contain thorough guidance pertaining to bond design. For example, industry standards address best practices such as: the ability to temporarily disconnect bonds for measurement purposes, the consideration of bonds in areas of high resistance (such as mechanical connections), etc.

- *Bonds should be capable of being temporarily disconnected for measuring purposes. [BS EN 13636, 5.2]*
- *Bonds, which are to be temporarily opened for measurement reason shall be placed above ground. [BS EN 13636, 7.4.1]*
- *Mechanical connections, other than isolating joints, which can cause an unacceptable increase in the longitudinal resistance of the structure shall be electrically bonded. [BS EN 13636, 7.4.3]*
- *If CP is to be applied on non-welded pipelines, the continuity of the pipeline shall be ensured. This shall be done by installing permanent bonds across the high-resistance mechanical connectors, using suitable attachment methods. [ISO 15589-1, 5.7]*
- *Direct bonds with earthing systems should be avoided (see clause 7). [BS EN 12954, 5.3]*
- *Bond connections to other structures or across insulating devices shall be mechanically secure, electrically conductive and suitably coated. Interference bonds shall be accessible for testing and monitoring. [OCC 1, 3.3.4.5]*
- *Unidirectional current control devices, such as diodes, may be required in conjunction with electrical bonds when dynamic currents are present. [OCC 1, C.4.1.2(a)]*
- *A resistor may be necessary in the bond circuit to control the flow of electrical current. [OCC 1, C.4.1.2(b)]*
- *The attachment of electrical bonds can reduce the level of cathodic protection on the interfering structure. Supplementary cathodic protection may therefore be required on the interfering structure to compensate for this effect. [OCC 1, C.4.1.2(c)]*
- *If electrical continuity is to be established permanently, the bonding should be done in a monitoring station. [ISO 15589-1, 5.7]*
- *A cable connection (consisting of two cables) shall be installed on each side of all isolating joints. All cables shall be separately terminated in a single monitoring station with facilities to install direct or resistive bonds and surge arrestors. [ISO 15589-1, 8.5]*
- *Bond connections should be accessible for testing. [NACE SP0169, 8.6.4]*
- *A resistor may be necessary in the bond circuit to control the flow of electrical current from the affected structure to the interfering structure. [NACE SP0169, 9.4.2.2]*
- *Close coordination should be maintained with all other utilities in the area, especially with those utilities to which bond connections are proposed. [NACE RP0177, 4.5.1]*
- *Resistance bonds for the purpose of DC interference mitigation should be designed for the maximum normal AC and DC current flow in order to prevent damage to the bond. Installation of solid state DC decouplers, polarization cells, or other devices in parallel with DC resistance bonds may prevent damage to bonds. Installation of semiconductors in DC interference bonds between cathodically protected structures may result in undesirable rectification. [NACE RP0177, 6.3.3.2]*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Black	Green

Summary:

Contrary to 49 CFR 192.465(c), which applies to all pipeline systems, current PG&E protocols only address monitoring frequency for backbone transmission bonds, not gas distribution and local transmission bonds. This non-compliance is remedied in PG&E's proposed standard 4181S, which lists specific guidance for monitoring frequency of critical and non-critical bonds in GD, LT, and BB systems.

- *Each reverse current switch, each diode, and each interference bond whose failure would jeopardize structure protection must be electrically checked for proper performance six times each calendar year, but with intervals not exceeding 2 1/2 months. Each other interference bond must be checked at least once each calendar year, but with intervals not exceeding 15 months. [49 CFR 192.465(c)]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
n/a	n/a

Summary:

N/A (Reason 2). In the context of interference bonds, 49 CFR 192.465(d) states that each operator shall take prompt remedial action to correct any deficiencies indicated by the monitoring. For analysis related to bond troubleshooting and remediation, see *P/S Monitoring, Troubleshooting and Remediation*.

Subtopic: Operator Qualification and Training

Current Status	Future Status
Red	Green

Summary:

Whereas ASME B31Q contains three tasks specific to bonds, PG&E's *PGEvASME OQ corrosion.xls* spreadsheet indicates that existing OQ 03-03.00 *Rectifier Reads* only incorporates ASME B31Q Task 0061 *Inspect or Test Cathodic Protection Bonds*). PG&E is developing two additional OQ documents that relate to ASME B31Q Tasks 0041 and 0051.

- *ASME B31Q Task 0041: Installation and Maintenance of Mechanical Electrical Connections*
- *ASME B31Q Task 0051: Installation of Exothermic Electrical Connections*

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Amber	Amber

Summary:

PG&E's current O-16 standard requires the retention of records and data related to bonds for the life of the asset. This is consistent with code requirements concerning maintenance of bond location and monitoring records. PG&E guidance does not indicate that all of the following recommended details are being retained: resistance, current magnitude and direction or other pertinent information, and location of any bonding to other structures, including any insulation of structure sections. Similarly, details to this effect are also absent from future standard 4181S.

- *Relative to the installation of external corrosion control facilities, the following should be recorded: details of interference bond installation, location and name of company involved, resistance value or other pertinent information, and magnitude and polarity of drainage current. [NACE SP0169, 11.5]*
- *Interference mitigation facility records shall include: location and date placed in service, identification of bonded structures, bond parameters, such as resistance, current magnitude and direction or other pertinent information. [OCC 1, 6.2.2.3]*
- *Appropriate documentation shall include the following...location of any bonding to other structures, including any insulation of structure sections. [AS 2832.1, 11.1]*

4. 10%ers

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Red
Acceptance Criteria	Amber	Green
Design	n/a	n/a
Monitoring Scope, Locations, and Frequency	Green	Green
Troubleshooting and Remediation	n/a	n/a
Operator Qualification and Training	n/a	n/a
Documentation and Recordkeeping	n/a	n/a

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

"10%ers" are defined as isolated services that must be monitored at least once every 10 years.

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Red

Summary:

There is no indication in current or proposed PG&E protocols that design calculations are being performed to verify that cathodic protection systems monitored on a 10-year basis will remain effective until the next required monitoring (see PHMSA Part 192 Guidance, p. 43).

- *Distribution and transmission operators monitoring isolated short sections of galvanic anode protected pipeline on a 10-year basis, should perform design calculations to verify that the cathodic protection system will remain effective until the next required monitoring. [PHMSA Part 192 Guidance, p. 43]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Amber	Green

Summary:

PG&E's current O-16 acceptance criteria is consistent with code; PG&E's proposed TD-4181S acceptance criteria is even more conservative (-950 mV), and aligned with other operators.

Subtopic: Design

Summary:

N/A (Reason 2). See *P/S Monitoring, Design.*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Green	Green

Summary:

PG&E's current and proposed practices are aligned with 49 CFR 192.465(a) in that lines not in excess of 100' or separately protected services are monitored on a sampling basis with 10% checked each subsequent year. It is worth noting that approximately half of all interviewed operators monitor 10%ers more frequently than on a 10-year cycle; in fact, many monitor them on an annual basis.

Subtopic: Troubleshooting and Remediation

Summary:

N/A (Reason 2). See *P/S Monitoring, Troubleshooting and Remediation.*

Subtopic: Operator Qualification and Training

Summary:

N/A (Reason 2). See *P/S Monitoring, Operator Qualification and Training.*

Subtopic: Documentation and Recordkeeping

Summary:

N/A (Reason 2). See *P/S Monitoring, Documentation and Recordkeeping*.

5. Rectifiers

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Green	Green
Acceptance Criteria	Green	Green
Design	Red	Red
Monitoring Scope, Locations, and Frequency	Amber	Amber
Troubleshooting and Remediation	Green	Amber
Operator Qualification and Training	Green	Green
Documentation and Recordkeeping	Amber	Amber

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Green	Green

Summary:

PG&E's current and proposed rectifier practice is aligned with PHMSA guidance and industry standards. Specific examples include: monitoring functionality by measuring volts and amps, clearing all contacts before raising current, and having numbered documents and job aids specific to rectifier installation, monitoring, etc. Minor gaps with respect to industry standards include: no guidance is provided on how rectifiers can be interrupted and no guidance is provided concerning following manufacturer's rectifier maintenance instructions.

- *Rectifiers can be interrupted at the primary AC, secondary AC, or DC side. [NACE SP0207, 5.6.1.2]*
- *Constant-potential or constant- current controlled rectifiers should be interrupted at the primary AC to prevent spiking. If there is an adjustable maximum voltage limit, the limit may be set to the rectifier output voltage, and the DC output may be interrupted without spiking. [NACE SP0207, 5.6.1.2.1]*
- *Transformer rectifiers shall be maintained in accordance with the manufacturer's recommendations. [BS EN 13636, 10.3.1]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Green	Green

Summary:

There are no acceptance criteria specific to rectifiers in federal code or best practices. Despite this fact, PG&E currently uses auto-generated work requests for abnormal rectifier readings (*i.e.*, any change in rectifier output greater than 50% between monitoring cycles).

Subtopic: Design

Current Status	Future Status
Red	Red

Summary:

There are no details pertaining to rectifier design in federal code or PHMSA guidance documents. Industry standards contain significant information about rectifier selection and inspection, placement, and testing upon installation not found in current or proposed PG&E standards or work procedures. While PG&E addresses selected best practice topics such as the recommended distance between anode beds and other facilities, as well as remote monitoring, they do not address others including: mechanical inspection and functionality assessment upon installation, polarity checking before energizing, avoiding greater than 50 V DC output, or lightning and surge protection.

- *Prior to energizing the CP system, the following equipment should be tested: transformer-rectifiers and drainage stations: measure the insulation resistance to ground (minimum shall be 10 MW at 30 °C); measure the electrical resistance of earth connections; check the tightness of screws and nuts; check that accessories are securely mounted; check the correct functioning of the unidirectional device (diode); check the full-range current output that can be obtained; check the correct polarity of pipeline and groundbed cables. [ISO 15589-1, 10.2(a)]*
- *After energizing the system, the polarity of the connection shall be verified by measuring the pipe-to-soil potential, paying particular attention to the polarity of the reading. [OCC 1, 3.3.2.1]*
- *Generally, voltages higher than 50 V (rectifier output) should be avoided. If this is impossible, then the likely consequences with regard to safety shall be assessed. [ISO 15589-1, 6.1]*
- *Rectifiers should be equipped with lightning and surge protection at the AC input and DC output connections. [NACE SP0177, 6.3.3.1]*
- *Silicon units are particularly susceptible to damage from power surges; therefore, protective devices should be included in these units to prevent lightning damage. Selenium rectifiers are not recommended if ambient temperatures are to exceed 130F. [API 1632, 4.2.1]*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Amber	Amber

Summary:

While current and proposed PG&E guidance is consistent with the rectifier monitoring frequency provided in 49 CFR 192.465(b) and CPUC Resolution SU-39, it does not appear as if PG&E recommends more frequent rectifier monitoring in instances of suspected interference (as recommended by NACE SP0177, 7.2.1 and ISO 15589-1, 11.2).

- *CP rectifiers that are subject to damage by adjacent electric utility systems should be checked for proper operation at more frequent intervals than rectifiers not subject to electric system influence. [NACE SP0177, 7.2.1]*
- *Routine functional checks, e.g. pipeline-to-soil potentials, transformer-rectifier voltage and current outputs etc., shall be carried out in accordance with Table 4. - every one to three months depending on operational conditions such as lightning, stray currents, construction activities [ISO 15589-1, 11.2]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Green	Amber

Summary:

PG&E's current 30 day target remediation time frame for rectifiers is consistent with 49 CFR 192.465(d) (*i.e.*, "remediate promptly") and ISO 15589-1 (*i.e.*, "typically remediate within 30 days"). Proposed document TD-4181P-004 indicates that a 60 day remediation time frame is being adopted across distribution and transmission lines. This lengthier remediation time frame should be re-evaluated in light of ISO 15589-1's recommended 30 days.

- *Inoperative rectifiers shall be repaired and returned to service as soon as possible, typically within 30 days. [ISO 15589-1, 12]*
- *IF corrective work is expected to take more than 60 calendar days to complete, THEN corrosion field personnel perform the following steps:*
    - *a. Create a written action plan in SAP (using the "notification long text comments"), or equivalent. If it is not practical to document the action plan in SAP or equivalent, complete TD-4181S, Attachment 1, Form TD-4181S-F01, "CPA Follow-Up Action Plan."*
    - *b. Update the action plan whenever there is a milestone, but in intervals not exceeding 60 calendar days until the corrective work is completed and the CPA shows adequate levels of protection. (See TD-4181S, "External Corrosion Control of Gas Facilities Standard, Subsection 7, "Cathodic Protection Restoration," for more information on updating action plans.)*
    - *c. File active paper action plans with the "Rectifier Test and Site Evaluation" form in the CPA file or equivalent. [TD-4181P-004, 1.2.4]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Green	Green

Summary:

PG&E has two operator qualifications specific to rectifiers (OQ 03-03 *Rectifier Reads* and 03-10 *Rectifier Maintenance*). As the content of these PG&E documents were not reviewed, PG&E should verify that their OQ procedures are consistent with ASME B31Q. Future guidance document TD-4181P-004 calls out those PG&E operator qualifications, as well as several others (*e.g.*, pipe-to-soil reads, galvanic anode maintenance), as being necessary for field personnel conducting rectifier maintenance and adjustment work.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Amber	Amber

Summary:

PG&E's current and proposed rectifier documentation practices for monitoring and maintenance are generally aligned with industry standards, which describe the retention of location and date placed in service, type, etc. • Consistent with industry standards, PG&E should consider retaining the following additional details: a drawing showing the location of underground wiring, polarity and anodes inside or nearby the rectifier cabinet, right-of-way information, direct current interference facilities, alarm conditions and fault finding, etc.

- *As-built drawings of impressed current systems shall be kept in accordance with Sub-section 6.2.2 of this Recommended Practice. A drawing showing the location of underground wiring, polarity and anodes shall be kept inside the rectifier cabinet or in a location near the cabinet. [OCC 1, 2.3.3.2.1]*
- *As-built drawings shall be retained for each impressed current cathodic protection installation. These drawings shall show details and location of components of the cathodic protection system with respect to the protected structure(s) and to major physical landmarks. As-built drawings and records of impressed current systems should include but not be limited to the following information: location and date placed in service, specifications of rectifier or other energy sources, quality, type, location and spacing of anodes, type of anode backfill material, point of attachment of negative lead(s), cable size and type of insulation, right-of-way information, direct current interference facilities. [OCC 1, 6.2.2.1]*
- *For maintenance of the CP facilities, the following information shall be recorded: repair of rectifiers and other d.c. power sources; repair or replacement of anodes, connections and cables; maintenance, repair and replacement of coating, isolating devices, test leads and other test facilities; drainage stations, casing and remote monitoring equipment. [ISO 15589-1, 13.5]*

- *Detailed system manuals shall be provided following commissioning and shall be updated after any modifications. These manuals shall include: (a) Detailed description of the system and its components (b) Detailed as-built drawings to show - (i) transformer/rectifier anode ground bed/support details; (ii) test point arrangement and locations; and (iii) locations and details of insulating joints, casings, earthing and electrolysis/stray current devices (c) Transformer rectifier operation instructions (d) System adjustment and control procedures (e) Alarm conditions and fault finding (f) Recommended routine inspection schedule and tests required. [AS 2832.1, 9.6]*

6. Alternating Current Interference

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Black	Black
Acceptance Criteria	Red	Red
Design	Red	Red
Monitoring Scope, Locations, and Frequency	Red	Red
Troubleshooting and Remediation	Red	Red
Operator Qualification and Training	Red	Red
Documentation and Recordkeeping	Red	Red

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

PG&E's "AC Interference" document was under preparation as of October 2013 and not available for review. Consequently, the RAG status indicator for all future AC interference subtopics is the same as that for current subtopics.

Subtopic: General Guidance/Scope

Current Status	Future Status
Black	Black

Summary:

At present, PG&E does not have a written plan to identify, test for, and minimize the detrimental effects of stray currents per 49 CFR 192.473(a) and PHMSA Part 192 Guidance (p. 92).

- *Each operator whose pipeline system is subjected to stray currents shall have in effect a continuing program to minimize the detrimental effects of such currents. [49 CFR 192.473(a)]*
- *The operator must have a written plan to identify, test for, and minimize the detrimental effects of such currents. [PHMSA Part 192 Guidance, p. 92]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Red	Red

Summary:

While there are no acceptance criteria specific to AC interference in federal code or PHMSA guidance documents, best practices stipulate that voltage should be less than 8 - 15 V AC and current density should be less than 20 - 30 A/m^2 in order to not present a safety hazard or result in accelerated corrosion. Current PG&E standards do not (1) provide as conservative an AC voltage criterion or (2) include any AC current criterion.

- *The safe limits must be determined by qualified personnel based on anticipated exposure conditions. For the purpose of this standard, a steady-state touch voltage of 15 V or more with respect to local earth at above-grade or exposed sections and appurtenances is considered to constitute a shock hazard. [NACE RP0177, 5.2.1.1]*
- *Corrosion likelihood may be negligible if alternating current density referred to a 1 cm^2 bare surface (e.g. an external test probe) is lower than 30 A/m^2 and the structure to electrolyte potential meets the cathodic protection criteria. [BS EN 12954, Annex A]*
- *Typical criteria are 8 - 15 V AC maximum, < 20 A/m^2. [Phase II Benchmarking]*

Subtopic: Design

Current Status	Future Status
Red	Red

Summary:

PG&E's AC interference design practices are aligned with 49 CFR 192.467(f) and PHMSA PI-98-009. However, current PG&E guidance documents do not address best practices such as: required testing, the need to estimate AC potential and current levels under normal conditions, fault conditions, and lightning surges. Future guidance document TD-4181P-002 partially addresses these gaps with content about design for prevention of induced AC.

- *Any one or a combination of the following test methods can be used: Measurement of structure-electrolyte potentials with recording or indicating instruments; measurement of current flowing on the structure with recording or indicating instruments; development of beta curves to locate the area of maximum current discharge from the affected structure (see Appendix A); and measurement of the variations in current output of the suspected source of interference current and correlations with measurements obtained in Paragraphs 9.3.2.1 and 9.3.2.2. [NACE SP0169, 9.3.2]*
- *Factors considered in the design of the grounding system of an independent structure include the resistivity of the soil and the magnitude of the induced potential and current that the designer expects the structure to encounter under all possible conditions. [NACE RP0177, 4.4.1]*
- *Design considerations should include steady-state conditions (including touch voltage and maximum pipe potentials during normal, emergency, and future loads) and fault conditions (including touch-and-step voltage, avoidance of pipe wall puncture and arc burns, and tolerable coating stress voltages). [NACE RP0177, 4.1.3]*

- *Design mitigation objectives should be clearly defined. As a minimum, the mitigation objectives should include the maximum steady-state voltage at above-grade portions and appurtenances, maximum pipe potential (ground potential rise [GPR]) for the normally buried and inaccessible portions, touch-and- step voltage criteria at above-grade portions and appurtenances during fault conditions, and the maximum coating stress voltage during fault conditions. [NACE RP0177, 4.1.4]*
- *A CP system design should include an evaluation to estimate the level of AC potentials and currents under normal conditions, fault conditions, and lightning surges. Because significant AC potentials may be encountered during field surveys, all personnel shall follow proper electrical safety procedures and treat the structure as a live electrical conductor until proven otherwise. [NACE RP0177, 6.2.1]*
- *a.c. interference should be simulated on a computer taking into consideration data from the affected pipeline such as coating resistance, diameter, route, and locations of isolating joints or isolating flanges. If the isolating device is bonded across, such that the pipeline is electrically continuous with a plant earthing grid, then either the resistance-to-earth of the grid shall be estimated or the grid itself shall be part of the study. For a.c. traction systems, data to be considered are the interfering high voltage, operating current, location and layout of the high-voltage tower and position of the wires, route (including the position of the transformers), frequency and electrical characteristics for high-power lines. [ISO 15589-1, B.3.2]*
- *During the construction of metallic structures in areas of AC influence, the following minimum protective requirements are prescribed: (a) On long metallic structures paralleling AC power systems, temporary electrical grounds shall be used at intervals not greater than 300 m (1,000 ft.), with the first ground installed at the beginning of the section. Under certain conditions, a ground may be required on individual structure joints or sections before handling. (b) All temporary grounding connections shall be left in place until immediately prior to backfilling. Sufficient temporary grounds shall be maintained on each portion of the structure until adequate permanent grounding connections have been made. [NACE RP0177, 5.3.3]*
- *Tests and investigations to estimate the extent of AC influence should include the following: (a) Meeting with electric utility personnel to determine peak load conditions and maximum fault currents and to discuss test procedures to be used in the survey. (b) Electrical measurement of induced AC potentials between the affected structure and ground. (c) Electrical measurement of induced AC current on the structure. (d) Calculations of the potentials and currents to which the structure may be subjected under normal and fault conditions. [NACE RP0177, 6.2.2]*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Red	Red

Summary:

There are no monitoring requirements for AC interference in federal code or PHMSA guidance documents. However, industry standards recommend installing coupons to monitor the risk, checking facilities for AC power levels, and using AC ammeters to measure AC leakage current density, none of which are addressed in current PG&E standards.

- *To determine the a.c. corrosion risk, coupons should be installed where the a.c. current density reaches its maximum. They should be buried at the pipeline depth and have adequate equipment for current measurements. It should also be considered to install additional coupons which can later be removed for visual examination. The a.c. current density within a coating defect is the primary determining factor in assessing the a.c. corrosion risk. In case of low soil resistivity, high a.c. current densities can be observed. In sections where a.c. voltages are higher than 10 V, or where voltages along the pipeline show variation to lower values, indicating possible a.c. discharge, additional measurements should be performed on site. [ISO 15589-1, B.3.3]*
- *Indications of AC power levels on affected structures may be obtained by temporarily bonding the structure to an adequate ground and measuring the resulting current flow with a clampon AC ammeter while measuring the AC potential. Suitable temporary grounds may be obtained by bonding to tower legs, power system neutral, bare pipeline casings, or across an isolating joint to a well grounded system. DC drainage bonds existing on the structure under investigation should also be checked for AC power levels. [NACE RP0177, 6.2.3.3]*
- *A clamp-on AC ammeter may be used to measure current in temporary or permanent bond and ground connections. Instrumentation with sufficient resolution may be used to measure current at buried coupons that are connected to the structure to provide an indication of the local AC leakage current density. [NACE RP0177, 6.2.3.2]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Red	Red

Summary:

There are no guidelines for troubleshooting or remediating AC interference in federal code or PHMSA documents. Contrary to industry best practices, PG&E does not specify strategies for troubleshooting or mitigating induced AC in TD-4182P-01. Methods of induced AC mitigation are addressed in ANSI/ASME B31.4 and NACE SP0286, both of which provide stray current hazard protection strategies.

- *The protection of the piping system against stray current induced corrosion shall be provided by metallic bonds, increased cathodic protection, supplemental protective coatings, insulating flanges, or galvanic anodes. [ANSI/ASME B31.4, 461.1.6(b)]*
- *Pipelines equipped with isolating devices may be protected from stray-current hazards originating from electrical power supplies through the use of grounding media or isolation protection equipment. Grounding media that should be considered for the discharge of induced AC, lightning, and fault current from a pipeline to earth include packaged galvanic anodes of magnesium or zinc and extruded ribbon of magnesium or zinc, with or without backfill. Electrically isolated bare steel pipeline casing, grounding*

grids, and ground rods should also be considered suitable grounds but must be separated from the cathodically protected pipeline by capacitors, zinc grounding cells, polarization cells, or equivalent solid-state products. [NACE SP0286, 8.3.4]

- *To reduce inadmissible step and touch voltages, the following methods should be considered: reduce the induced a.c. voltage by earthing the whole system; install grounding mats locally in areas where people work; install cancellation wires running parallel to the pipeline. To reduce a.c. voltage, the following methods should be considered. Install pipeline earthing equipped with suitable devices in order to let a.c. current, but not d.c. current, flow. A simulation on a computer might be required to optimize the number, location and resistance-to-earth of the earthing systems. Install active earthing-potential-controlled amplifiers to impress a current into the pipeline, compensating or reducing the induced voltage. This method should be applied if the required reduction of induced voltage cannot be achieved by simple earthing. The location of compensation devices shall be carefully considered. Add earthing systems to provide potential equalization at local areas. These earthing systems can be constructed using a wide variety of electrodes (galvanized steel, zinc, magnesium, etc.). Some earthing systems can have an adverse effect on the effectiveness of the CP. To avoid adverse effects on the CP, the earthing systems should be connected to the pipeline via appropriate devices, (e.g. spark gaps, d.c. decoupling devices, etc.). Shifting the d.c. voltage level to reach more negative potential can reduce the a.c. corrosion rate. The pipe-to- soil potentials should not be more negative than those given in 5.3. [ISO 15589-1, B.3.4]*

Note: PG&E does not adhere to the PHMSA enforcement guidance for 192.473(b) (1/22/2013 revisions), which states that at least 10% of an operator's affected pipeline must be monitored with a close interval survey during a calendar year. However, the interpretation summary found in the PHMSA guidance is inconsistent with the interpretation on which it is based (PI-ZZ-070). As such, PHMSA's ZZ-070 interpretation summary has not been considered in the assessment of AC interference troubleshooting and remediation.

- *This interpretation clarifies section 192.473 and states that at least 10% of an operator's affected pipeline must be monitored with a close interval survey during a calendar year. [PHMSA Part 192 Guidance, p.92]*
- *Question 1: Section 192.465(a) – What does the DOT mean by survey of a minimum of 10% each year for short service lines and mains, and is this required to be done? If so, does this mean an electrical pipe to soil survey?*
    - *MTB Response: Section 192.465(a) requires all pipelines under cathodic protection to be tested at least once each calendar year to determine compliance with §192.463. An exception is provided for service lines and short sections of protected mains 100 feet or less in length, permitting these to be tested on a sampling basis. The sampling of these short sections must be done in a manner that at least 10% of the total number of such short piping segments in the pipeline system are tested each calendar year. Failure to conduct these tests in accordance with the required schedule is a violation of this section. The tests required must determine whether the cathodic protection requirements of §192.463 are being met. Section 192.463 states that the applicable criteria for*

such tests are contained in Appendix D of Part 192. In a telephone conversation with a member of the MTB staff, it was determined that the question assumes steel pipelines. Referring to Appendix D, it is clear that all of the tests mentioned for use on steel pipelines are electrical tests. [PHMSA Interpretation ZZ-070]

Subtopic: Operator Qualification and Training

Current Status	Future Status
Red	Red

Summary:

Current PG&E guidance documents do not explicitly state that pipeline proximity to electrical transmission towers must be determined by a person qualified in pipeline corrosion control methods who has knowledge of the circumstances (per PHMSA PI-98-009, referencing 49 CFR 192.453). Additionally, PG&E provides minimal safety guidance (in TD-4182P-01) for employees working in proximity to electrical towers or other possible faulting locations.

- *Under 49 CFR 192.453, the distance must be determined by a person qualified in pipeline corrosion control methods who has knowledge of the circumstances. [PHMSA PI-98-009]*
- *Because significant AC potentials may be encountered during field surveys, all personnel shall follow proper electrical safety procedures and treat the structure as a live electrical conductor until proven otherwise. [NACE RP0177, 6.2.1]*
- *AC potentials on structures must be reduced to and maintained at safe levels to prevent shock hazards to personnel. [NACE RP0177, 5.2.1]*
- *The safe limits must be determined by qualified personnel based on anticipated exposure conditions. [NACE RP0177, 5.2.1.1]*

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Red	Red

Summary:

There are no AC interference-specific documentation/recordkeeping guidelines in federal code, PHMSA guidance, or current PG&E standards. However, best practices dictate that operators record AC interference-related details such as location and date placed in service of the interference mitigation facility, identification of connected structures, and type of device (see OCC 1, 6.2.2.3).

- *Unidirectional current flow and AC mitigation facility records shall include: location and date placed in service, identification of connected structures, type of device. [OCC 1, 6.2.2.3]*

- *CP records should include the results of these tests (that is, tests of CP systems under the influence of AC potentials) [NACE SP0177, 5.4.3]*
- *A survey should be conducted over those portions of the affected structure in which AC exposure has been noted or is suspended. The location and time that each measurement was taken should be recorded. [NACE SP0177, 6.2.3]*
- *If a.c. or d.c. interference currents are present, measurements shall be taken to determine the impact of the interference on the effectiveness of the CP. These measurements shall be carried out with the CP systems both in operation and de-energized. In both cases, the pipe-to-soil potential shall be recorded for at least 24 h. When the CP system is energized, the drainage current should also be recorded. [ISO 15589-1, 10.3]*

7. Direct Current Interference

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Black	Black
Acceptance Criteria	Red	Red
Design	Green	Green
Monitoring Scope, Locations, and Frequency	n/a	n/a
Troubleshooting and Remediation	Red	Red
Operator Qualification and Training	n/a	n/a
Documentation and Recordkeeping	Red	Red

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

PG&E's forthcoming TD-4183S "DC Interference" document is under development and was not available for review. Consequently, the RAG status indicator for all future DC interference subtopics is the same as that for current subtopics.

Subtopic: General Guidance/Scope

Current Status	Future Status
Black	Black

Summary:

At present, PG&E does not have a written plan to identify, test for, and minimize the detrimental effects of stray currents per 49 CFR 192.473(a) and PHMSA Part 192 Guidance (p. 92). PG&E does not provide examples of how DC interference may manifest during pipeline evaluation (similar to those found in NACE SP0169, 9.3.1). In addition, PG&E does not specify a duration for interference testing; ISO 15589-1, B.2.1 suggests carrying out measurements for 24 hours, or a period that is typical for the suspected interference phenomenon being investigated.

- *Each operator whose pipeline system is subjected to stray currents shall have in effect a continuing program to minimize the detrimental effects of such currents. [49 CFR 192.473(a)]*
- *The operator must have a written plan to identify, test for, and minimize the detrimental effects of such currents. [PHMSA Part 192 Guidance, p. 92]*

- *During external corrosion control surveys, personnel should be alert for electrical or physical observations that could indicate interference from a foreign source such as the following: pipe-electrolyte potential changes on the affected structure caused by the foreign DC source; changes in the line current magnitude or direction caused by the foreign DC source; localized pitting in areas near or immediately adjacent to a foreign structure; and damage to external coatings in a localized area near an anode bed or near any other source of stray direct current. [NACE SP0169, 9.3.1]*
- *Many sources of interference exhibit the maximum and minimum levels over a 24 h period. It is advisable to record the measured values of the affected system and an operating parameter of the stray current source simultaneously to allow a clear association of the stray current to the source. Values recorded during the non operational period of the interfering system shall be considered as the normal or unaffected potentials. [BS EN 50162, 5.2.3]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Red	Red

Summary:

Federal code and PHMSA guidance do not address DC interference acceptance criteria. However, industry standards (*e.g.*, AS 2832.1, BS EN 50162) state that the maximum allowed potential changes on foreign structures shall be 20 mV in the positive direction and 200 mV in the negative direction. Current PG&E guidance does not address DC interference acceptance criteria.

- *When there are no statutory regulatory authority in place, the maximum allowed potential changes on the foreign structures shall be 20 mV in the positive direction and 200 mV in the negative direction. This criteria may be changed only by the agreement of the parties involved. If it can be shown that the current density is sufficiently low to result in a negligible corrosion rate, then greater potential shifts may be tolerated, subject to agreement between all interested parties. On the MEN system greater changes in potential may be accepted provided the current discharge caused by the interference to any single electrode is less than 1 mA. [AS 2832.1, 8.3.3]*
- *Anodic interference (see Annex B) on structures without cathodic protection is acceptable if the positive potential shift ΔU is lower than the criterion given in Table 1. [BS EN 50162, 6.1.1]*

Subtopic: Design

Current Status	Future Status
Green	Green

Summary:

Consistent with 49 CFR 192.473(a) and industry standards, PG&E addresses design for DC interference mitigation in O-16.

Subtopic: Monitoring Scope, Locations, and Frequency

Summary:

N/A (Reason 3)

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Red	Red

Summary:

PG&E's DC interference troubleshooting and remediation guidelines in O-16 are limited, and do not provide specific mitigation methods such as those found in industry best practices. For example, NACE SP0169, OCC 1, and AS 2832.1 address adjustment of interfering rectifier output, rerouting of proposed pipelines, and application of external coating to current pick-up areas.

- *These methods may be used individually or in combination: Design and installation of electrical bonds of proper resistance between the affected structures is a technique for interference control...Adjustment of the current output from interfering CP rectifiers may resolve interference problems; Relocation of the groundbeds of cathodic protection rectifiers can reduce or eliminate the pickup of interference currents on nearby structures; Rerouting of proposed pipelines may avoid sources of interference current; Properly located isolating fittings in the affected structure may reduce or resolve interference problems; Application of external coating to current pick-up area(s) may reduce or resolve interference problems; Restoration of the structure-electrolyte potentials on the affected structure to those values that existed prior to the interference. [NACE SP0169, 9.4]*
- *Where current pick-up cannot be prevented the following steps may be taken: Counteract the effect of the interfering current by modifying the cathodic protection, remove or relocate the interfering current source, reduce the current output from the cathodic protection energy sources causing the interference, reroute the proposed pipelines, locate the isolating fittings in the affected structure, apply a coating to the current pick-up area(s) to reduce or resolve the interference, install direct or resistive bonding. [OCC 1, C.4.1.1]*
- *Where testing of a cathodic protection installation indicates that interference exists at a level which may result in corrosion of the foreign structure, interference shall be controlled. Interference may be controlled by one or more of the following measures: (a) Installing galvanic anodes on the foreign structure (see Clause 8.3.4.2) (b) Bonding the foreign structure to the primary structure through control resistance, if appropriate (c) Insulating the foreign structure (d) Using distributed cathode points on poorly coated*

structures to reduce the average potential shift on the protected structures (e) Relocating foreign structures away from the interfering field or relocating the interfering field away from the foreign structures (f) Reduce the output current of the cathodic protection systems (g) Excavate and coat the structure to be protected in the vicinity of the effected structure. Mitigation techniques that require action to be taken on the foreign structure, such as Items (a), (b) and (c) above, may only be used with the agreement of the foreign structure owner. [AS 2832.1, 8.3.4.1]

Note: PG&E does not adhere to the PHMSA enforcement guidance for 192.473(b) (1/22/2013 revisions), which states that at least 10% of an operator's affected pipeline must be monitored with a close interval survey during a calendar year. However, the interpretation summary found in the PHMSA guidance is inconsistent with the interpretation on which it is based (PI-ZZ-070). As such, PHMSA's ZZ-070 interpretation summary has not been considered in the assessment of DC interference troubleshooting and remediation.

- *This interpretation clarifies section 192.473 and states that at least 10% of an operator's affected pipeline must be monitored with a close interval survey during a calendar year. [PHMSA Part 192 Guidance, p.92]*
- *Question 1: Section 192.465(a) – What does the DOT mean by survey of a minimum of 10% each year for short service lines and mains, and is this required to be done? If so, does this mean an electrical pipe to soil survey?*
    - *MTB Response: Section 192.465(a) requires all pipelines under cathodic protection to be tested at least once each calendar year to determine compliance with §192.463. An exception is provided for service lines and short sections of protected mains 100 feet or less in length, permitting these to be tested on a sampling basis. The sampling of these short sections must be done in a manner that at least 10% of the total number of such short piping segments in the pipeline system are tested each calendar year. Failure to conduct these tests in accordance with the required schedule is a violation of this section. The tests required must determine whether the cathodic protection requirements of §192.463 are being met. Section 192.463 states that the applicable criteria for such tests are contained in Appendix D of Part 192. In a telephone conversation with a member of the MTB staff, it was determined that the question assumes steel pipelines. Referring to Appendix D, it is clear that all of the tests mentioned for use on steel pipelines are electrical tests. [PHMSA Interpretation ZZ-070]*

Subtopic: Operator Qualification and Training

Summary:

N/A (Reason 1). DC interference is an advanced troubleshooting issue and may require additional qualification and/or training. For instance, NACE CP Level 2 contains instruction concerning DC interference identification and mitigation. Otherwise, however, there are no OQ requirements specific to DC interference in federal code, PHMSA Guidance, best practices, or PG&E guidance documents.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Red	Red

Summary:

O-16 does not clearly indicate what documentation is required for reporting of interference issues on backbone (*i.e.*, in O-16, the "Interference Test Form" is indicated for distribution and local transmission use only). Current PG&E standards do not address (1) documenting instances of interference due to non-PG&E structures (2) preparing drawings identifying DC interference facilities.

- *After the successful commissioning of the CP system, the following shall be compiled in a commissioning report:...records of the interference tests (if any) carried out on neighboring structures; the voltage and current at which each CP system was initially set and the voltage and current levels to be used during future interference tests. The location and type of interference-current sources (if any)...[ISO 15589-1, 13.2]*
- *As-built drawings shall be retained for each impressed current cathodic protection installation. These drawings shall show details and location of components of the cathodic protection system with respect to the protected structure(s) and to major physical landmarks...direct current interference facilities. [OCC 1, 6.2.2.1]*

8. Casings

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Green
Acceptance Criteria	Green	Green
Design	Amber	Amber
Monitoring Scope, Locations, and Frequency	Black	Red
Troubleshooting and Remediation	Amber	Amber
Operator Qualification and Training	Red	Red
Documentation and Recordkeeping	Amber	Amber

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Green

Summary:

49 CFR 192.467(d) requires that all casings are monitored adequately. O-16 (p. 8) mandates that all local transmission, backbone transmission, and gas gathering pipeline cased crossings must be monitored annually. PG&E is currently minimally compliant with 49 CFR 192.467(d) regarding

monitoring casings because there is no explicit guidance regarding how to monitor casings without test facilities.

- *Inspection and electrical tests must be made to assure that electrical isolation is adequate. [49 CFR 192.467(d)]*

Future documents TD-4181P-601, as well as TD-4181P-003, address casing test procedures and contain additional information concerning monitoring casings without test facilities.

Note: O-16 directs the reader to Utility Standard S4126 "Cathodic Protection Standards for Cased Pipeline Crossings," which reportedly included procedures for monitoring casings without facilities, but is no longer effective. In addition, the document "PG&E Distribution and Transmission Pipeline Cased Crossing Testing and Maintenance Policy – May 2010," which contains information on monitoring casings without test facilities, is not an official guidance document.

Subtopic: Acceptance Criteria

Current Status	Future Status
Green	Green

Summary:

Current (WP4133-04) and proposed (TD-4181P-601) PG&E casing acceptance criteria are consistent with NACE SP0200 *i.e.*, if the difference between casing-to-soil potential and pipe-to-soil potential is 100 mV or less, action must be taken.

Subtopic: Design

Current Status	Future Status
Amber	Amber

Summary:

PG&E Document A-70 addresses the design and installation of casings at highway and railroad crossings, and is generally consistent with best practices (avoiding casings wherever possible and ensuring isolation otherwise). Selected casing design guidance present in industry standards but absent from PG&E documentation include: making casings as short as possible, adequate supporting of casings and pipes to withstand operational loads, and external sealing of surface casings.

- *The casing should be kept as short in length as possible. [NACE SP0200, 3.2.1]*
- *Insulators to be properly sized, spaced, and tightened on the pipeline to withstand insertion stresses without sliding on the pipe. Inspection should be made to verify that the leading insulator has remained in position. [NACE SP0169. 4.3.3]*

- *Surface casings, if used, shall be externally sealed, and may be either internally sealed or extended above the high-water level. [NACE SP0572, 3.3.1]*

Subtopic: Monitoring Scope, Locations, and Frequency

Current Status	Future Status
Black	Red

Summary:

PG&E current and proposed casing monitoring frequency guidance for transmission pipeline are aligned with code requirements and best practices (annual monitoring). PG&E does not currently provide casing monitoring guidance for distribution pipeline, contrary to 49 CFR 192.467(a), which states that all casings must be electrically isolated. Proposed PG&E guidance document TD-4181S leverages PHMSA PI 86004 to indicate why distribution casings should be exempt from monitoring. While PG&E indirectly addresses PI 86004 via resurvey procedure WP-4133-02, it does not explicitly advise that cathodic protection for the *entire* pipeline must be verified in accordance with 49 CFR 192.465(a).

- *Buried pipelines to be isolated from other metallic structures unless they are electrically interconnected and cathodically protected as a single unit. [49 CFR 192.467(a)]*
- *The tests under 49 CFR 192.465(a) must be sufficient to determine whether the cathodic protection meets the requirements of 49 CFR 192.463 for the entire pipeline, including any cathodically protected segments inside casings. [PHMSA PI 86004]*
- *Each pipeline under CP must be tested once a year, (not exceeding 15 months), to verify CP meets requirements of 49 CFR 192.463. [49 CFR 192.465(a)]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Amber	Amber

Summary:

In general, PG&E provides adequate guidance in WP4133-03 and WP4133-04 with respect to troubleshooting and remediating casing contacts. Future guidance document TD-4181P-003 (4.1.2.c) indicates that corrosion field personnel will notify corrosion engineering of issues with backbone transmission and gas gathering line cased crossings, but does not reference WP4133-04.

PG&E's current and proposed guidance require the generation of a corrective action plan within 30 days of discovering a casing short, which is not stipulated in code, PHMSA, or best practices. However, PHMSA FAQs and PI 86004 states that corrective action must be initiated within six months of a casing short being identified. This phrasing leaves room for interpretation; it is not clear if “initiating corrective action” is satisfied by the generation of a corrective action plan alone.

- *A violation of Paragraph 192.467(c) exists if cathodically protected transmission or distribution pipeline, (other than unprotected copper inserted into ferrous pipe), is electrically connected to metallic casings and remediation is not initiated within six months. After the cathodic protection survey has been completed and a shorted casing has been identified, the operator should determine a course of action intended to correct or negate the adverse effects of shorted casings. [PHMSA PI 86004]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Red	Red

Summary:

PG&E does not provide OQ specific to casings (based upon ASME B31Q Task 0971 *Installation and Maintenance of Casing Spacers, Vents, and Seals*, for example) in existing or proposed guidance.

- *ASME B31Q Task 0971: Installation and Maintenance of Casing Spacers, Vents, and Seals*

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Amber	Amber

Summary:

PG&E has developed Forms F4133-03-1 and F4133-03-2, which are used for reporting casing investigation data acquired in the field. It is not clear if these forms are used for documenting recommended information per ISO 15589-1 and AS 2832.1. It is also not obvious if Forms F4133-03-1 and F4133-03-2 are used for generic data acquisition in the absence of troubleshooting measures. In addition, guidance is not provided concerning the retention and distribution of casing-related data.

- *Maintain records of casing equipment. [ISO 15589-1, 13.5]*
- *Maintain locations and details of casing-related features. [AS 2832.1, 9.6]*

9. Coatings

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Black	Black
Acceptance Criteria	n/a	n/a
Design	Amber	Amber
Monitoring Scope, Locations, and Frequency	n/a	n/a
Troubleshooting and Remediation	Amber	Amber
Operator Qualification and Training	Amber	Amber
Documentation and Recordkeeping	Red	Red

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Black	Black

Summary:

PG&E does not currently have standards in place to protect coatings from damage on installation as indicated in 49 CFR 192.461. While proposed PG&E standards call out 49 CFR 192.461, PHMSA stipulates that operators should have "developed procedures" for taking precautions to protect coatings during installation (PHMSA Part 192 Guidance, p. 30). These developed procedures should address matters like handling and storing, pipe supports, backfilling, slings, etc. PG&E's coating program omits specific mandates found in industry standards, which indicate that pipe should be protected from coating deterioration during storage (ASME B31.8) and electrically tested (ANSI/ASME B31.4) prior to lowering. Similarly, standards indicate that OQed individuals should monitor all aspects of the pipe coating and installation process (NACE SP0169) and that the effects of shielding should be considered if rock guards are used (OCC 1).

- *Each external protective coating must be inspected just prior to lowering the pipe into the ditch and backfilling, and any damage detrimental to effective corrosion control must be repaired. [49 CFR 192.461(c)]*
- *Each external protective coating must be protected from damage resulting from adverse ditch conditions or damage from supporting blocks. [49 CFR 192.461(d)]*
- *If coated pipe is installed by boring, driving, or other similar method, precautions must be taken to minimize damage to the coating during installation. [49 CFR 192.461(e)]*
- *In rocky environments, the use of a protective outer wrap, select backfill, or other suitable measures shall be considered to minimize physical damage. [ASME B31.8, 865.2]*
- *The ditch bottom and the backfill materials contacting the pipe should be free from rocks, frozen lumps of soil and other foreign matter that would damage the coating during pipe installation or during service. [OCC 1, 3.2.2]*
- *Care should be taken during backfilling so that rocks and debris do not strike and damage the pipe coating. [NACE SP0169, 5.2.3.6]*

- *The backfilling operation shall be inspected for quality, compaction, and placement of material to prevent damage to pipe coating. [ANSI/ASME B31.4, 461.1.2(g)]*
- *The operator should have developed procedures for taking precautions to protect the coating while installing pipe in such a manner. Some operators may elect to install an abrasion-resistant coating, such as various concrete materials, over the dielectric coating used for the cathodic protection. The operator should utilize an appropriate bore size/diameter ratio and a sufficient bend radius to minimize potential damage to the coating (and possibly to the pipe). The operator should also inspect for damage on the pipe visible in the bore's exit pit. Damage noted to the coating and/or pipe in the exit pit might indicate that additional undetected damage may have occurred during the installation to the coating and/or the pipe that is not visible. Note if the operator doing any type of testing on the carrier pipe after boring or pulling to determine the effectiveness of the coating as a dielectric between the casing or soil. [PHMSA Part 192 Guidance, p. 30]*
- *Coated pipe to be stored should be protected internally and externally from atmospheric corrosion and coating deterioration. [NACE SP0169, 5.2.1.1]*
- *Pipe coating shall be inspected, both visually and by an electric holiday detector, just prior to: lowering pipe into ditch, applying a weight coating if used, or submerging the pipe if no weight coating is used. Any holiday or other damage to the coating detrimental to effective corrosion control shall be repaired and reinspected. [ANSI/ASME B31.4, 461.1.2(c)]*
- *Qualified personnel should keep every phase of the coating operation and piping installation under surveillance. [NACE SP0169, 5.2.2.1]*
- *If rock guards, shields, foam, etc. are used to provide additional mechanical protection to coating, consideration shall be given to the possible creation of cathodic protection shielding. [OCC 1, 3.2.2]*

Subtopic: Acceptance Criteria

Summary:

N/A (Reason 2). See *Coatings, General Guidance/Scope*.

Subtopic: Design

Current Status	Future Status
Amber	Amber

Summary:

Federal code, PHMSA guidance, and benchmarking provide minimal details about coating design. Current and proposed PG&E guidance documents are consistent with industry standards, as exemplified by (1) visual inspection of coatings prior to installation (ASME B31.8, 862.112), (2) coating of air-to-soil transitions (BS EN 13636, 8.3.2), and (3) instruction concerning coating application conditions (*e.g.*, temperature, primer, etc. as mentioned in NACE SP0169, 5.2.2.2).

PG&E does not provide any guidance about the application and monitoring of internal coatings, however.

- *Internal coating of pipelines should be considered as an internal corrosion control measure. Internal coatings should also be considered for selected areas, such as in-station manifold piping or small-diameter gathering lines, where it is not feasible or economical to use other corrosion control measures. [NACE SP0106, 5.5.1]*
- *If internal coatings are used to control corrosion, they shall meet the quality specifications and minimum dry film thickness established in the industry and be inspected in accordance with industry recommended practices. Internal coatings shall include provisions for joint protection on piping joined by welding or other methods exposing parent metal at the joints, such as the use of a suitable corrosion inhibitor. [ANSI/ASME B31.4, 462.1(c)]*
- *When internal coating is to be used to protect a piping system (1) The coating shall meet the quality specifications, and the minimum dry film thickness shall be established to protect the facility from the corrosive media involved, based on the type of coating and methods of application. (2) Applied coatings shall be inspected in accordance with established specifications or accepted practice. (3) Provision shall be made to prevent joint corrosion, such as cleaning and recoating or the continuing use of a suitable inhibitor when coated pipe or other components are joined by welding or other methods that leave the parent metal exposed. (4) The types of coating and pitting tools used should be evaluated and chosen to prevent damage to the internal coating if pigs or spheres are to be used. [ASME B31.8, 863.2(a)]*
- *Internal coating can be accomplished joint-by-joint at a coating plant, or by coating entire line segments in place. Regardless of where coating takes place, coating performance is dependent on suitable pipe cleaning and surface preparation as well as use of proper application procedures. [NACE SP0106, 5.5.4]*

Subtopic: Monitoring Scope, Locations, and Frequency

Summary:

N/A (Reason 3)

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Amber	Amber

Summary:

Federal code and PHMSA Guidance do not provide requirements concerning coating troubleshooting and remediation. With respect to industry best practices, PG&E's coatings program does not stipulate that additional mitigation methods may be necessary if coating damage is found to be widespread (per NACE SP0106, Section 7.4). In addition, PG&E does not address electrical inspection of locations other than air-to-soil transitions (as specified in NACE SP0169, Section 5.3.3.1).

- *Damaged areas shall be suitably repaired, if at all feasible, to maintain overall coating integrity. If coating damage is too widespread or repair is otherwise not feasible, supplemental mitigation measures shall be considered. [NACE SP0106, 7.4]*
- *Visual and electrical inspection of in-service pipeline coatings should be used to evaluate the performance of an external coating system. These inspections can be conducted wherever the pipeline is excavated or at bell holes made for inspection purposes. [NACE SP0169, 5.3.1.1]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Amber	Amber

Summary:

While PG&E provides OQ 03-02 *Transmission Pipe Coatings*, no OQ is provided for distribution line coatings.

As the content of PG&E OQ 03-02 Transmission Pipe Coatings was not reviewed, PG&E should consider ensuring that OQ procedures are consistent with applicable ASME B31Q tasks: 0991 Coating Application and Repair: Brushed or Rolled, Task 1001 Coating Application and Repair: Sprayed, Task 1011 External Coating Application and Repair: Wrapped, and Task 1021 Apply of Repair Internal Coating Other Than by Brushing, Rolling, or Spraying.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Red	Red

Summary:

Current and proposed PG&E guidance does not appear to address the documentation of coating-related information detailed in industry standards such as coating type, coating thickness, holiday detection results, and installation date.

- *Records of the coating selected for each component of the piping system shall be maintained...these include but are not limited to: type of coating and specific coating specification, coating manufacturer and applicator, date and place of application, applicable specification and inspection data, transportation and storage records. [OCC 1, 6.2.1]*
- *Copies of all records from quality control, inspection, and testing by the applicator shall be supplied to the purchaser or purchaser's representative within 24 hours of the inspection or test. [NACE RP0394, 7.1.1]*

- *Relative to the determination of the need for external corrosion control, the following should be recorded...external coating condition observed when a buried structure is exposed. [NACE SP0169, 11.2]*
- *Relative to structure design, the following should be recorded: external coating material and application specifications...[NACE SP0169, 11.3]*
- *Relative to the maintenance of external corrosion control facilities, the following information should be recorded...Maintenance, repair, and replacement of external coating, isolating devices, test leads, and other test facilities. [NACE SP0169, 11.7]*
- *Records of the coating selected for each component of the piping system shall be maintained in accordance with CSA Z662 and CSA Z245.20 Series-10. These include but are not limited to: type of coating and specific coating specification, coating manufacturer and applicator, date and place of application, applicable specification and inspection data, transportation and storage records. [OCC 1, 6.2.1]*
- *Records of the following should also be retained: coating tests, repairs and replacements...[OCC 1, 6.3.3]*
- *For maintenance of the CP facilities, the following information shall be recorded:...maintenance, repair and replacement of coating...[ISO 15589-1, 13.5]*
- *Records of the following items shall be retained for the life of the structure: (i) The condition of coating at the time of any examination, and the details of any coating repair. (j) The results of any coating defect surveys carried out. [AS 2832.1, 10.6]*

10. Internal Corrosion

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Green
Acceptance Criteria	Amber	Green
Design	Red	Amber
Monitoring Scope, Locations, and Frequency	Red	Amber
Troubleshooting and Remediation	Amber	Green
Operator Qualification and Training	Green	Green
Documentation and Recordkeeping	Green	Green

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Green

Summary:

PG&E's current TD-4580P-07 and Liquid Sampling Procedure (Form LSP-2) and future IC Manual procedures sufficiently address the PHMSA gas and liquid quality measurement requirement (per PHMSA Part 192 Guidance, p. 96). However, ASME B31.8 dictates that (1) a formal pipeline internal corrosion control program should exist and (2) the program should entail records review, inspection, and gas/liquid/solid analysis. PG&E does not currently have a formal program for internal corrosion control. The IC Manual remedies this shortcoming.

- *A pipeline internal corrosion control program shall include, but shall not be limited to, the following: (a) The establishment and evaluation of a program for the detection, prevention, or mitigation of detrimental internal corrosion should include the following: (1) Pipeline leak and repair records should be reviewed for indication of the effects of internal corrosion. (2) When any part of a pipeline is removed and the internal surface is accessible for inspection, it should be visually examined and evaluated for internal corrosion. (3) If evidence of internal corrosion is discovered, the gas shall be analyzed to determine the types and concentrations of any corrosive agents. (4) Liquids or solids removed from the pipeline by pigging, draining, or cleanup should be analyzed as necessary to determine the presence of corrosive materials and evidence of corrosion products. [ASME B31.8, 863.3]*

Subtopic: Acceptance Criteria

Current Status	Future Status
Amber	Green

Summary:

PG&E does not currently provide acceptance criteria for internal corrosion (*i.e.*, acceptable general and pit mil per year values) similar to those found in NACE SP0775. PG&E's proposed IC Manual addresses this shortcoming, and mirrors the acceptance criteria found in NACE SP0775.

- *See Table 2 in NACE SP0775 for qualitative categorization of carbon steel corrosion rates for oil production systems. Average corrosion rate is defined as low if it is less than 1 mpy; maximum pitting rate is described as low if it is less than 5 mpy. [NACE SP0775, p. 17]*

Subtopic: Design

Current Status	Future Status
Red	Amber

Summary:

PG&E's Gas Information Bulletin 230 meets the minimum guidelines provided in 49 CFR 192.476 concerning transmission line design for the prevention of internal corrosion and provides selected details on implementation, such as process workflow and required internal corrosion approvals. Proposed documents including the IC Manual, the IC Review Procedure, and TD-4186S contain additional transmission pipeline design-related details. However, current and proposed PG&E work procedures could be adapted to incorporate industry best practices such as: consider flow velocity effects (NACE SP0106), consult a corrosion specialist during pipeline design (NACE SP0106), etc.

- *A corrosion specialist should be consulted during pipeline design and construction. [NACE SP0106, 3.1.1]*
- *Design consideration shall be given to control of flow velocity within a range that minimizes corrosion. The lower limit of the flow velocity range should be that velocity that will keep impurities suspended in the gas or liquids, thereby NACE International minimizing accumulation of corrosive matter within the pipeline. The upper limit of the velocity range shall be such that erosion-corrosion, cavitation, or impingement attacks are minimal. API 14E includes a section for calculation of erosional velocity in gas/liquid two-phase lines. [NACE SP0106, 3.2..2.1]*
- *If operating criteria dictate the need for intermittent flow, design consideration should be given to obtaining an operating velocity that will pick up and sweep away water or sediment that accumulates in lower places in the line during periods of no flow or low flow. [NACE SP0106, 3.2.3.1]*
- *If water, sediment, or other corrosive contaminants are expected to accumulate in the pipeline, pigs should be used to clean the line. The design should include pig loading and receiving traps. [NACE SP0106, 3.2.3.2]*
- *Changes in line size diameter should be designed to provide a smooth hydraulic transition, thereby eliminating pockets of altered flow velocity, where corrosive contaminants can collect. [NACE SP0106, 3.2.4.1]*
- *Dead ends associated with blind flanges, stubs, laterals, or tie-ins shall be avoided in design. If they are necessary, blow-offs, traps, or drains shall be included in the design so that all accumulated contaminants, including sand, can be periodically removed. [NACE SP0106, 3.2.4.2]*
- *The pipeline system should be designed to eliminate any air entry. [NACE SP0106, 3.2.6]*
- *Materials of construction for the equipment should be suitable for continuous service in contact with the inhibitor. The chemical supplier's recommended materials of construction should be used. Stainless steel should be considered for small-diameter piping or tubing in which even minor rusting could cause plugging or make pumping of more viscous liquids difficult. When nitrogen-based inhibitors (amines, amides, and nitrites) are handled, copper or copper-based alloys shall be avoided because SCC might result. Nonmetallic seal and packing materials shall be checked for compatibility with the inhibitor formulation. [NACE SP0106, 7.3.2.4]*

Note: Utility Standard S4118 referenced in O-16 (in the context of liquid-containing pipelines) could not be located. In addition, the IC Manual introduction and scope sections provide conflicting information about the plan's applicability to distribution pipeline; the introduction states that the plan only applies to transmission pipeline, while the scope states that the plan applied to transmission and distribution lines.

Subtopic: Monitoring Scope, Location, and Frequency

Current Status	Future Status
Red	Amber

Summary:

PG&E does not currently advise proactive, targeted monitoring of high-risk locations such as dead ends, downstream of dehydration facilities, compressor stations, and metering and regulating stations, per PHMSA Part 192 Guidance (p. 95-96) and API 1160. The future IC Review Procedure cautions about internal corrosion issues in pipe dead legs, stubs, and low spots, but omits similar monitoring location specifics. In addition, PHMSA advisory bulletin ADB-08-08 identifies risk factors that need to be assessed to ensure the transported commodity is not corrosive. Although this bulletin is meant for operators who transport hazardous liquids, PG&E should ensure that applicable internal corrosion risk factors (*i.e.*, ones pertaining to natural gas transportation) are evaluated. The internal corrosion monitoring frequency requirement laid out in 49 CFR 192.477 is addressed in O-16 and TD-4186S.

- *Some locations from where periodic testing of liquids should be performed include pipeline drips, deadhead locations, low points and downstream of dehydration facilities, compressor stations, and metering and regulating stations. [PHMSA Part 192 Guidance, p. 95-96]*
- *The wall thickness should be monitored periodically at locations where water may be expected to accumulate (i.e. at the stagnant end of a dead-leg and at the point of its connection to an active line, and low points and blocked ends to drain lines and relief lines. [API 1160, 11.3.2]*
- *Review and analyze the following risk factors to determine if commodity transported could corrode the pipeline: Type of commodity; Flow rate; Velocity; Operating Pressure; Topography; Amount of foreign material and/or contaminants present in the pipeline and/or commodity stream such as sand, silt, water, or other materials that could cause or promote internal corrosion; Amount of sulfur, salts, acids, hydrogen sulfide, carbon dioxide or other corrosive material present and corrosive effect based upon partial pressures of material in the pipeline; Presence of microbes; Temperature; Pipe configuration, design, and material specifications; Operating conditions, including but not limited to, steady state conditions, slack line conditions, upset conditions in the pipeline system, and upset conditions in upstream facilities such as refineries or processing facilities; Any other circumstance or condition that could cause, promote, or increase the likelihood of internal corrosion. [PHMSA ADB-08-08]*

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Amber	Green

Summary:

While PG&E currently mandates that a mitigation plan be developed if internal corrosion is identified, it provides minimal guidance regarding the strategies outlined in NACE SP0106. The future IC Manual addresses this deficiency with additional detail about gas dehydration, liquid separation, pigging, etc. Consistent with 49 CFR 192.475(b) and PHMSA Part 192 Guidance (p.

97), PG&E provides instruction to perform RSTRENG calculations if internal corrosion is identified in adjacent pipeline.

- *If reductions of the water content alone will not control the expected corrosion, other mitigation methods—such as pigging, internal coating, and chemical inhibition—may be used in conjunction with dehydration to provide adequate corrosion control. [NACE SP0106, 3.2.6.1]*
- *Periodic line cleaning with pigs can be used in conjunction with other corrosion mitigation measures such as chemical inhibition or dehydration. [NACE SP0106, 5.2.1]*
- *If past experience has shown that the products being transported, particularly in distribution piping, are not corrosive to the system, some or all of these considerations may be rejected. [NACE SP0106, 5.1.2]*
- *In conjunction with deaeration, the entire pipeline system should be searched for points at which air may enter or otherwise contact the liquid. [NACE SP0106, 5.3.2]*
- *Addition of corrosion inhibitors should be considered a corrosion mitigation measure when corrosive gases or liquids are transported. [NACE SP0106, 5.4.1]*
- *Of foremost importance in choosing a corrosion inhibitor is a firm understanding of the corrosion problem and its cause. The choice further depends on compatibility with the gas or liquid and other additives, ease of handling and injection, and possible adverse effects on downstream processes. [NACE SP0106, 5.4.3]*
- *Laboratory tests, field tests, industry experience, and inhibitor manufacturer's recommendations can be useful for screening inhibitors as to their effectiveness, degree of solubility, compatibility, or required injection rates. [NACE SP0106, 5.4.4]*
- *To increase inhibitor effectiveness, consideration should be given to the use of other corrosion mitigation procedures, such as line cleaning or dehydration, in conjunction with the inhibition program. [NACE SP0106, 5.4.5]*
- *Care must be exercised in location of atomization systems, particularly in distribution piping, so that flow-borne mist will not adversely affect the operations of pilot operated regulatory systems. [NACE SP0106, 7.3.2.3]*
- *Points of injection shall be chosen to provide maximum benefit in the pipeline system. Injection on the suction side of pumps takes advantage of pump turbulence to promote mixing of inhibitor with fluid. Injection through a tube into the center of the pipeline also aids mixing. When a venturi is used as an injection device, installation in a smaller-diameter bypass is preferred because gas flow at high velocity can be maintained more easily. [NACE SP0106, 7.3.3]*
- *Premixing or dilution of the inhibitor can improve handling and promote more rapid dissolution, especially between immiscible phases. Injection point damage can occur due to low pH of the additive or flashing of solvents leaving a solid deposit. Viscous inhibitors can be diluted with a compatible, miscible hydrocarbon carrier to decrease viscosity, making pumping easier and metering more accurate, especially at low usage rates. Premixing water before injection greatly facilitates mixing of inhibitor with line water. [NACE SP0106,7.3.4]*
- *Premixing and dilution of inhibitor should be performed only if the supplier indicates no adverse impacts on the handling or performance of the inhibitor will result. Impacts can include emulsification, separation, or the formation of solids. [NACE SP0106,7.3.5]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Green	Green

Summary:

PG&E provides OQ 03-09 *Internal Corrosion/Monitor*. As the content of this PG&E document was not reviewed, PG&E should consider ensuring that OQ procedures are consistent with applicable ASME B31Q tasks: 0131 Insert and Remove Coupons/Probes for Internal Corrosion Monitoring, 0121 Collect Sample for Internal Corrosion Monitoring, 0161 Visual Inspection for Internal Corrosion, and 0181 Measure Internal Corrosion.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Green	Green

Summary:

PG&E documents internal corrosion findings and mitigation plans, drip tube logs, corrosometer probe data sheets, and chemical usage reports. These practices are aligned with the recommendations in industry standards concerning recording of pipe specifications, mitigation method information, and inhibitor details. For example, consistent with ANSI/ASME B31.4, 465(b), WP4330-02 requires that liquid sample analysis results be kept for the life of the pipeline. PG&E's proposed IC Manual has additional details about records, reports and drawings pertaining to design for IC mitigation.

11. Atmospheric Corrosion

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	n/a
Acceptance Criteria	n/a	n/a
Design	Amber	Amber
Monitoring Scope, Locations, and Frequency	Black	Black
Troubleshooting and Remediation	Black	Black
Operator Qualification and Training	Green	Green
Documentation and Recordkeeping	Amber	Amber

[1] **"Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations**
[2] **"Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations**

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	n/a

Summary:

Inconsistent with PHMSA Part 192 Guidance (p. 118), PG&E does not currently have procedures for acquiring quantitative atmospheric corrosion-related data (although this shortcoming may be addressed by TD-4188P-01, which is currently under development and was not provided for review).

- *The operator should specify and employ an adequate corrosion under thermal insulation evaluation system based on measurement or visual observation that enables the operator to properly evaluate the status of the piping system. However, in those instances where a "visual observation" may not be sufficient, such as in instances of "pitting" or similar flaws, which may dictate a quantitative evaluation, the operator should perform a more in-depth analysis, and rely on more measureable techniques, such as the use of a "pit gauge" to determine if the integrity of the pipe is threatened at the operating pressure. [PHMSA Part 192 Guidance, p. 118]*

Note: The Gas T&D Manual Part II references two superseded documents: Gas Information Bulletin 171, "Atmospheric Corrosion Program for Exposed Mains and Services" (referenced in Gas T&D Manual Part II) and WP4110-06 "Atmospheric Corrosion Inspection of Above Ground Gas Facilities" (referenced in Gas T&D Manual Part II). Similarly, Utility Standard D-S0353/S4112, which is referenced in the current version O-16, is no longer active.

Subtopic: Acceptance Criteria

Summary:

N/A (Reason 2). See *General Cathodic Protection, Troubleshooting and Remediation.*

Subtopic: Design

Current Status	Future Status
Amber	Amber

Summary:

PG&E currently adheres to the atmospheric corrosion content in 49 CFR 192.479 via coating-related instructions in O-16, E-30, and TD-4430P-02. The guidance should be consolidated to ensure proper implementation. PG&E's proposed standard TD-4188S exactly mirrors 49 CFR 192.479. Benchmarking and review of industry standards yielded minimal information pertaining to design for prevention of atmospheric corrosion. As such, it is not possible to confirm PG&E's alignment with best practices.

- *Each operator must clean and coat each pipeline or portion of pipeline that is exposed to the atmosphere, except pipelines under paragraph (c) of this section. [49 CFR 192.479(a)]*

- *Coating material must be suitable for the prevention of atmospheric corrosion. [49 CFR 192.479(b)]*
- *Except portions of pipelines in offshore splash zones or soil-to-air interfaces, the operator need not protect from atmospheric corrosion any pipeline for which the operator demonstrates by test, investigation, or experience appropriate to the environment of the pipeline that corrosion will - (1) only be a light surface oxide; or (2) not affect the safe operation of the pipeline before the next scheduled inspection. [49 CFR 192.479(c)]*

Subtopic: Monitoring Scope, Location, and Frequency

Current Status	Future Status
Black	Black

Summary:

Contrary to PHMSA Part 192 Guidance clarification of 49 CFR 192.481, there are no existing or planned atmospheric corrosion inspection requirements for customer meters (which are part of service lines). TD-4412P-07 covers atmospheric corrosion monitoring of local transmission and distribution services, but specifically excludes customer riser pipes and customer meter and regulator sets. Future guidance document TD-4188S (p. 3) indicates that customer riser pipes and customer meter and regulator sets will be covered by a forthcoming document TD-4110P-06 "Field Inspections of Gas Facilities."

- *This interpretation clarifies that customer meter sets are part of service lines, and that the sets are subject to the same inspection requirements as service lines; and include monitoring for atmospheric corrosion under §192.481. [PHMSA Part 192 Guidance, p. 116]*

In addition, PG&E presently only addresses the inspection of air-to-soil transitions or corrosion-under-insulation for transmission stations (TD-4430P-02), not for GD, LT, and BB, as required by 49 CFR 192.481(b). Future guidance document TD-4188S applies to all pipeline, remedying this omission. The atmospheric corrosion monitoring frequencies outlined in Utility Procedure TD4412P-07 and proposed guidance document TD-4188S are aligned with 49 CFR 192.481(a) (*i.e.*, at least once every three calendar years for onshore piping).

- *During inspections the operator must give particular attention to pipe at soil-to-air interfaces, under thermal insulation, under disbonded coatings, at pipe supports, in splash zones, at deck penetrations, and in spans over water. [49 CFR 192.481(b)]*

Note: A conflict exists between the atmospheric corrosion inspection frequency noted for backbone transmission and gas gathering in O-16 (annual) vs. TD4412P-07 (every three years). This discrepancy will no longer exist when O-16 is retired and proposed guidance TD-4188S comes into effect.

Subtopic: Troubleshooting and Remediation

Current Status	Future Status
Black	Black

Summary:

In contrast to PHMSA Part 192 Guidance (p. 122), PG&E does not specifically instruct that atmospheric corrosion issues must be remediated by the next inspection date in either current or future documentation. This was recently identified in a PG&E self-report dated February 11, 2014.

- *If the operator identified areas of atmospheric corrosion during an inspection, those areas must be protected before the next scheduled inspection. If corrosion is found that might jeopardize the integrity of the pipeline prior to the next scheduled inspection, then more prompt remedial action may be required under §192.485 or §192.487. [PHMSA Part 192 Guidance, p. 122]*

In addition, although not a code violation, as this topic is covered by existing general corrosion remediation guidance, current PG&E documentation does not specifically address atmospheric corrosion remediation. Future document TD-4188S directly addresses 49 CFR 192.481(c), which states that protection must be provided against atmospheric corrosion found during an inspection.

- *If atmospheric corrosion is found during an inspection, the operator must provide protection against the corrosion as required by § 192.479. [49 CFR 192.481(c)]*

Subtopic: Operator Qualification and Training

Current Status	Future Status
Green	Green

Summary:

PG&E has developed OQ 03-04 Atmospheric Corrosion/Monitor and 03-05 Pipe Inspection. As the content of these PG&E documents were not reviewed, PG&E should consider ensuring that their OQ procedures are consistent with applicable ASME B31Q tasks: 0141 Visual Inspection for Atmospheric Corrosion, 0151 Visual Inspection of Buried Pipe and Components When Exposed, and 0191 Measure Atmospheric Corrosion.

Subtopic: Documentation and Recordkeeping

Current Status	Future Status
Amber	Amber

Summary:

PG&E's current atmospheric corrosion documentation procedures appear to be consistent with those in PHMSA Part 192 Guidance (p. 117-118), which states that operators should record the results of examinations as required in written procedures. While routine atmospheric corrosion inspections are tracked in electronic databases such as SAP and PLM, efforts should be made to track atmospheric corrective work in the aforementioned databases. PG&E's TD-4188P-01 "Atmospheric Corrosion Inspection Procedure" document, which is slated to provide details on the maintenance of atmospheric corrosion inspection records, is under development and cannot be assessed.

12. Equipment and Calibration

Subtopic	Current[1]	Future[2]
General Guidance/Scope	Red	Red
Acceptance Criteria	n/a	n/a
Design	n/a	n/a
Monitoring Scope, Locations, and Frequency	n/a	n/a
Troubleshooting and Remediation	n/a	n/a
Operator Qualification and Training	n/a	n/a
Documentation and Recordkeeping	Amber	Amber

[1] "Current" column compares PG&E standards currently in place (as of 10/11/13) to industry standards, benchmarking, and federal regulations
[2] "Future" column compares PG&E standards under revision (as of 10/31/13) to industry standards, benchmarking, and federal regulations

Subtopic: General Guidance/Scope

Current Status	Future Status
Red	Red

Summary:

In contrast to industry standards, PG&E does not explicitly instruct that all measurement instrumentation be calibrated *e.g.*, dry film thickness gauge, pipeline current mappers. In some instances, like for ground resistance testers, calibration instructions are provided in job aids versus standards. In the specific context of reference electrode calibration, NACE SP0207 specifies a maximum voltage difference of 5 mV between a master reference electrode and another reference electrode; PG&E Form FO-71-A allows for ± 10 mV. PG&E's reference electrode, multimeter, and digital potential meters calibration frequencies appear to be consistent with the guidance found in best practices. However, PG&E does not provide calibration frequency requirements for other measurement instrumentation.

- *The thickness of the finished cured coating system shall be checked and verified using a dry-film thickness gauge that has been properly calibrated using certified coating thickness calibration standard chips. [NACE RP0402, 8.1.4]*
- *Instrumentation (e.g., permanent reference electrodes, measuring and regulating devices, telemetry) shall be kept in good working order and shall be subjected to periodical calibration and safety checks. [BS EN 13636, 10.3.2]*

EXHIBIT JAL-11

GTS-RateCase2015_DR_IP_002-Q115

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-115		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q115		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	April 11, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Sara Peralta	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 7 – CORROSION CONTROL

QUESTION 115

On Page 7-6, Lines 2 to 3, PG&E states that is forecasted costs for corrosion control overhaul "reflects a large amount of routine work which customers have not funded in the past …."

a. Did PG&E propose to undertake all of the routine work referenced on lines 2 to 3 in any past rate case? If so, please identify the routine work proposed, the applicable rate case proceeding in which it was proposed, and whether the Commission granted or denied PG&E's request.

b. What is the reason for why customers did not fund the routine work in the past?

c. Why should customers now fund work to overhaul corrosion control?

d. Please provide a list and the associated cost from 2003 to 2014 for each instance of routine work related to corrosion control in which customers did not fund the work.

ANSWER 115

a. No, PG&E did not forecast all of the routine work referenced in lines 2 to 3 in any prior rate case. As stated in PG&E's 2015 Gas Transmission and Storage (GT&S) Rate Case testimony at page 7-5, lines 9 through 24:

> Historically, PG&E's corrosion control programs were organized and managed in a decentralized manner. … PG&E undertook a high-level review of its corrosion control programs to better understand how it compares to best practices in the industry for managing various types of corrosion as well as the way industry-leading companies organize and implement corrosion control. This review found PG&E's decentralized approach out of alignment with current industry best practices. Moreover, in 2013, our asset and risk management processes identified corrosion as one of the top threats to PG&E's natural gas transmission

and storage assets. As a result, PG&E decided to revamp its corrosion control process, establish it under a centralized authority and begin the process of moving towards industry best practices to better identify and assess the risks arising from corrosion and prioritize the mitigation efforts to reduce it.

Therefore PG&E is planning and forecasting more routine work than PG&E forecasted in prior GT&S rate cases, and has already begun to expand the scope of its corrosion-control program beyond what was forecast in the 2011 GT&S rate case. The corrosion control forecasts in the 2015 GT&S testimony for Chapter 7 are a combination of continuing work that was previously forecasted in past GT&S rate cases and work that was not previously forecasted which PG&E has now identified as reasonable and consistent with industry best practices. The following table identifies PG&E's forecast corrosion control programs, whether they were included within prior GT&S forecasts, and, if so, whether PG&E is now forecasting an expanded scope of work within the program:

Description	Previously Proposed in a GT&S rate case (Yes/No)	Forecasting Expanded Scope of Work (Yes/No)
Cathodic Protection Rectifier	Yes	No
Cathodic Protection Monitoring	Yes	Yes
Cathodic Protection Resurvey	Yes	Yes
Cathodic Protection Troubleshooting	Yes	No
CP Corrective Maintenance	Yes	No
CP Systems – Replace/New	Yes	Yes
Coupon Test Stations	No	NA
Corrosion Investigations	No	NA
Close Interval Survey	No	NA
AC Interference	No	NA
DC Interference	No	NA
Casings	No	NA
Internal Corrosion	No	NA
Atmospheric Corrosion Inspection and Mitigation	No	NA

The Commission approved an overall revenue requirement in PG&E's Gas Accord V, with the exception of certain specific funding areas (which did not include corrosion). The decision did not specifically approve or disapprove of funding for corrosion-related work.

b. See response to (a) above.

c. PG&E is not asking for customer funding to overhaul its corrosion control program. Rather, PG&E is forecasting the necessary corrosion-control work consistent with meeting all federal requirements and industry best practice, as required by Senate Bill 705. The forecast work and associated costs are reasonable to achieve the appropriate level of risk reduction for the corrosion control program over a reasonable time period.

d. As stated in testimony for Chapter 7 on page 7-15, line 30 to page 7-16, line 2: "PG&E redesigned its Major Work Category's (MWCs) and Maintenance Activity Types (MAT) in 2012 to better identify and group the costs of work being performed in Gas Operations. This redesign resulted in changes to the MWCs that recorded costs for PG&E's corrosion control efforts. Historically, corrosion control expense work was combined with other maintenance work in MWC BX." As such, PG&E cannot compare the cost of corrosion control work performed in the past to the forecast cost or to the adopted amount that might be imputed based on the CPUC's decisions. As shown on Slide 18 of the PG&E Corporation Fourth Quarter Earnings Call included in attachment GTS-RateCase2015_DR_IP_002-Q115Atch01, through 2013 PG&E spent approximately $500 million more than it was authorized to recover through the Gas Accord V decision, and expects to spend another $760 million more than it is authorized to recover from customers. As stated in Chapter 7, pages 7-1 through 7-2, PG&E expects to incur $21 million in capital and $58 million in expense through 2017 to bring its program into compliance. PG&E has excluded these costs from its forecast.

EXHIBIT JAL-12

GTS-RateCase2015_DR_IS_004-Q014

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_004-Q14		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_004-Q14		
Request Date:	June 6, 2014	Requester DR No.:	004
Date Sent:	June 25, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Sara Peralta Burke	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: WITNESS SARA PERALTA, CHAPTER 7 – CORROSION CONTROL

QUESTION 14

In PG&E response IP002-Q115, PG&E stated "PG&E did not forecast all of the routine work [to be done in 2015 to 2017] in any prior rate case" because "[h]istorically, PG&E's corrosion control programs were organized and managed in a decentralized manner."

(a) What corrosion control work is PG&E aware of that occurred between 2003 and 2013? Please provide an explanation of all known work, including costs.

ANSWER 14

(a) Data requested prior to 2009 is not readily available. See tables below for the work performed by program and associated costs for 2009 through 2013. The explanation for the work contained in each program is in PG&E's 2015 Gas Transmission and Storage Rate Case Chapter 7 testimony beginning on page 7-13. Much of the same corrosion control work shown for 2009-2013 was also performed between 2003-2008 either as a routine maintenance activity or as a reactive measure (not addressed proactively through a formal program with an annual scope). Work that was not done during this time period includes the newly proposed work which PG&E has not implemented yet as discussed in IP004-Q15c.

Capital ($)

Program	2009 Recorded	2010 Recorded	2011 Recorded	2012 Recorded	2013 Recorded
CP Systems - Replace	1,032,995	1,604,562	3,400,067	3,205,442	2,262,510
CP Systems - New	2,297,336	2,446,534	576,714	779,392	2,300,708
Coupon Test Stations	80,615	696,002	999,572	943,112	2,223,346
AC Interference Mitigation	-	-	120,849	268,088	423,355
DC Interference Mitigation	-	66,118	664,634	936,396	4,119,132
Casings	5,932	44,682	62,462	2,029,729	1,721,072
Internal Corrosion	76	90	47,661	32,026	151,871

Expense ($)

Program	2009 Recorded	2010 Recorded	2011 Recorded	2012 Recorded	2013 Recorded
Cathodic Protection Rectifier	-	-	-	11,443	137,942
Cathodic Protection Monitoring	636,953	714,766	800,538	927,973	1,097,385
Cathodic Protection Resurvey	43,323	92,510	94,061	48,300	23,074
Cathodic Protection Troubleshooting	21,932	5,436	8,840	3,410	102,383
CP Corrective Maintenance	433,522	401,941	425,614	640,252	999,854
CP Systems - Replace	-	1,264	-	-	351,361
Coupon Test Stations	-	-	-	-	53,997
Corrosion Investigations	756,806	(447)	1,009,677	2,287,863	2,085,722
Close Interval Survey	-	-	-	-	107,849
AC Interference	-	-	(393)	-	849,634
DC Interference	-	-	-	84	82,134
Casings (testing and mitigation)	-	-	209,574	3,415,928	3,111,214
Internal Corrosion	-	-	-	-	314,101
Atmospheric Corrosion Inspection and Mitigation	24,976	283,404	296,507	1,114,912	721,201
Corrosion Engineering Support	-	-	-	-	1,375,064

EXHIBIT JAL-13

GTS-RateCase2015_ORA_073-13, Att.1, attached as JAL-10

EXHIBIT JAL-14

GTS-RateCase2015_ORA_073-13, Att. 1, p. 2

Table 1 Modified RAG or "BRAG" status key showing color, associated meaning, and quality metric.

Color	Meaning	Quality Metric
n/a	Not applicable	n/a
Black	Guidance documentation is non-compliant	0
Red	Guidance documentation is minimally compliant and/or minimally aligned with best practices	1
Amber	Guidance documentation is compliant and partially aligned with best practices	2
Green	Guidance documentation is compliant and aligned with best practices	3

Note: For a topic with seven assessed subtopics, the target quality metric is 21. For topics with fewer than seven assessed subtopics (*i.e.*, certain subtopics are assigned n/a indicators), the target quality metric is scaled accordingly. Topic and subtopic quality metrics are presented in terms of a percentage.

Based upon analysis of current guidance documents, the corrosion control program status findings are as follows (Figure 1):

- 15% of the assessed subtopics (10/66) were deemed non-compliant with federal code.
- 65% of the assessed subtopics (43/66) exhibited room for improvement with respect to compliance with federal code and/or alignment with best practices.
- 20% of the assessed subtopics (13/66) were deemed compliant with federal code and aligned with best practices.

Based upon analysis of future guidance documents, the corrosion control program status findings are as follows (Figure 2):

- 8% of the assessed subtopics (5/65) were deemed non-compliant with federal code.
- 63% of the assessed subtopics (41/65) exhibited room for improvement with respect to compliance with federal code and/or alignment with best practices.
- 29% of the assessed subtopics (19/65) were deemed compliant with federal code and aligned with best practices.

Review of future versus current PG&E guidance documents revealed that the number of non-compliant subtopics dropped from 15% to 8% (*i.e.*, 10/66 to 5/65).

Status indicators were quantified via a "quality metric" in order to compare and rank PG&E's corrosion control program health by topic and subtopic. The target quality metric for a given topic and subtopic is 100%. As shown graphically in Figure 3, the following trends were observed with respect to topic (*i.e.*, programmatic) BRAG status:

- Based upon analysis of current guidance documents:
    - General Cathodic Protection (20%) and Alternating Current (AC) Interference (29%) rank lowest in terms of quality metric.

EXHIBIT JAL-15

GTS-RateCase2015-DR_TURN_008-Q004(d)

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	TURN_008-04		
PG&E File Name:	GTS-RateCase2015_DR_TURN_008-Q04		
Request Date:	March 3, 2014	Requester DR No.:	TURN-8
Date Sent:	March 10, 2014	Requesting Party:	The Utility Reform Network
PG&E Witness:	Bennie Barnes	Requester:	Tom Long

QUESTION 4

Regarding the Vintage Pipe Replacement Program,

a. Please provide the table, Vintage Pipe Replacement, on pp.WP 4A 711-721 as a functioning worksheet.

b. It appears to TURN that the priority set for the vintage pipe replacement projects is based strictly on the percentage reduction in total occupancy at risk.

   i. Is this the case?

   ii. If not, please explain PG&E's methodology for setting the priority for these projects

c. In locations in which land movement could damage vintage pipe, has PG&E evaluated the likelihood and likely severity of land movement?

d. Has PG&E evaluated the candidate projects for the Vintage Pipe Replacement Program in a model such as that used by Willbros Engineers, to evaluate the risk impact of untested sections of pipeline?

ANSWER 4

a. Please see PG&E's response to TURN_005-Q01 for functioning spreadsheets of all Chapter 4A workpapers.

b.

   i. Yes, the goal of the Vintage Pipe Replacement program is to reduce the risk caused by vintage construction and fabrication threats interacting with the threat of land movement. To accomplish this, the target is to reduce the risk generated by these interacting threats for over 90 percent of the population living within the Potential Impact Radius (PIR) of PG&E's pipelines by the end of 2017.

   ii. N/A

c. Yes, PG&E used the fact that these locations are vintage construction (known locations containing wrinkle bends, dresser couplings or expansion joints, and pre-1962 miter bends, for example) in locations that are in areas of known or moderate to high potential for land movement. These locations inherently have a higher likelihood for this interactive threat to exist. In order to generate the population of 370 miles within the Vintage Pipe Replacement program, PG&E overlaid the locations of known vintage construction and fabrication methods with California United States Geological Survey (USGS) landslide susceptibility data. This is monitored through an annual threat analysis process for the Weather Related Outside Force (WROF) threat. PG&E is also in the process of further refining its knowledge of site-specific land movement and PG&E has included a forecast in the 2015 Rate Case period for a program called, "Geo-Hazard Threat Identification and Mitigation". The details of this program are explained in testimony, pages 4A-59 through 4A-63. PG&E has also trained its pipeline patrol crews in identifying features indicative of land movement to also improve our knowledge of site-specific land movement. That data is also used to inform the threat identification process and it is used in PG&E's risk analysis algorithm.

d. PG&E has not yet formally completed a relative prioritization of these potential projects using the likelihood of failure component. The primary reason this was not done is that these interactive threats were identified as the greatest unmitigated risk to the Transmission pipeline system. As such, all of the Vintage Pipe Replacement program sites are relatively high risk in relationship to other programs. For example, the Investment Planning risk analysis model was used to place this program in the high risk category (see TURN_001-Q01 for detailed documentation of the risk prioritization process). As stated in testimony, page 4A-59, "we will use the revenues authorized to continue to reduce risk posed by the threat of construction defects interacting with land movement." For the purposes of this program the goal was to quickly reduce the consequential component of risk by reducing the risk of these interacting threats to 90 percent of the population living within the PIR of PG&E's pipelines by the end of 2017.

EXHIBIT JAL-16

GTS-RateCase2015_DR_ORA_056-Q003

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	ORA_056-03		
PG&E File Name:	GTS-RateCase2015_DR_ORA_056-Q03		
Request Date:	May 29, 2014	Requester DR No.:	ORA-GT&S-56
Date Sent:	June 13, 2014	Requesting Party:	Office of Ratepayer Advocates
PG&E Witness:	Bennie Barnes	Requester:	Tom Roberts Nathaniel Skinner

SUBJECT: VINTAGE PIPELINE REPLACEMENT PROGRAM ("VIPER") COST ESTIMATE

Note for all questions: In many of the following requests, a basis question is asked which is followed by more detailed questions in sub questions labeled a, b, c, etc. All parts of the question must be addressed, including the basic question, for the response to be considered complete. All references to pages, figures, and tables are to the application and workpapers filed December 19, 2013 in this proceeding. Provide all files in their native format. Where files are linked, provide files grouped such that links can remain active. If links cannot be maintained, explain why and provide versions of the files that provide the maximum degree of functionality, e.g. active formulas, macros, and links within files.

QUESTION 3

Please provide all workpapers, analyses, and calculations supporting PG&E's requested unit costs as provided on page WP 4A-722. This response should show which projects were used in the derivation of each of the three proposed unit costs.

ANSWER 3

Please see the table below for projects used to derive the Vintage Pipeline Replacement Program unit costs. Please note that the data that was used to develop the cost estimates was as of 3/20/2013. Average costs per foot were rounded to the nearest hundred dollars, yielding the unit costs that are found in the workpapers on page WP 4A-722.

PSEP Project #	Route	Diameter Range	Estimate at Completion (Includes Actuals & Forecasts)	Miles	Cost ($/Ft)
R-004	142S	< 12"	$ 5,414,078	1.04	$ 986
				Ave Cost/Ft	$ 986

R-006	111A	12" - 24"	$ 33,382,484	9.45	$ 669
R-037	172A	12" - 24"	$ 18,331,009	3.19	$ 1,088
R-061	196A	12" - 24"	$ 35,432,204	2.06	$ 3,258
R-066	119B	12" - 24"	$ 8,083,158	2.00	$ 765
				Ave Cost/Ft	$ 1,080

R-022	109	24"+	$ 46,132,492	3.26	$ 2,680
R-030	109	24"+	$ 20,851,345	1.61	$ 2,453
R-047	109	24"+	$ 4,885,313	0.47	$ 1,969
R-049	109	24"+	$ 6,714,142	0.67	$ 1,898
				Ave Cost/Ft	$ 2,476

*** Data as of 3/20/2013 ***

EXHIBIT JAL-17

GTS-RateCase2015_DR_IP_004-Q006(a)(i)

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_004-Q06		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_004-Q06		
Request Date:	June 6, 2014	Requester DR No.:	004
Date Sent:	June 20, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Bennie Barnes (a-b) Chuck Marre (c-d)	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: WITNESS BENNIE BARNES, CHAPTER 4A – TRANSMISSION PIPE INTEGRITY AND EMERGENCY RESPONSE PROGRAMS

QUESTION 6

In regards to cost for the Vintage Pipeline Replacement Program:

(a) What is the average per mile cost of pipe replacement under the Vintage Pipe Replacement Program?

(i) What method did PG&E use to determine the average per mile cost of pipe replacement under the Vintage Pipe Replacement Program?

(ii) Please provide in electronic format all documents, models, methodologies, or any other related source used to determine the average per mile cost of pipe replacement under the Vintage Pipe Replacement Program.

(b) For vintage pipe replacement, does PG&E consider the pipe that it replaces to be in-service, out-of-service, or both?

(i) Please provide PG&E's reasoning for the in-service/out-of-service classification.

(ii) Please provide total miles of Vintage Pipe Replacement pipe classified as in-service.

(iii) Please provide total miles of Vintage Pipe Replacement pipe classified as out-of-service.

(c) If PG&E considers the pipe that is replaced under the Vintage Pipe Replacement Program as out of service:

(i) Does PG&E consider that same pipe as the retirement of an asset? Please provide the reasoning for this answer.

(ii) Will the asset remain in PG&E's rate base?

(iii) If the asset does not remain in PG&E's rate base, how will PG&E recover any remaining asset balance?

(iv) Does PG&E seek cost recovery for pipe that is replaced under the Vintage Pipe Program that is classified as out-of-service? Please provide the total amount of cost recovery PG&E seeks from pipe that is replaced and taken out-of-service.

(v) Please explain why PG&E seeks cost recovery for pipe that is replaced and taken out-of-service.

(d) If PG&E considers the pipe that is replaced under the Vintage Pipe Replacement Program as in-service:

(i) Does PG&E consider that same pipe as the retirement of an asset? Please provide the reasoning for this answer.

(ii) Will the asset remain in PG&E's rate base?

(iii) If the asset does not remain in PG&E's rate base, how will PG&E recover any remaining asset balance?

(iv) Does PG&E seek cost recovery for pipe that is replaced under the Vintage Pipe Program that is classified as in-service? Please provide the total amount of cost recovery PG&E seeks from pipe that is replaced and taken out-of-service.

(v) Please explain why PG&E seeks cost recovery for pipe that is replaced but remains in-service.

ANSWER 6

(a) The per mile cost of pipe replacement under the Vintage Pipe Replacement Program can be found in workpapers on page WP 4A-722 and is based on three different diameter ranges shown in the workpaper.

(i) PG&E identified populations of projects from its Pipeline Safety Enhancement Plan (PSEP) in diameter ranges in congested areas that were representative of the population of pipe planned for replacement during the 2015 Gas Transmission and Storage (GT&S) Rate Case period from actual PSEP expenditures from 2012 and 2013. The results of this analysis are contained in the "Unit Cost Analysis" table on page WP 4A-722.

(ii) Please see the response to ORA_056-Q03 for the projects used to derive the unit costs that are shown in workpapers on page WP 4A-722.

(b) The vintage pipe (or original pipe) is considered in-service (i.e., used and useful) until such time that it is replaced. Once the replacement pipe (i.e., newly installed pipe) is installed, the vintage pipe is no longer used and useful and considered out-of-service. PG&E considers the newly installed pipe, which replaces the vintage pipe, to be in-service pipe (i.e., used and useful).

(i) PG&E's reasoning for the in-service classification is that each piece of pipe is a replacement unit that is being used in operation.

(ii) All pipe within the Vintage Pipe Replacement Program as identified in testimony on page 4A-52 is classified as in-service.

(iii) None of the pipe within the Vintage Pipe Replacement Program as identified in testimony on page 4A-52 is classified as out-of-service. The pipe will not be classified as out-of-service until it is replaced.

(c) The vintage pipe (or original pipe) is considered in-service (i.e., used and useful) until such time that it is replaced. Once the replacement pipe (i.e., newly installed pipe) is installed, the vintage pipe is no longer used and useful and considered out-of-service. PG&E considers the newly installed pipe, which replaces the vintage pipe, to be in-service pipe (i.e., used and useful).

(i) The vintage pipe (or original pipe), once replaced, is no longer used and useful, is considered out-of-service, and is retired.

(ii) Assets in the Vintage Pipe Replacement Program that are no longer used and useful are retired. Under the group depreciation method utilized by PG&E, upon retirement of an asset, the cost of the asset is credited to the asset account and debited to the accumulated depreciation account. Throughout the life of the asset, the asset is depreciated until it is no longer in use and is retired. Under group accounting, it is assumed that retired assets have achieved their service lives and are fully depreciated; i.e., there is no remaining amount to recover once retired.

(iii) See the response to subpart (c) (ii).

(iv) See the response to subpart (c) (ii).

(v) See the response to subpart (c) (ii).

(d) See the response to part (c).

(i) See the response to subpart (c) (i).

(ii) See the response to subpart (c) (ii).

(iii) See the response to subpart (c) (ii).

(iv) See the response to subpart (c) (ii).

(v) See the response to subpart (c) (ii).

EXHIBIT JAL-18

GTS-RateCase2015_DR_TURN_008-Q004.d

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	TURN_008-04		
PG&E File Name:	GTS-RateCase2015_DR_TURN_008-Q04		
Request Date:	March 3, 2014	Requester DR No.:	TURN-8
Date Sent:	March 10, 2014	Requesting Party:	The Utility Reform Network
PG&E Witness:	Bennie Barnes	Requester:	Tom Long

QUESTION 4

Regarding the Vintage Pipe Replacement Program,

a. Please provide the table, Vintage Pipe Replacement, on pp.WP 4A 711-721 as a functioning worksheet.

b. It appears to TURN that the priority set for the vintage pipe replacement projects is based strictly on the percentage reduction in total occupancy at risk.

   i. Is this the case?

   ii. If not, please explain PG&E's methodology for setting the priority for these projects

c. In locations in which land movement could damage vintage pipe, has PG&E evaluated the likelihood and likely severity of land movement?

d. Has PG&E evaluated the candidate projects for the Vintage Pipe Replacement Program in a model such as that used by Willbros Engineers, to evaluate the risk impact of untested sections of pipeline?

ANSWER 4

a. Please see PG&E's response to TURN_005-Q01 for functioning spreadsheets of all Chapter 4A workpapers.

b.

   i. Yes, the goal of the Vintage Pipe Replacement program is to reduce the risk caused by vintage construction and fabrication threats interacting with the threat of land movement. To accomplish this, the target is to reduce the risk generated by these interacting threats for over 90 percent of the population living within the Potential Impact Radius (PIR) of PG&E's pipelines by the end of 2017.

   ii. N/A

c. Yes, PG&E used the fact that these locations are vintage construction (known locations containing wrinkle bends, dresser couplings or expansion joints, and pre-1962 miter bends, for example) in locations that are in areas of known or moderate to high potential for land movement. These locations inherently have a higher likelihood for this interactive threat to exist. In order to generate the population of 370 miles within the Vintage Pipe Replacement program, PG&E overlaid the locations of known vintage construction and fabrication methods with California United States Geological Survey (USGS) landslide susceptibility data. This is monitored through an annual threat analysis process for the Weather Related Outside Force (WROF) threat. PG&E is also in the process of further refining its knowledge of site-specific land movement and PG&E has included a forecast in the 2015 Rate Case period for a program called, "Geo-Hazard Threat Identification and Mitigation". The details of this program are explained in testimony, pages 4A-59 through 4A-63. PG&E has also trained its pipeline patrol crews in identifying features indicative of land movement to also improve our knowledge of site-specific land movement. That data is also used to inform the threat identification process and it is used in PG&E's risk analysis algorithm.

d. PG&E has not yet formally completed a relative prioritization of these potential projects using the likelihood of failure component. The primary reason this was not done is that these interactive threats were identified as the greatest unmitigated risk to the Transmission pipeline system. As such, all of the Vintage Pipe Replacement program sites are relatively high risk in relationship to other programs. For example, the Investment Planning risk analysis model was used to place this program in the high risk category (see TURN_001-Q01 for detailed documentation of the risk prioritization process). As stated in testimony, page 4A-59, "we will use the revenues authorized to continue to reduce risk posed by the threat of construction defects interacting with land movement." For the purposes of this program the goal was to quickly reduce the consequential component of risk by reducing the risk of these interacting threats to 90 percent of the population living within the PIR of PG&E's pipelines by the end of 2017.

EXHIBIT JAL-19

GTS-RateCase2015_DR_IP_002-Q85Atch04

Item Number	ROUTE	SEGMENT NUMBER	Mile Point 1	Mile Point 2	LENGTH (Miles)	RISK
1	100	101.2	138.45804	139.277	0.81896	HIGH
2	101	121	11.62	11.92	0.3	HIGH
3	101	124	12.65	12.83484	0.18484	HIGH
4	101	152.6	24.89	24.9	0.01	HIGH
5	101	157.4	27.77224	27.91	0.13776	HIGH
6	101	178	35.69	36.51	0.82	HIGH
7	101	180.6	39.23041	39.73738	0.50697	HIGH
8	101	180.8	39.80901	39.85	0.04099	HIGH
9	101	184	40.83	41.49	0.66	HIGH
10	101	185.6	41.62	41.66	0.04	HIGH
11	101	187	41.67	41.70137	0.03137	HIGH
12	101	188	41.99	42.1	0.11	HIGH
13	101	188.6	42.1	42.17	0.07	HIGH
14	101	190.5	42.23953	42.29	0.05047	HIGH
15	101	194	42.98	43.19	0.21	HIGH
16	101	197	43.3	43.5	0.2	HIGH
17	101	198.3	43.85	43.87	0.02	HIGH
18	101	198.6	43.87	43.92	0.05	HIGH
19	108	107.1	3.61	4.57	0.96	HIGH
20	108	124	12.5958	12.7512	0.1554	HIGH
21	108	141	37.17	37.3178	0.1478	HIGH
22	108	165.1	48.90605	49.03021	0.12416	HIGH
23	108	165.2	49.03021	49.19	0.15979	HIGH
24	109	136.97	13.99	14.67057	0.68057	HIGH
25	109	137	15	15.38376	0.38376	HIGH
26	109	139.2	17.10522	17.36311	0.25789	HIGH
27	109	141	17.3796	18.60914	1.22954	HIGH
28	109	185.352	39.44331	40.01468	0.57137	HIGH
29	109	195.5	45.22	45.24	0.02	HIGH
30	109	222.6	48.02	48.11	0.09	HIGH
31	109	228.4	49.87373	50.04	0.16627	HIGH
32	121	101	0	0.94	0.94	HIGH
33	123	116.09	10.93833	11.03	0.09167	HIGH
34	123	116.86	11.56647	11.71969	0.15322	HIGH
35	131	136.6	31	31.89773	0.89773	HIGH
36	132	144	13.95	14.01077	0.06077	HIGH
37	132	153	18.59	19.42567	0.83567	HIGH
38	132	160.9	23.16365	23.42445	0.2608	HIGH
39	132	161.6	23.84134	24.1686	0.32726	HIGH
40	132	171	30.66864	30.95946	0.29082	HIGH
41	132	171.01	30.95946	31.00522	0.04576	HIGH
42	132	191.5	43.74843	44.1	0.35157	HIGH
43	138	111	20.35	20.39297	0.04297	HIGH
44	148	101	0.00138	1.58469	1.58331	HIGH

45	148	101.7	1.58572	1.63	0.04428	HIGH
46	148	116.5	16.30373	16.39592	0.09219	HIGH
47	173	112.7	12.39014	13.54578	1.15564	HIGH
48	173	112.8	13.54578	14.23314	0.68736	HIGH
49	196	102	0.8712	0.8858	0.0146	HIGH
50	314	101	0	3.8841	3.8841	HIGH
51	314	126	27.58	28.1141	0.5341	HIGH
52	314	127	28.1141	28.83	0.7159	HIGH
53	314	130.5	30.5	33.2995	2.7995	HIGH
54	402	144.8	32.87182	33	0.12818	HIGH
55	0210-01	117.05	3.66806	3.83869	0.17063	HIGH
56	0210-01	118.47	6.03347	6.18339	0.14992	HIGH
57	021A	100	12.0444	12.0465	0.0021	HIGH
58	021A	135	31.57	31.76	0.19	HIGH
59	021A	136	31.76	31.81	0.05	HIGH
60	021B	103.8	1.9127	1.93	0.0173	HIGH
61	021B	112.1	11.29774	11.3455	0.04776	HIGH
62	021B	112.2	11.3455	11.41774	0.07224	HIGH
63	021C	129.3	43.26	43.30855	0.04855	HIGH
64	021F	139	15.95	16.08183	0.13183	HIGH
65	021H	122.55	8.04707	8.06	0.01293	HIGH
66	021H	123	8.08	8.15348	0.07348	HIGH
67	021H	123.11	8.15348	8.17891	0.02543	HIGH
68	021H	123.13	8.35748	8.38766	0.03018	HIGH
69	021H	123.14	8.38766	8.71	0.32234	HIGH
70	0405-01	111.8	6.45885	6.91502	0.45617	HIGH
71	0405-01	117.25	11.64923	11.78596	0.13673	HIGH
72	0405-01	117.7	12.58073	13.0046	0.42387	HIGH
73	0405-01	117.74	13.00606	13.04493	0.03887	HIGH
74	0405-01	121.4	17.2323	17.52653	0.29423	HIGH
75	0405-01	124.14	20.1164	20.46024	0.34384	HIGH
76	0405-01	124.20	20.69723	20.8242	0.12697	HIGH
77	0405-01	124.25	20.8686	20.8694	0.0008	HIGH
78	0405-01	142.2	27.14	27.39	0.25	HIGH
79	0405-02	106	1.13	1.16004	0.03004	HIGH
80	0405-02	107	1.41	1.98783	0.57783	HIGH
81	050A	138	12.19	12.24109	0.05109	HIGH
82	057A-MD1	103.1	0.71584	0.81401	0.09817	HIGH
83	057A-MD1	103.15	0.81401	0.91	0.09599	HIGH
84	057A-MD1	103.2	0.91	0.912	0.002	HIGH
85	057A-MD1	103.4	0.912	0.93	0.018	HIGH
86	057A-MT	101.3	0.56	0.57	0.01	HIGH
87	057A-MT	101.6	0.57	0.58	0.01	HIGH
88	057B	101	0.02	0.3366	0.3166	HIGH
89	057B	101.2	0.3366	1.88	1.5434	HIGH
90	0605-03	112	0.00038	0.00524	0.00486	HIGH
91	0611-02	402.5	0.53	0.68513	0.15513	HIGH

92	0613-01	124	5.11256	5.29	0.17744	HIGH
93	0617-06	171	10.95398	11.00572	0.05174	HIGH
94	0617-10	104.5	2.36844	2.4912	0.12276	HIGH
95	0821-01	107.5	2.51	3.29	0.78	HIGH
96	0824-01	105.3	0.48	0.49	0.01	HIGH
97	111A	125	16.78	18.75	1.97	HIGH
98	118A	103.3	2.75214	2.83887	0.08673	HIGH
99	118A	160	25.01	25.64	0.63	HIGH
100	118A	166.13	30.38493	30.4	0.01507	HIGH
101	118A	166.17	30.4	31.06271	0.66271	HIGH
102	118A	247.7	83.55412	83.69	0.13588	HIGH
103	118B	136.1	18.47086	19.13679	0.66593	HIGH
104	119A	124	13.36	14.02	0.66	HIGH
105	119B	101.2	0.01765	0.58984	0.57219	HIGH
106	119B	102.5	0.5918	0.75	0.1582	HIGH
107	119C	101	0	1.14853	1.14853	HIGH
108	124A	101.03	0.24155	0.25653	0.01498	HIGH
109	124B	105	6.4576	6.70859	0.25099	HIGH
110	124B	112	9.845	10.45447	0.60947	HIGH
111	124B	118	14.98	15.7	0.72	HIGH
112	126A	102	3.08	3.95891	0.87891	HIGH
113	126A	103.3	4.09	4.90667	0.81667	HIGH
114	126A	112	9.6	10	0.4	HIGH
115	126B	105	2.73	3.63363	0.90363	HIGH
116	126B	105.5	3.63363	4	0.36637	HIGH
117	126B	106	4	4.60089	0.60089	HIGH
118	126B	106.8	5.1	5.13	0.03	HIGH
119	1302-01	102	0.03	0.12	0.09	HIGH
120	1302-02	101.5	0.0011	0.00211	0.00101	HIGH
121	1303-03	134	0.45	0.76	0.31	HIGH
122	137B	102.3	0.89278	1.29	0.39722	HIGH
123	137C	104	1.33	1.94	0.61	HIGH
124	1501-01	113	2.30606	3.89773	1.59167	HIGH
125	1504-02	101	0.00189	0.4386	0.43671	HIGH
126	1518-01	123	1.19744	1.29872	0.10128	HIGH
127	1519-01	101.6	0.42767	0.57054	0.14287	HIGH
128	1613-06	388	0.0019	0.0604	0.0585	HIGH
129	1614-08	313	0.7033	0.76032	0.05702	HIGH
130	1625-01	103	5.1	9	3.9	HIGH
131	1625-01	105	9.12	10.57451	1.45451	HIGH
132	1625-05	301	0	0.99	0.99	HIGH
133	162A	102.8	1.53071	1.68	0.14929	HIGH
134	177A	124	19.98	20.51364	0.53364	HIGH
135	177A	125	21	22.17	1.17	HIGH
136	177A	221.09	173.70659	173.87	0.16341	HIGH
137	177A	237.2	182.24269	183.13694	0.89425	HIGH
138	1813-02	152.7	1.11454	1.49	0.37546	HIGH

139	1815-02	207	14.55	14.60478	0.05478	HIGH
140	1816-01	208	1.33699	1.45457	0.11758	HIGH
141	1816-01	216	4.71868	4.7194	0.00072	HIGH
142	1816-01	216	6.86152	6.86879	0.00727	HIGH
143	1816-01	217.5	7.72687	8.1384	0.41153	HIGH
144	1816-01	229.7	13.55068	13.81	0.25932	HIGH
145	1816-01	232.2	14.2537	14.3611	0.1074	HIGH
146	1816-01	234.2	15.4306	15.78	0.3494	HIGH
147	1816-05	201	0.00019	0.00036	0.00017	HIGH
148	1816-15	309.5	0.72973	0.97757	0.24784	HIGH
149	1816-15	310	0.97757	1.71838	0.74081	HIGH
150	1817-01	103.6	0.9287	0.96025	0.03155	HIGH
151	1817-01	108	2.59051	2.9621	0.37159	HIGH
152	1818-01	115.7	2.16867	2.49	0.32133	HIGH
153	1818-01	116	2.49	2.69	0.2	HIGH
154	1818-01	116.5	2.69	2.81377	0.12377	HIGH
155	181A	102.5	15.4449	16.59561	1.15071	HIGH
156	181A	108.3	19.8	19.89	0.09	HIGH
157	191-1	110	21.68	22.11	0.43	HIGH
158	191-1	127.22	33.83401	34.02	0.18599	HIGH
159	196-6	1	0	0.0003	0.0003	HIGH
160	196A	103.4	2.08	2.6	0.52	HIGH
161	200-151	353.3	0	0	0	HIGH
162	200A-2	104	0.48712	0.48939	0.00227	HIGH
163	200B2-2	107	0.47	0.57	0.1	HIGH
164	300A	101.2	0.10259	0.12593	0.02334	HIGH
165	300A	102	0.14	0.2855	0.1455	HIGH
166	300A	102.5	0.2855	0.49	0.2045	HIGH
167	300A	103.2	0.54	0.64	0.1	HIGH
168	300A	103.9	0.71	0.79	0.08	HIGH
169	300A	104.11	0.81	0.82028	0.01028	HIGH
170	300A	104.12	0.82028	0.83607	0.01579	HIGH
171	300A	110.6	22.14	23.18	1.04	HIGH
172	300A	113	30.79	36.36	5.57	HIGH
173	300A	115.9	51	52.05	1.05	HIGH
174	300A	137.8	103.72	103.74	0.02	HIGH
175	300A	147	121.76	121.86826	0.10826	HIGH
176	300A	147.1	121.8722	122.08	0.2078	HIGH
177	300A	147.3	122.08	122.49	0.41	HIGH
178	300A	147.6	122.49	122.67878	0.18878	HIGH
179	300A	147.7	122.67878	122.68144	0.00266	HIGH
180	300A	147.95	122.68508	123.9	1.21492	HIGH
181	300A	149	125.39	127.02844	1.63844	HIGH
182	300A	149.1	127.0327	127.27538	0.24268	HIGH
183	300A	149.2	127.27538	127.92949	0.65411	HIGH
184	300A	149.5	127.933	128.69138	0.75838	HIGH
185	300A	157	135.85001	137.03	1.17999	HIGH

186	300A	165.2	149.66	150.26252	0.60252	HIGH
187	300A	165.3	150.26252	151.06	0.79748	HIGH
188	300A	165.8	151.066	153.53999	2.47399	HIGH
189	300A	166.6	154.17676	154.36	0.18324	HIGH
190	300A	167.0	154.36	154.46769	0.10769	HIGH
191	300A	167.2	154.46769	154.50999	0.0423	HIGH
192	300A	167.7	154.52004	154.66	0.13996	HIGH
193	300A	169.5	155.53	155.71409	0.18409	HIGH
194	300A	169.7	155.71409	156.39465	0.68056	HIGH
195	300A	172.5	159.33	159.38	0.05	HIGH
196	300A	172.7	159.38	160	0.62	HIGH
197	300A	183	180.64	180.95213	0.31213	HIGH
198	300A	184.1	181.44583	181.73	0.28417	HIGH
199	300A	185.2	181.9715	182.11	0.1385	HIGH
200	300A	185.5	182.12816	182.16	0.03184	HIGH
201	300A	185.6	182.16	182.33648	0.17648	HIGH
202	300A	186	186.09	187.83982	1.74982	HIGH
203	300A	186.5	187.85387	188.05	0.19613	HIGH
204	300A	187	188.05	188.40836	0.35836	HIGH
205	300A	223.2	248.63	248.64999	0.01999	HIGH
206	300A	260	313.82001	319.97	6.14999	HIGH
207	300A	274.9	353.56	353.67999	0.11999	HIGH
208	300A	291.5	372.49419	372.87	0.37581	HIGH
209	300A	356.41	462.41	462.42001	0.01001	HIGH
210	300A	385.5	483.22	483.3587	0.1387	HIGH
211	300A	294.5	483.3587	483.38394	0.02524	HIGH
212	300A	385.7	483.471	483.73922	0.26822	HIGH
213	300A	386.2	483.74259	484.01001	0.26742	HIGH
214	300A	392.45	486.62	486.95077	0.33077	HIGH
215	300A	394.6515	488.67173	488.77816	0.10643	HIGH
216	300A	394.653	488.78963	488.82896	0.03933	HIGH
217	300A	395.34	490.15	490.20001	0.05001	HIGH
218	300A	395.6	490.20001	490.48137	0.28136	HIGH
219	300A	395.4	490.20001	490.20001	0	HIGH
220	300A	397.5	490.67787	491.79999	1.12212	HIGH
221	300A	402.3	493.93549	494.91	0.97451	HIGH
222	300A	403	494.9437	495.48999	0.54629	HIGH
223	300B	101.045	0.12613	0.12887	0.00274	HIGH
224	300B	101.047	0.12887	0.15479	0.02592	HIGH
225	300B	101.09	0.15579	0.22174	0.06595	HIGH
226	300B	101.097	0.22345	0.23489	0.01144	HIGH
227	300B	101.1	0.23489	0.24738	0.01249	HIGH
228	300B	101.105	0.24738	0.44821	0.20083	HIGH
229	300B	117	7.75	8.86	1.11	HIGH
230	300B	155	116.72	121.44	4.72	HIGH
231	300B	170.9	143.304	144.07001	0.76601	HIGH
232	300B	186	153.39999	153.4817	0.08171	HIGH

233	300B	193	161.02	161.07001	0.05001	HIGH
234	300B	255.57	240.61284	241.33	0.71716	HIGH
235	300B	258.5	242.67401	242.95028	0.27627	HIGH
236	300B	263.9	248.6705	248.73165	0.06115	HIGH
237	300B	263.9	248.73165	248.74702	0.01537	HIGH
238	300B	264.9	249.09	249.22999	0.13999	HIGH
239	300B	273	264.36796	264.64154	0.27358	HIGH
240	300B	280.7	272.17637	272.40034	0.22397	HIGH
241	300B	345	372.62854	373	0.37146	HIGH
242	301A	125.5	21.3865	21.44126	0.05476	HIGH
243	301A	126	21.44126	21.7192	0.27794	HIGH
244	301A	126.5	21.71922	22.51	0.79078	HIGH
245	302-212	101.9	0.23	0.24	0.01	HIGH
246	316A	116	1.2302	1.68409	0.45389	HIGH
247	316A	116.5	1.68409	2.0537	0.36961	HIGH
248	316A	117	2.0537	2.3105	0.2568	HIGH
249	7211-01	105.7	2.77529	2.78497	0.00968	HIGH
250	7221-10	110.56	11.66792	11.82004	0.15212	HIGH
251	7222-01	170	13.15	13.46803	0.31803	HIGH
252	BD22	100	2.2	2.2	0	HIGH
253	DCUST10128	100	0	0.001	0.001	HIGH
254	DCUST1375	100	0	0	0	HIGH
255	DCUST1494	100	0	0	0	HIGH
256	DCUST1584	100	0	0	0	HIGH
257	DCUST1767	531	0	0.02	0.02	HIGH
258	DCUST1834	545	0	0.02	0.02	HIGH
259	DCUST1844	578	0	0.02	0.02	HIGH
260	DCUST2061	194	0	0.01	0.01	HIGH
261	DCUST2728	100	0	0	0	HIGH
262	DCUST2743	101	0	0	0	HIGH
263	DCUST2794	100	0	0	0	HIGH
264	DCUST2953	100	0	0	0	HIGH
265	DCUST6771	-	0	0.02	0.02	HIGH
266	DCUST7682	100	0	0.01	0.01	HIGH
267	DCUST8303	901	0	0.01515	0.01515	HIGH
268	DCUST8619	901	0	0	0	HIGH
269	DCUST8662	100	0	0	0	HIGH
270	DCUST871	101	0	0.1286	0.1286	HIGH
271	DCUST9805	901	0	0.02	0.02	HIGH
272	DF3319	701	39.86	39.86	0	HIGH
273	DFDS3552	703	0.00067	0.00568	0.00501	HIGH
274	DREG3796	100	0	0	0	HIGH
275	DREG3921	100	0	0	0	HIGH
276	DREG3936	100	0	0.02027	0.02027	HIGH
277	DREG3938	100	0	0	0	HIGH
278	DREG4187	807	0.37557	0.52311	0.14754	HIGH
279	DREG4933	113	0	0.01	0.01	HIGH

280	DREG5009	800	0	0.00189	0.00189	HIGH
281	DREG5130	551	0	0.04102	0.04102	HIGH
282	DREG5532	104	0	0.01	0.01	HIGH
283	DREG7160	101	0	0	0	HIGH
284	DREG8011	803	0.0036	0.01004	0.00644	HIGH
285	DSBN11232	224.3	0.20784	0.24439	0.03655	HIGH
286	DSBN13667	100	0	0.0161	0.0161	HIGH
287	DSBN13863	315.2	0.27364	0.73954	0.4659	HIGH
288	DSBN5747	213	0.38	0.62	0.24	HIGH
289	DSBN8866	204	0	0.02	0.02	HIGH
290	GCUST5778	101	0	0.0854	0.0854	HIGH
291	STA8897	101	0	0.01174	0.01174	HIGH
292	STA9296	100	0	0	0	HIGH
293	STUB10711	201	0	0.0036	0.0036	HIGH
294	STUB14000	100	0	0.00019	0.00019	HIGH
295	STUB6257	551	0	0	0	HIGH
296	STUB7528	163.1	0	0.00027	0.00027	HIGH
297	STUB7555	102	0	0	0	HIGH
298	X6511	704	0.289	0.337	0.048	HIGH
299	X6512	502	0	0.09	0.09	HIGH
300	X7598	101.5	0.00724	0.00799	0.00075	HIGH
301	300A	226.2	255.91	256.20999	0.29999	MEDIUM
302	300A	204.3	225.57001	226.52	0.94999	MEDIUM
303	300A	334.921	428.4827	428.5455	0.0628	MEDIUM
304	300B	366	426.68361	426.70001	0.0164	MEDIUM
305	300B	365.0	425.16	425.19	0.03	MEDIUM
306	300B	397	466	468.0746	2.0746	MEDIUM
307	300B	365.3	425.45001	425.54999	0.09998	MEDIUM
308	300A	391.8	485.82001	485.95001	0.13	MEDIUM
309	300A	398	492.15381	492.24095	0.08714	MEDIUM
310	300A	384.2	483.14794	483.20001	0.05207	MEDIUM
311	300A	341.10	440.95999	442.06563	1.10564	MEDIUM
312	300A	287	368.92999	371.81	2.88001	MEDIUM
313	300A	372	477.31271	477.76721	0.4545	MEDIUM
314	300B	332.5	355.14001	358.85001	3.71	MEDIUM
315	300A	327.8	410.73999	414.57272	3.83273	MEDIUM
316	300A	350.5	454.25575	454.32894	0.07319	MEDIUM
317	300A	409	497.70999	499.76526	2.05527	MEDIUM
318	300A	350.48	454.19062	454.25575	0.06513	MEDIUM
319	300A	368.1	472.08095	472.12789	0.04694	MEDIUM
320	300B	339	363.89001	367.62	3.72999	MEDIUM
321	300A	350.45	454.10962	454.19062	0.081	MEDIUM
322	300A	395.25	489.45999	489.66	0.20001	MEDIUM
323	300A	349.3	453.79528	453.82001	0.02473	MEDIUM
324	300A	350.54	454.33267	454.38334	0.05067	MEDIUM
325	300A	371.5	476.46129	476.60999	0.1487	MEDIUM
326	300A	226.605	256.22752	257.07626	0.84874	MEDIUM

327	300B	358.2	404.56	405.20999	0.64999	MEDIUM
328	300B	362.1	410.87429	413.10001	2.22572	MEDIUM
329	300A	336.10	429.5	429.51001	0.01001	MEDIUM
330	300A	329.61	422.78	422.7843	0.0043	MEDIUM
331	300A	338.41	436.73001	436.73999	0.00998	MEDIUM
332	300A	395.31	489.79999	489.84717	0.04718	MEDIUM
333	GCUST5902	406	0.89403	1.02	0.12597	MEDIUM
334	300A	348.9	453.597	453.72	0.123	MEDIUM
335	300A	371.8	477.0967	477.31271	0.21601	MEDIUM
336	300A	391.1	485.14139	485.16	0.01861	MEDIUM
337	142N	119	8.741	9.68	0.939	MEDIUM
338	142N	135	12.48	13.82	1.34	MEDIUM
339	142N	126	11	11.4	0.4	MEDIUM
340	142S	119	11.281	11.45854	0.17754	MEDIUM
341	142S	118.905	10.44611	11.27	0.82389	MEDIUM
342	187	101.5	1.00038	3.74	2.73962	MEDIUM
343	X6526	506	0.2432	0.25873	0.01553	MEDIUM
344	X6526	504.4	0.1553	0.2161	0.0608	MEDIUM
345	187	101.7	3.74	3.74	0	MEDIUM
346	164	306	0.61	2.31	1.7	MEDIUM
347	1211-01	102	0.21	1.02	0.81	MEDIUM
348	164	311	4.06	4.06	0	MEDIUM
349	138A	103	2	2.68	0.68	MEDIUM
350	138B	104	3.08	6.41626	3.33626	MEDIUM
351	138B	105	7	9.88	2.88	MEDIUM
352	187	144.4	46.5796	46.72636	0.14676	MEDIUM
353	187	144.1	45.11211	45.196	0.08389	MEDIUM
354	187	144.2	45.196	45.3682	0.1722	MEDIUM
355	187	142.3	44.8201	44.826	0.0059	MEDIUM
356	187	144.5	46.72636	46.7644	0.03804	MEDIUM
357	187	147.3	50.34	50.49	0.15	MEDIUM
358	187	148	50.49	51.15301	0.66301	MEDIUM
359	002	110.5	39.83	43.45	3.62	MEDIUM
360	187	154.2	58.47	58.4776	0.0076	MEDIUM
361	187	155	58.9053	59.3953	0.49	MEDIUM
362	DCUST2184	420	0	0.01	0.01	MEDIUM
363	DREG5356	702	0.00697	0.01	0.00303	MEDIUM
364	111A	110.2	8.64198	8.77	0.12802	MEDIUM
365	111A	108	5	8	3	MEDIUM
366	1813-02	176	13.3	14.1	0.8	MEDIUM
367	1813-02	172.3	12.95	13.01	0.06	MEDIUM
368	1813-02	178	14.24	14.49	0.25	MEDIUM
369	1815-15	102	0	0.18	0.18	MEDIUM
370	1813-02	179	14.49	15.06	0.57	MEDIUM
371	187	160.95	62.21823	62.44825	0.23002	MEDIUM
372	187	158.6	60.86	61.42	0.56	MEDIUM
373	187	161.5	62.51693	63	0.48307	MEDIUM

374	187	159.6	61.5	61.5	0	MEDIUM
375	DCUST1345	901	0	0.0108	0.0108	MEDIUM
376	138	130.05	38.46919	38.58	0.11081	MEDIUM
377	1209-01	102.6	1.01635	1.0416	0.02525	MEDIUM
378	1209-01	102.65	1.0416	1.23	0.1884	MEDIUM
379	300B	328	351.84	353.52684	1.68684	MEDIUM
380	DREG5385	301	0	0.01	0.01	MEDIUM
381	300A	376.6	480.69	480.70001	0.01001	MEDIUM
382	1209-01	106.5	5.41464	5.89243	0.47779	MEDIUM
383	DREG4518	801	0	0.01	0.01	MEDIUM
384	1209-02	205.5	0.61479	1.46945	0.85466	MEDIUM
385	1209-08	102	0.01731	2.4449	2.42759	MEDIUM
386	1220-01	218	0.57	0.86	0.29	MEDIUM
387	002	117	52.1	54.27	2.17	MEDIUM
388	301F	109	4.99	6.52	1.53	MEDIUM
389	300A	391.56	485.1816	485.7818	0.6002	MEDIUM
390	7207-01	101.5	0.0014	0.62941	0.62801	MEDIUM
391	103	141	23.82	24.04	0.22	MEDIUM
392	1881-01	205	1.31208	2.65	1.33792	MEDIUM
393	103	122.7	15.86285	16	0.13715	MEDIUM
394	103	122.6	15.64168	15.86285	0.22117	MEDIUM
395	103	122.5	15.22	15.63385	0.41385	MEDIUM
396	103	149	27.2687	27.6904	0.4217	MEDIUM
397	103	136.6	23.23886	23.2443	0.00544	MEDIUM
398	DREG4255	303	0.00579	0.01	0.00421	MEDIUM
399	103	126.45	19.50845	19.5442	0.03575	MEDIUM
400	1813-02	152	1.06	1.09395	0.03395	MEDIUM
401	103	122.3	15.2	15.22	0.02	MEDIUM
402	103	125.4	18.8234	18.8252	0.0018	MEDIUM
403	301B	110.65	6.89	6.9622	0.0722	MEDIUM
404	301B	110.8	7.1313	9.45	2.3187	MEDIUM
405	103	123	16	16.02736	0.02736	MEDIUM
406	103	123.3	16.02876	16.57	0.54124	MEDIUM
407	301B	110.5	5.14	5.15	0.01	MEDIUM
408	301B	112.7	10.58	10.97629	0.39629	MEDIUM
409	DFDS3572	205	0.00552	0.01	0.00448	MEDIUM
410	301B	110.63	5.95859	5.95915	0.00056	MEDIUM
411	301C	121	17.26	17.26	0	MEDIUM
412	103	126.0	19	19.24974	0.24974	MEDIUM
413	1202-16	102	0.49	1.03	0.54	MEDIUM
414	1202-16	113	1.51	1.67472	0.16472	MEDIUM
415	1217-01	105.5	2.61636	2.73	0.11364	MEDIUM
416	134A	122	18.32	18.99	0.67	MEDIUM
417	134A	121.5	17.73208	18.32	0.58792	MEDIUM
418	134A	123	19	19.35	0.35	MEDIUM
419	301B	102.3	0.73	0.73	0	MEDIUM
420	301B	103	0.73	1.11555	0.38555	MEDIUM

421	103	117.5	11.42	11.65	0.23	MEDIUM
422	DSBN10716	102.3	6.2	6.21	0.01	MEDIUM
423	7209-02	106	0.81	0.85131	0.04131	MEDIUM
424	DSBN5744	110.9	9.68	9.68	0	MEDIUM
425	186	101.3	0.12	0.18	0.06	MEDIUM
426	300A	400	492.89999	493.35999	0.46	MEDIUM
427	DCUST10318	101	0.00038	0.0072	0.00682	MEDIUM
428	300A	396	490.59	490.63	0.04	MEDIUM
429	301A	104	1.72	2.07	0.35	MEDIUM
430	DREG5420	401	0	0.01	0.01	MEDIUM
431	181A-10	105.7	5.49851	5.66	0.16149	MEDIUM
432	181B	107.1	4.08268	4.33947	0.25679	MEDIUM
433	181B	107	3.72	4.07568	0.35568	MEDIUM
434	DCUST2195	622	0	0.02	0.02	MEDIUM
435	181B	107.1	4.07568	4.07758	0.0019	MEDIUM
436	181B	107.05	4.07758	4.08268	0.0051	MEDIUM
437	181A	105.3	16.82988	16.85852	0.02864	MEDIUM
438	181B	106.2	2.23	2.23	0	MEDIUM
439	002	138	70.46	71	0.54	MEDIUM
440	401	720.1	395.4957	396.84	1.3443	MEDIUM
441	186	116.4	9.4	9.46	0.06	MEDIUM
442	186	115.8	9.35	9.4	0.05	MEDIUM
443	0833-01	108	5.56	5.6361	0.0761	MEDIUM
444	STUB7075	101	0	0	0	MEDIUM
445	GCUST5779	100	0.01691	0.01983	0.00292	MEDIUM
446	118A	102	0.32481	0.40045	0.07564	MEDIUM
447	118A	102.95	0.85484	0.8869	0.03206	MEDIUM
448	118A	102.9	0.83	0.85484	0.02484	MEDIUM
449	118A	103	0.8869	1.15456	0.26766	MEDIUM
450	118A	102.3	0.40045	0.76	0.35955	MEDIUM
451	118A	119.5	10.78	10.96578	0.18578	MEDIUM
452	118A	160.3	25.65	26.36342	0.71342	MEDIUM
453	118A	103.27	2.14353	2.18665	0.04312	MEDIUM
454	118A	119.7	10.96578	10.9969	0.03112	MEDIUM
455	118A	127	12.811	13.04	0.229	MEDIUM
456	118A	126	12.58	12.81	0.23	MEDIUM
457	DREG4790	802	0	0	0	MEDIUM
458	118B	136.2	19.13679	19.82251	0.68572	MEDIUM
459	118A	139	17.35	17.4312	0.0812	MEDIUM
460	118A	139.48	17.62896	17.63811	0.00915	MEDIUM
461	118A	160.1	25.64	25.65	0.01	MEDIUM
462	118A	140.48	17.63811	17.94	0.30189	MEDIUM
463	118A	117.07	9.42942	9.78976	0.36034	MEDIUM
464	118A	103.22	2.00653	2.02185	0.01532	MEDIUM
465	118A	101.51	0.20271	0.23939	0.03668	MEDIUM
466	118A	115	8.56	8.63909	0.07909	MEDIUM
467	118A	114.5	8.42677	8.56	0.13323	MEDIUM

468	118A	139.14	17.4312	17.62896	0.19776	MEDIUM
469	118A	103.25	2.02185	2.14353	0.12168	MEDIUM
470	118A	146	21	21.11	0.11	MEDIUM
471	118A	135.3	14.96	15	0.04	MEDIUM
472	118A	135.7	15	15.18049	0.18049	MEDIUM
473	118A	137	16.3	16.44549	0.14549	MEDIUM
474	118A	136	15.18049	15.20074	0.02025	MEDIUM
475	118A	136.5	16.25749	16.27517	0.01768	MEDIUM
476	118A	136.7	16.27517	16.3	0.02483	MEDIUM
477	118B	107.9	3.58786	3.64	0.05214	MEDIUM
478	118B	129.75	15.71805	15.85464	0.13659	MEDIUM
479	118A	135.2	14.87111	14.96	0.08889	MEDIUM
480	118A	136.4	16.1908	16.25749	0.06669	MEDIUM
481	DCUST1498	901	0.00136	0.36951	0.36815	MEDIUM
482	118A	164.3	29.57	29.59937	0.02937	MEDIUM
483	118A	164.4	29.59937	29.64	0.04063	MEDIUM
484	118A	165	29.77242	29.80617	0.03375	MEDIUM
485	118A	164	29.45	29.57	0.12	MEDIUM
486	118A	113	7.1469	7.30057	0.15367	MEDIUM
487	118A	165.2	29.80617	30.19001	0.38384	MEDIUM
488	118A	113.7	8.00055	8.17	0.16945	MEDIUM
489	118A	113.6	7.85669	8.00055	0.14386	MEDIUM
490	111A	128.5	19.36	19.43479	0.07479	MEDIUM
491	111A	145	27.46	27.53	0.07	MEDIUM
492	111A	129	20.0181	20.89	0.8719	MEDIUM
493	111A	140	25.59638	25.70279	0.10641	MEDIUM
494	111A	142.2	26.86084	27.14	0.27916	MEDIUM
495	111A	128.9	19.98361	20.0181	0.03449	MEDIUM
496	111A	139.7	25.52888	25.59638	0.0675	MEDIUM
497	111A	128.7	19.51815	19.56964	0.05149	MEDIUM
498	111A	128.8	19.57896	19.98361	0.40465	MEDIUM
499	118A	101.3	0.181	0.19766	0.01666	MEDIUM
500	111A	144	27.31331	27.46	0.14669	MEDIUM
501	118A	164.5	29.64	29.77242	0.13242	MEDIUM
502	118A	154.3	24.1	24.11	0.01	MEDIUM
503	118A	155	24.11	24.24781	0.13781	MEDIUM
504	118A	155	24.24781	24.41086	0.16305	MEDIUM
505	DREG4788	802	0.00449	0.01	0.00551	MEDIUM
506	118A	140.7	17.98107	19	1.01893	MEDIUM
507	138C	102	43.69	43.99	0.3	MEDIUM
508	118B	135.5	17.91118	18.3	0.38882	MEDIUM
509	111A	139.5	25	25.52888	0.52888	MEDIUM
510	118B	111.27	4.75121	4.97887	0.22766	MEDIUM
511	DCUST2614	100	0	0	0	MEDIUM
512	1202-01	101	0	0.3579	0.3579	MEDIUM
513	118A	101.5	0.20169	0.20271	0.00102	MEDIUM
514	DREG4364	802	0	0	0	MEDIUM

515	118B	107.55	3.13211	3.5033	0.37119	MEDIUM
516	1818-01	117.5	3.11636	3.67326	0.5569	MEDIUM
517	1817-01	101.3	0.42	0.49	0.07	MEDIUM
518	1816-01	211	2.63	3.34143	0.71143	MEDIUM
519	1816-01	233.5	15.22	15.40571	0.18571	MEDIUM
520	181A	108	19.65	19.8	0.15	MEDIUM
521	181B	114	9.99	10.32	0.33	MEDIUM
522	181B	115	10.32	10.57	0.25	MEDIUM
523	1816-01	232.5	14.36105	14.66	0.29895	MEDIUM
524	1818-01	115.4	2.12038	2.13827	0.01789	MEDIUM
525	1817-01	101	0	0.42	0.42	MEDIUM
526	1818-01	117	2.81377	2.92673	0.11296	MEDIUM
527	1816-01	223	10.84	11.26	0.42	MEDIUM
528	1816-01	221.6	10.8	10.84	0.04	MEDIUM
529	1816-01	221	10.28204	10.73	0.44796	MEDIUM
530	1816-01	221.35	10.73024	10.79814	0.0679	MEDIUM
531	1816-01	242.5	17.96864	18.00719	0.03855	MEDIUM
532	1816-01	235.5	15.96521	16.29859	0.33338	MEDIUM
533	DREG5115	262	0.00187	0.04	0.03813	MEDIUM
534	1816-01	236.3	16.72	16.75	0.03	MEDIUM
535	1816-01	243	18.00719	18.24638	0.23919	MEDIUM
536	1816-01	229	13.46	13.54348	0.08348	MEDIUM
537	1818-01	119.7	4.06982	4.274	0.20418	MEDIUM
538	1816-01	213	3.52	3.72	0.2	MEDIUM
539	186	130	24.19	24.24778	0.05778	MEDIUM
540	186	128.6	24.07955	24.09	0.01045	MEDIUM
541	186	128.3	24	24.07955	0.07955	MEDIUM
542	186	129	24.09	24.19	0.1	MEDIUM
543	DCUST2503	101	0	0.01515	0.01515	MEDIUM
544	401	698.3	378.76999	378.78491	0.01492	MEDIUM
545	401	698.22	378.50396	378.66945	0.16549	MEDIUM
546	002	157.7	88.4998	89.44	0.9402	MEDIUM
547	118A	180.5	40.7115	41	0.2885	MEDIUM
548	118A	182.2	41.23401	41.39	0.15599	MEDIUM
549	300A	337.70	434.29001	434.57001	0.28	MEDIUM
550	300A	349	453.72	453.79528	0.07528	MEDIUM
551	300A	350.4	453.97	454.10962	0.13962	MEDIUM
552	300A	371.7	476.60999	477.0967	0.48671	MEDIUM
553	300A	378.1	480.95738	481.51989	0.56251	MEDIUM
554	118B	151	32	34.03	2.03	MEDIUM
555	DCUST1319	126	0	0	0	MEDIUM
556	7220-01	108.3	10.32	10.33	0.01	MEDIUM
557	118A	206.5	60.2513	60.28673	0.03543	MEDIUM
558	118A	198.1	57.05337	57.22217	0.1688	MEDIUM
559	118A	197.2	56.07746	56.10316	0.0257	MEDIUM
560	118A	198	57	57.05337	0.05337	MEDIUM
561	118A	197.3	56.10316	56.26636	0.1632	MEDIUM

562	118A	197.4	56.26636	56.85235	0.58599	MEDIUM
563	118A	200.2	57.99	58.21	0.22	MEDIUM
564	118A	204	59.8	59.94	0.14	MEDIUM
565	DREG4388	123	0.00285	0.07	0.06715	MEDIUM
566	7220-01	105.08	4.14471	4.38	0.23529	MEDIUM
567	118A	222	66.22	66.73	0.51	MEDIUM
568	118A	220	65.65	66.07	0.42	MEDIUM
569	002	173	107	109.93	2.93	MEDIUM
570	118A	231	73.248	73.89688	0.64888	MEDIUM
571	215	107	6.98	7.04495	0.06495	MEDIUM
572	7217-04	101	0	0.74	0.74	MEDIUM
573	002	181	116.55	117.73	1.18	MEDIUM
574	0804-01	108	0.65842	0.86709	0.20867	MEDIUM
575	0804-01	108.5	0.86709	0.99944	0.13235	MEDIUM
576	101	130	14.52	14.9	0.38	MEDIUM
577	101	122	12.06	12.4	0.34	MEDIUM
578	101	113.7	7.22045	8.42965	1.2092	MEDIUM
579	109	133.12	10.91267	11.36639	0.45372	MEDIUM
580	132	132	9.88	10.16	0.28	MEDIUM
581	132	132.3	10.16	10.16	0	MEDIUM
582	109	135	11.97	13.64	1.67	MEDIUM
583	101	140	16.83	19.78	2.95	MEDIUM
584	109	121.1	7.02279	7.57198	0.54919	MEDIUM
585	132	133	10.16	10.27967	0.11967	MEDIUM
586	109	134.1	11.52	11.9301	0.4101	MEDIUM
587	100	111	145.58	147.77	2.19	MEDIUM
588	100	101.05	138.43445	138.4514	0.01695	MEDIUM
589	300B	363.7	416.30971	416.78963	0.47992	MEDIUM
590	300A	332.73	426.30401	426.60001	0.296	MEDIUM
591	300A	338.94	437.72	437.76001	0.04001	MEDIUM
592	300A	340.46	440.05486	440.06117	0.00631	MEDIUM
593	0821-01	107.93	4.98	4.99	0.01	MEDIUM
594	0821-01	107.95	4.99	5.1	0.11	MEDIUM
595	0821-01	107.91	3.29	4.33263	1.04263	MEDIUM
596	300B	344.5	371.8735	372.62854	0.75504	MEDIUM
597	300A	328.3	414.92001	415.1556	0.23559	MEDIUM
598	300B	363.9	416.78963	417.36963	0.58	MEDIUM
599	300A	336.84	431.9959	432.0051	0.0092	MEDIUM
600	300A	336.86	432.0051	432.0134	0.0083	MEDIUM
601	300A	336.82	431.9933	431.9959	0.0026	MEDIUM
602	GCUST5813	204	1.08029	1.41	0.32971	MEDIUM
603	DREG4731	402	0.00117	0.00989	0.00872	MEDIUM
604	GCUST5813	202	0.03	1.08	1.05	MEDIUM
605	132	124	6.41	7.06	0.65	MEDIUM
606	132	140	11.151	11.99	0.839	MEDIUM
607	132	105.5	1.22581	1.26	0.03419	MEDIUM
608	DREG4738	801.95	0.04966	0.37	0.32034	MEDIUM

609	SP4Z	114	8.4	8.75753	0.35753	MEDIUM
610	109	118.3	6.41396	6.55512	0.14116	MEDIUM
611	DFDS3675	103	0	0	0	MEDIUM
612	DCUST1072	100	0	0	0	MEDIUM
613	7222-01	169	11.67619	11.7037	0.02751	MEDIUM
614	7222-01	169	11.70556	13.14891	1.44335	MEDIUM
615	401	661	346.42001	348.76999	2.34998	MEDIUM
616	002	184	118.1	121.80721	3.70721	MEDIUM
617	401	652	341.44	342.54999	1.10999	MEDIUM
618	002	188.6	123.21167	126	2.78833	MEDIUM
619	7222-01	155.2	5.87258	6.01731	0.14473	MEDIUM
620	DRIP5731	100	0	0	0	MEDIUM
621	148	110.1	13.6	13.60897	0.00897	MEDIUM
622	7219-01	103	1.24	1.33864	0.09864	MEDIUM
623	148	110.3	13.61541	14	0.38459	MEDIUM
624	STUB13766	100	0	0	0	MEDIUM
625	2403-02	156	1.77	1.99	0.22	MEDIUM
626	7222-01	138	0.6054	0.69269	0.08729	MEDIUM
627	7222-01	139	0.69269	0.71219	0.0195	MEDIUM
628	7224-07	102	0.91	1.14	0.23	MEDIUM
629	7223-01	104	0.14601	0.21934	0.07333	MEDIUM
630	7223-01	123	3.66869	3.7848	0.11611	MEDIUM
631	148	118.3	16.62766	17.138	0.51034	MEDIUM
632	7223-01	108	0.55563	1.39223	0.8366	MEDIUM
633	7223-01	110	1.40559	2.6085	1.20291	MEDIUM
634	GCUST5750	308	0.09	0.41	0.32	MEDIUM
635	2402-01	108.5	3.39	3.93	0.54	MEDIUM
636	108	113.04	7.09754	7.12847	0.03093	MEDIUM
637	108	113.07	7.17076	7.23533	0.06457	MEDIUM
638	2408-05	124	4.75967	4.82879	0.06912	MEDIUM
639	2408-04	209	0.27	0.92	0.65	MEDIUM
640	131	137	31.93655	32.16013	0.22358	MEDIUM
641	7221-10	121	15	15.17518	0.17518	MEDIUM
642	7221-10	119.9	14.98	15	0.02	MEDIUM
643	7221-10	117.1	14.37057	14.82	0.44943	MEDIUM
644	DCUST2823	104	0.3	0.43	0.13	MEDIUM
645	7221-10	122	15.9877	16.13	0.1423	MEDIUM
646	DCUST2823	104.3	0.43	0.52	0.09	MEDIUM
647	7228-01	101	0	0.05109	0.05109	MEDIUM
648	7226-01	101.05	0.08114	0.25322	0.17208	MEDIUM
649	7226-02	101.2	0.24204	0.34672	0.10468	MEDIUM
650	7226-02	101	0	0.24204	0.24204	MEDIUM
651	222	106	0.89	1.02	0.13	MEDIUM
652	162A	106.1	4.41789	4.65	0.23211	MEDIUM
653	162A	113.25	7.22593	7.3119	0.08597	MEDIUM
654	162A	107	4.65	4.76	0.11	MEDIUM
655	162A	113.2	7.07484	7.22593	0.15109	MEDIUM

656	162A	112	6.08	6.6093	0.5293	MEDIUM
657	101	180.28	38.31605	38.64136	0.32531	MEDIUM
658	101	194.6	43.2	43.22	0.02	MEDIUM
659	101	174.5	34.84134	34.97245	0.13111	MEDIUM
660	101	170.1	33.90403	33.93556	0.03153	MEDIUM
661	101	198	43.5	43.85	0.35	MEDIUM
662	101	195.8	43.23	43.3	0.07	MEDIUM
663	101	171	34.06	34.12	0.06	MEDIUM
664	DREG4208	801	0	0	0	MEDIUM
665	101	175	35	35.04429	0.04429	MEDIUM
666	101	170.2	33.93556	33.96	0.02444	MEDIUM
667	101	179	36.51	36.95128	0.44128	MEDIUM
668	101	147	22.79	23.07	0.28	MEDIUM
669	101	165	31.36	31.95	0.59	MEDIUM
670	101	146.3	22.78	22.79	0.01	MEDIUM
671	101	149	23.16	24.05	0.89	MEDIUM
672	101	167.2	33.06385	33.41432	0.35047	MEDIUM
673	DREG4207	114	0.13	0.31811	0.18811	MEDIUM
674	101	170.095	33.85251	33.90403	0.05152	MEDIUM
675	1403-01	209	0.39	0.44	0.05	MEDIUM
676	132B	105	0.17801	0.35	0.17199	MEDIUM
677	132B	103	0.011	0.09667	0.08567	MEDIUM
678	132B	104	0.09667	0.17801	0.08134	MEDIUM
679	132B	101.2	0.0002	0.01	0.0098	MEDIUM
680	132	197.7	46.60592	46.60803	0.00211	MEDIUM
681	1401-01	313	0.0072	0.16	0.1528	MEDIUM
682	1401-01	315	0.19	0.27364	0.08364	MEDIUM
683	STUB13869	101	0	0.00019	0.00019	MEDIUM
684	132	189.78	42.7155	42.81584	0.10034	MEDIUM
685	300A	395.29	489.70001	489.79001	0.09	MEDIUM
686	114	156.7	30.03454	31.2	1.16546	MEDIUM
687	DCUST2371	371	0	0.02	0.02	MEDIUM
688	131	163.6	46.34	46.34054	0.00054	MEDIUM
689	131	145.1	35.44004	35.60939	0.16935	MEDIUM
690	131	152	38.55	38.56042	0.01042	MEDIUM
691	108	123.3	12.5445	12.5782	0.0337	MEDIUM
692	108	123	12.361	12.43435	0.07335	MEDIUM
693	108	123.2	12.5225	12.5445	0.022	MEDIUM
694	108	124.5	12.7741	12.8102	0.0361	MEDIUM
695	108	124.6	12.8102	12.89469	0.08449	MEDIUM
696	7221-10	110.633	11.8805	12.0791	0.1986	MEDIUM
697	7221-10	111	12.0791	12.84	0.7609	MEDIUM
698	7221-15	106.8	3.51651	3.6	0.08349	MEDIUM
699	DCUST1824	490	0	0.02	0.02	MEDIUM
700	DCUST1835	549	0	0.02	0.02	MEDIUM
701	DCUST1839	563	0	0.02	0.02	MEDIUM
702	DCUST1796	100	0	0	0	MEDIUM

703	DCUST8179	100	0	0.025	0.025	MEDIUM
704	DCUST1836	553	0	0.02	0.02	MEDIUM
705	DCUST1840	566	0	0.02	0.02	MEDIUM
706	DCUST1841	569	0	0.02	0.02	MEDIUM
707	DCUST1837	557	0	0.02	0.02	MEDIUM
708	1603-01	206	0.8231	1.2356	0.4125	MEDIUM
709	191-1	119.2	26.0286	26.51	0.4814	MEDIUM
710	191-1	120	26.51	26.61	0.1	MEDIUM
711	191-1	115.2	23.15965	23.61	0.45035	MEDIUM
712	191-1	107.5	20.96521	21.35	0.38479	MEDIUM
713	191-1	103.22	16.28343	16.86433	0.5809	MEDIUM
714	114	127.4	11.9013	12.067	0.1657	MEDIUM
715	1607-01	108	1.45	1.62	0.17	MEDIUM
716	1608-01	102.6	0.39	0.4	0.01	MEDIUM
717	1608-01	103	0.4	0.89	0.49	MEDIUM
718	1607-01	103.05	0.10716	0.63042	0.52326	MEDIUM
719	1609-01	102.8	1.37697	1.48	0.10303	MEDIUM
720	DREG4893	102.5	0.00745	0.0084	0.00095	MEDIUM
721	DREG4893	103	0.0084	0.0188	0.0104	MEDIUM
722	DREG4893	101.8	0.00091	0.00745	0.00654	MEDIUM
723	021G	140.2	18.76392	19.43711	0.67319	MEDIUM
724	0402-01	128.3	1.217	1.4496	0.2326	MEDIUM
725	0401-01	104.8	2.47722	2.76	0.28278	MEDIUM
726	0402-01	134	2.2716	2.3511	0.0795	MEDIUM
727	0401-01	103.5	1.50359	2.4	0.89641	MEDIUM
728	DCUST10442	100	0	0.00303	0.00303	MEDIUM
729	0402-01	132	2.0595	2.2275	0.168	MEDIUM
730	021F	151.3	20.36	20.43	0.07	MEDIUM
731	0401-01	105	2.76	3.25359	0.49359	MEDIUM
732	0109-01	104	1.13	1.73	0.6	MEDIUM
733	105A	106.8	39.06378	39.68751	0.62373	MEDIUM
734	105C	102	0.14	0.32	0.18	MEDIUM
735	105C	103	0.32	1.75641	1.43641	MEDIUM
736	0126-01	101.1	0.14085	1.76	1.61915	MEDIUM
737	105N	166	32	32.71663	0.71663	MEDIUM
738	105N	147	26	26.2	0.2	MEDIUM
739	105N	149.3	26.76	26.77	0.01	MEDIUM
740	105N	149.6	26.77	26.81	0.04	MEDIUM
741	105N	151	27.58576	27.94	0.35424	MEDIUM
742	105N	158	30	30.27	0.27	MEDIUM
743	105N	163	31.19	31.7	0.51	MEDIUM
744	DREG4875	201	0	0.00161	0.00161	MEDIUM
745	153	137.003	18.03372	18.24255	0.20883	MEDIUM
746	153	138.02	19.37566	19.60685	0.23119	MEDIUM
747	153	138.007	19.32233	19.37471	0.05238	MEDIUM
748	153	138.004	19.12974	19.32137	0.19163	MEDIUM
749	153	137.005	18.24255	18.24378	0.00123	MEDIUM

750	153	150	27.26192	27.30611	0.04419	MEDIUM
751	153	150	27.33355	27.38441	0.05086	MEDIUM
752	153	147.78	24.8035	24.89135	0.08785	MEDIUM
753	153	147.78	24.89201	24.9941	0.10209	MEDIUM
754	153	147.78	24.26888	24.45536	0.18648	MEDIUM
755	153	151	24.45612	24.54659	0.09047	MEDIUM
756	153	147.78	24.6623	24.8026	0.1403	MEDIUM
757	153	147.78	24.59279	24.66141	0.06862	MEDIUM
758	X6460	106	18.68	19.27	0.59	MEDIUM
759	0133-01	105.6	0.3	0.34	0.04	MEDIUM
760	DCUST10347	101	0.00154	0.00265	0.00111	MEDIUM
761	X6380	100	0	0	0	MEDIUM
762	0133-03	103	0.23	0.33	0.1	MEDIUM
763	DCUST758	-	0.00579	0.01318	0.00739	MEDIUM
764	0133-05	101	0.41	0.41052	0.00052	MEDIUM
765	DCUST10346	101	0.00894	0.0095	0.00056	MEDIUM
766	DSBN	104	37.21	37.33	0.12	MEDIUM
767	0111-01	104	0.82	0.96	0.14	MEDIUM
768	0130-01	103	0	0.25	0.25	MEDIUM
769	DCUST9275	101	0	0	0	MEDIUM
770	300A	391.15	485.17999	485.18161	0.00162	MEDIUM
771	DCUST9773	902	0.001	0.04	0.039	MEDIUM
772	0133-01	105.4	0.14	0.15	0.01	MEDIUM
773	0112-05	100.3	0	0.07	0.07	MEDIUM
774	DCUST9276	101	0	0.01161	0.01161	MEDIUM
775	0111-08	101.2	0.13	0.1395	0.0095	MEDIUM
776	153	153	27.0998	27.10903	0.00923	MEDIUM
777	DCUST10352	100	0	0.00682	0.00682	MEDIUM
778	SP5	101.3	0.85572	1.43	0.57428	MEDIUM
779	153	153	27.30688	27.33279	0.02591	MEDIUM
780	153	153	27.30611	27.30688	0.00077	MEDIUM
781	153	147.05	22.92559	23.03396	0.10837	MEDIUM
782	191-1	131.1	34.83159	34.97934	0.14775	MEDIUM
783	191-1	131.22	35.21195	35.59	0.37805	MEDIUM
784	108	143.3	37.40793	38	0.59207	MEDIUM
785	021F	125	10.85	11.53235	0.68235	MEDIUM
786	021F	125.27	11.62927	11.72	0.09073	MEDIUM
787	021G	118.5	8.95932	9.16	0.20068	MEDIUM
788	021G	125	10.47	12	1.53	MEDIUM
789	021F	119	9.43	9.46918	0.03918	MEDIUM
790	021G	122.2	10.21775	10.27	0.05225	MEDIUM
791	DREG3869	100	0	0	0	MEDIUM
792	021F	139.7	16.35663	16.65	0.29337	MEDIUM
793	1614-13	606	0.24	0.33747	0.09747	MEDIUM
794	1614-08	309.7	0.56062	0.63568	0.07506	MEDIUM
795	1614-08	310	0.63568	0.70277	0.06709	MEDIUM
796	1614-08	320	0.95079	0.98859	0.0378	MEDIUM

797	1614-13	623	2.24	2.97	0.73	MEDIUM
798	1614-08	319	0.76088	0.8915	0.13062	MEDIUM
799	108	154.25	42.66636	42.72	0.05364	MEDIUM
800	108	154.2	42.3547	42.66636	0.31166	MEDIUM
801	1614-01	105	0.24933	2.15218	1.90285	MEDIUM
802	108	158	43.8	44.88	1.08	MEDIUM
803	DSBN7548	-	0	0	0	MEDIUM
804	197C	101	0.01	3.5	3.49	MEDIUM
805	168-1-3	118	1.36894	1.54205	0.17311	MEDIUM
806	196A	114	8.56	9.9153	1.3553	MEDIUM
807	168-1-1	107.4	0.54	0.54	0	MEDIUM
808	168-1-3	112	0.90322	0.97064	0.06742	MEDIUM
809	168-1-3	115	1.06761	1.25511	0.1875	MEDIUM
810	021F	114	5.24283	5.26	0.01717	MEDIUM
811	1625-01	101	0	4.81	4.81	MEDIUM
812	197A	121.8	33.88555	37.7	3.81445	MEDIUM
813	1625-01	106	10.57451	12.17	1.59549	MEDIUM
814	1625-10	101.6	0.82225	1.88	1.05775	MEDIUM
815	210C	103	19.8	20.10411	0.30411	MEDIUM
816	114	122.15	8.33099	8.78373	0.45274	MEDIUM
817	DSBN	105	0.73	0.9	0.17	MEDIUM
818	195-012	209.3	0	0.05	0.05	MEDIUM
819	195A6-4	211X	3.06	3.32	0.26	MEDIUM
820	195	108	2.59	2.79	0.2	MEDIUM
821	DREG5243	101	0	0	0	MEDIUM
822	STUB8255	101	0.00295	0.00334	0.00039	MEDIUM
823	195B5-1	101.1	2.1272	2.1275	0.0003	MEDIUM
824	195-1	101	0	0.56912	0.56912	MEDIUM
825	FORGN	1001	0	0	0	MEDIUM
826	195B9-3	101	0	0.4	0.4	MEDIUM
827	195B9-4	100.3	0	0.05	0.05	MEDIUM
828	195B4-2	103	0	0	0	MEDIUM
829	195A6-4	210X	1.75	3.06	1.31	MEDIUM
830	195B5-1	101.2	2.1198	2.12	0.0002	MEDIUM
831	195-0101	141	0	0	0	MEDIUM
832	STUB8241	102	0.0006	0.0008	0.0002	MEDIUM
833	195	110	2.81	3.51	0.7	MEDIUM
834	195B7-9	101	0.05	0.88	0.83	MEDIUM
835	195B5-2	102	0.25	0.73	0.48	MEDIUM
836	195B11	111	0.29	0.29	0	MEDIUM
837	195B4-1	101.2	0.04	1.12	1.08	MEDIUM
838	195B5-9	101	0	0.2741	0.2741	MEDIUM
839	FORGN	100.8	0	0	0	MEDIUM
840	STUB8254	101	0	0	0	MEDIUM
841	195-0120	171	0	0.95	0.95	MEDIUM
842	195B8-6	102	0.44	0.74	0.3	MEDIUM
843	STUB8115	102	0.0006	0.0008	0.0002	MEDIUM

844	195	101	0	1.17	1.17	MEDIUM
845	195-058	131	0	0.07	0.07	MEDIUM
846	195B5-1	101.11	2.12	2.1204	0.0004	MEDIUM
847	195-037	260.9	0	0	0	MEDIUM
848	0605-01	159	2.32	2.43837	0.11837	MEDIUM
849	DCUST13548	100	0	0.00132	0.00132	MEDIUM
850	DCUST13546	100	0	0.00094	0.00094	MEDIUM
851	108	163.6	48.55	48.63	0.08	MEDIUM
852	DREG4321	201	0	0.01	0.01	MEDIUM
853	021F	106.7	1.74557	1.78	0.03443	MEDIUM
854	021F	107	1.78	2.02	0.24	MEDIUM
855	021C	111.1	36.73609	36.91757	0.18148	MEDIUM
856	021A	132	30	31.06	1.06	MEDIUM
857	021C	124.32	39.4423	39.5931	0.1508	MEDIUM
858	021C	102.2	32.38	32.3818	0.0018	MEDIUM
859	021C	114.9	37.42	37.44	0.02	MEDIUM
860	1301-01	134	4.48909	4.58701	0.09792	MEDIUM
861	021A	123.8	24.58	24.59	0.01	MEDIUM
862	021B	111.2	11.09028	11.12912	0.03884	MEDIUM
863	1305-01	210.4	2.43751	2.43922	0.00171	MEDIUM
864	DREG4624	29	0	0.01	0.01	MEDIUM
865	1305-01	209	0.3	1.95862	1.65862	MEDIUM
866	DF7713	63.2	0.00078	0.00119	0.00041	MEDIUM
867	X6334	130	0	0	0	MEDIUM
868	0604-06	125.2	1.26477	1.39	0.12523	MEDIUM
869	0604-06	126	1.51	1.59549	0.08549	MEDIUM
870	DCUST7601	901	0	0	0	MEDIUM
871	DSBN13711	101	0.0161	0.12386	0.10776	MEDIUM
872	021B	102.4	0.52274	0.95755	0.43481	MEDIUM
873	0407-01	105.6	2.9681	3.16	0.1919	MEDIUM
874	0407-01	112	4.19	4.28245	0.09245	MEDIUM
875	0407-01	106.1	3.16324	3.39	0.22676	MEDIUM
876	0405-01	105.5	2.19776	2.79	0.59224	MEDIUM
877	021B	102	0.18	0.52274	0.34274	MEDIUM
878	021A	102.1	13.00914	13.11365	0.10451	MEDIUM
879	0405-01	111.5	5.27481	5.42324	0.14843	MEDIUM
880	0405-01	116.4	9.04422	9.20293	0.15871	MEDIUM
881	105B-2	205	0	0.65	0.65	MEDIUM
882	210A	124.7	24.54598	24.56584	0.01986	MEDIUM
883	210A	124.6	24.14	24.54598	0.40598	MEDIUM
884	210A	124.77	24.75419	24.77356	0.01937	MEDIUM
885	210A	124.76	24.74239	24.75419	0.0118	MEDIUM
886	210A	124.75	24.6085	24.74239	0.13389	MEDIUM
887	210A	124.72	24.56584	24.6085	0.04266	MEDIUM
888	210A	124.8	24.77356	25.36	0.58644	MEDIUM
889	DCUST7685	-	0	0.02	0.02	MEDIUM
890	021B	109.2	4.94777	7	2.05223	MEDIUM

891	021H	125.8	11.29014	11.41	0.11986	MEDIUM
892	DREG5265	103	0	0	0	MEDIUM
893	0407-01	104.25	0.69642	1.05704	0.36062	MEDIUM
894	210B	131	24.8374	24.89	0.0526	MEDIUM
895	210A	124.05	23.15118	24.14	0.98882	MEDIUM
896	0407-01	116.15	7.45882	7.47	0.01118	MEDIUM
897	021H	125.1	10.15665	10.43123	0.27458	MEDIUM
898	021BX	501	0	0.418	0.418	MEDIUM
899	0407-01	101	0	0.41148	0.41148	MEDIUM
900	DCUST6633	100	0	0.02	0.02	MEDIUM
901	DCUST9804	901	0	0.02	0.02	MEDIUM
902	DCUST7686	100	0	0.02	0.02	MEDIUM
903	0405-01	115.45	8.85069	8.9	0.04931	MEDIUM
904	DCUST8418	901	0	0.01515	0.01515	MEDIUM
905	DCUST10436	101	0.00115	0.0027	0.00155	MEDIUM
906	0407-01	121.3	11.91934	12.31563	0.39629	MEDIUM
907	0407-01	112.51	5.39	5.5	0.11	MEDIUM
908	0607-01	116	3.94	4.11124	0.17124	MEDIUM
909	0607-01	123.7	5.98273	6.06	0.07727	MEDIUM
910	0607-01	125	6.09	6.14	0.05	MEDIUM
911	1302-02	121	11.1	11.69355	0.59355	MEDIUM
912	1302-02	118	10.62	10.92	0.3	MEDIUM
913	DCUST9564	901	0	0.03	0.03	MEDIUM
914	021C	142	51.22799	51.40486	0.17687	MEDIUM
915	021C	140	50.51	50.96783	0.45783	MEDIUM
916	STUB6137	270	0	0	0	MEDIUM
917	1305-05	100.6	0.01	0.03	0.02	MEDIUM
918	DREG4325	104	0.06	0.25	0.19	MEDIUM
919	0608-01	154.5	3.7172	4.54945	0.83225	MEDIUM
920	0609-02	103	0.6244	0.65163	0.02723	MEDIUM
921	1307-01	106	1.28	1.68	0.4	MEDIUM
922	1307-02	103	0.23	0.56	0.33	MEDIUM
923	400	390	260.39693	260.42743	0.0305	MEDIUM
924	150	101	4.7	4.70144	0.00144	MEDIUM
925	150	118.3	17.511	17.89563	0.38463	MEDIUM
926	116	101	0.04	0.76	0.72	MEDIUM
927	116	100.7	0.03	0.04	0.01	MEDIUM
928	119A	102	0.40284	1.19299	0.79015	MEDIUM
929	220	136	22.1715	22.31	0.1385	MEDIUM
930	DSBN13718	100	0	0.13636	0.13636	MEDIUM
931	220	130	21.3	21.66542	0.36542	MEDIUM
932	DCUST1208	101	0	0	0	MEDIUM
933	DCUST1207	100.7	0.00772	0.008	0.00028	MEDIUM
934	DCUST1574	101	0	0	0	MEDIUM
935	220	129	20.95	21.3	0.35	MEDIUM
936	0405-02	103	0.73	0.85	0.12	MEDIUM
937	1307-01	117.5	6.27	6.55	0.28	MEDIUM

938	0614-25	106	0.51	0.55	0.04	MEDIUM
939	0617-06	220	20.12194	20.20494	0.083	MEDIUM
940	0617-06	219.5	20.03186	20.12194	0.09008	MEDIUM
941	0617-06	212.8	19.26477	19.28163	0.01686	MEDIUM
942	0617-06	225	20.58163	20.66894	0.08731	MEDIUM
943	0617-06	224	20.45532	20.58163	0.12631	MEDIUM
944	0617-06	213	19.28163	19.35692	0.07529	MEDIUM
945	220	152	30.25	30.28787	0.03787	MEDIUM
946	220	156.8	31.12359	31.37	0.24641	MEDIUM
947	220	158	31.5	31.75	0.25	MEDIUM
948	0646-01	114.9	9.99	10.24	0.25	MEDIUM
949	DSBN11264	111.7	8.38	9.87	1.49	MEDIUM
950	172A	130	55.11636	55.39723	0.28087	MEDIUM
951	0646-01	116	10.31	11.05	0.74	MEDIUM
952	021E	140.2	80.58174	80.6827	0.10096	MEDIUM
953	172A	127.2	49.28246	49.75879	0.47633	MEDIUM
954	108	198	74.47	74.93	0.46	MEDIUM
955	116	123	10.24	10.74	0.5	MEDIUM
956	0617-06	157.2	1.026	1.13451	0.10851	MEDIUM
957	173	102	0.952	1.00959	0.05759	MEDIUM
958	0617-06	160	5.64566	6.21519	0.56953	MEDIUM
959	0618-03	114.7	2.63	2.71855	0.08855	MEDIUM
960	0617-06	157.8	3.51484	4.04037	0.52553	MEDIUM
961	0613-01	115	3.29	3.51	0.22	MEDIUM
962	0651-01	301.2	0	0.02724	0.02724	MEDIUM
963	173	101.1	0.28089	0.85131	0.57042	MEDIUM
964	172A	166.4	75.45	76.6	1.15	MEDIUM
965	0613-01	122.5	3.98607	4.38262	0.39655	MEDIUM
966	172A	168.2	76.68	77	0.32	MEDIUM
967	119A	111.1	9.36347	9.67	0.30653	MEDIUM
968	119A	111	8.8375	9.35621	0.51871	MEDIUM
969	0617-03	101	0.00322	1.04275	1.03953	MEDIUM
970	0617-01	101	0.0604	1.0998	1.0394	MEDIUM
971	172A	171	77.33	78.53	1.2	MEDIUM
972	173-1	101.2	0.34934	0.73491	0.38557	MEDIUM
973	0618-05	100.3	0	0	0	MEDIUM
974	DSBN10046	112	0.61212	0.61288	0.00076	MEDIUM
975	DCUST9994	101	0.00474	0.00947	0.00473	MEDIUM
976	0619-01	216	0.43236	0.71813	0.28577	MEDIUM
977	STUB7052	101	0.0003	0.0004	0.0001	MEDIUM
978	DCUST1873	282.7	0.11429	0.21	0.09571	MEDIUM
979	173	112.85	14.23314	14.66257	0.42943	MEDIUM
980	173	109	7.631	7.91	0.279	MEDIUM
981	DCUST10528	100	0	0.00189	0.00189	MEDIUM
982	021E	155.05	95.89626	96.40754	0.51128	MEDIUM
983	DREG9090	102	0.00284	0.00852	0.00568	MEDIUM
984	DSBN11068	401.2	0.01432	0.03479	0.02047	MEDIUM

985	174-1-1	113.25	1.45402	1.93	0.47598	MEDIUM
986	124B	111	9.55	9.73571	0.18571	MEDIUM
987	124B	111.2	9.73571	9.84	0.10429	MEDIUM
988	124A	111.2	11.56556	11.89349	0.32793	MEDIUM
989	124B	116	12	12.78	0.78	MEDIUM
990	1511-01	118.7	3.39374	3.45	0.05626	MEDIUM
991	302E	116	12.18	13	0.82	MEDIUM
992	124B	120.3	16.7111	16.73565	0.02455	MEDIUM
993	124B	120.35	16.73565	16.81303	0.07738	MEDIUM
994	124B	120.15	16.44392	16.67637	0.23245	MEDIUM
995	124B	120.2	16.67637	16.7111	0.03473	MEDIUM
996	1508-01	101	0	3.14423	3.14423	MEDIUM
997	1508-01	102	3.14423	3.5458	0.40157	MEDIUM
998	0630-01	105.1	5.77689	5.77774	0.00085	MEDIUM
999	050A-1	106	0.96	1.52926	0.56926	MEDIUM
1000	050A-1	101	0	0.38718	0.38718	MEDIUM
1001	124B	130	22.86	23.18	0.32	MEDIUM
1002	1509-04	106.02	0.78081	0.87973	0.09892	MEDIUM
1003	1509-01	113	1.3729	1.43104	0.05814	MEDIUM
1004	1509-01	115	1.49829	1.58862	0.09033	MEDIUM
1005	1509-01	114	1.43104	1.49829	0.06725	MEDIUM
1006	124A	128.99	25.42965	26.03	0.60035	MEDIUM
1007	DSBN13865	113.2	0.0007	0.04	0.0393	MEDIUM
1008	DREG4014	802	0.022	0.023	0.001	MEDIUM
1009	DCUST7898	100	0	0.1358	0.1358	MEDIUM
1010	DCUST9089	101	0	0.01606	0.01606	MEDIUM
1011	400	312	206.52	208.73	2.21	MEDIUM
1012	1502-08	101.2	0.03	0.1349	0.1049	MEDIUM
1013	1502-08	101.25	0.18425	0.27	0.08575	MEDIUM
1014	1502-08	101.22	0.1349	0.18425	0.04935	MEDIUM
1015	1502-06	102	0.01	0.32	0.31	MEDIUM
1016	172A	108.6	13.28	13.28	0	MEDIUM
1017	DREG3838	100	0	0	0	MEDIUM
1018	050A	140	13.65	14	0.35	MEDIUM
1019	STUB9860	100	0	0	0	MEDIUM
1020	050A	146	18.2	18.3	0.1	MEDIUM
1021	1016-01	102	0	1.98855	1.98855	MEDIUM
1022	DSBN10571	108	1.97	3.18	1.21	MEDIUM
1023	169-14	103	0.012	0.881	0.869	MEDIUM
1024	169-6D-6	100.3	0	0.01	0.01	MEDIUM
1025	169A	109.1	5.1889	5.19232	0.00342	MEDIUM
1026	050A	172	32.59	32.9	0.31	MEDIUM
1027	128	108	4.13	5.27	1.14	MEDIUM
1028	050A	193.5	40.86047	41.52	0.65953	MEDIUM
1029	177B	114.5	7.31606	7.51	0.19394	MEDIUM
1030	177A	114	10.6	14	3.4	MEDIUM
1031	193-003	103	0	1.75	1.75	MEDIUM

1032	177A	124.1	20.51364	21	0.48636	MEDIUM
1033	177A	130	25.18	25.46	0.28	MEDIUM
1034	177A	131.1	25.47844	25.75422	0.27578	MEDIUM
1035	400	260	158.85001	159.87	1.01999	MEDIUM
1036	177A	136.15	30.46253	30.63204	0.16951	MEDIUM
1037	400	237.2	144.58438	145.18888	0.6045	MEDIUM
1038	GCUST5923	103	0.0823	0.20521	0.12291	MEDIUM
1039	DSBN10447	104	0.20521	0.22283	0.01762	MEDIUM
1040	177A	179.2	88.8313	88.89612	0.06482	MEDIUM
1041	402B	303.4	11.69711	11.91751	0.2204	MEDIUM
1042	402B	303.5	11.91751	11.98597	0.06846	MEDIUM
1043	400	213.9	115.28	115.3	0.02	MEDIUM
1044	402	124.2	18.4628	18.74	0.2772	MEDIUM
1045	402	126.3	20.49339	20.82225	0.32886	MEDIUM
1046	402	120	14.79	15.4	0.61	MEDIUM
1047	DREG5477	107	0.33749	0.51618	0.17869	MEDIUM
1048	BD10838	326	20.72	20.72	0	MEDIUM
1049	DF10290	100	0	0	0	MEDIUM
1050	400	171	97.67	101.29	3.62	MEDIUM
1051	DREG5483	101	0	0	0	MEDIUM
1052	402	140	30	30.27352	0.27352	MEDIUM
1053	402	139	28.52	28.96613	0.44613	MEDIUM
1054	402	139.4	29.03222	29.91104	0.87882	MEDIUM
1055	402	130	24	25	1	MEDIUM
1056	402	140.2	30.27352	30.47935	0.20583	MEDIUM
1057	402	141.2	30.67859	30.68025	0.00166	MEDIUM
1058	DREG5484	101	0.00222	0.00852	0.0063	MEDIUM
1059	126B	104	2.17	2.73	0.56	MEDIUM
1060	402	149	35.57	35.80825	0.23825	MEDIUM
1061	402	150.4	36.64804	36.93395	0.28591	MEDIUM
1062	402	148.7	35.29054	35.57	0.27946	MEDIUM
1063	137B	107	6.28	6.35505	0.07505	MEDIUM
1064	137C	118	8.09	8.46	0.37	MEDIUM
1065	137A	101	0	0.11	0.11	MEDIUM
1066	126A	116	11.19	12.62	1.43	MEDIUM
1067	401	232	84.07	84.39	0.32	MEDIUM
1068	DREG5456	101.05	0.02143	0.02175	0.00032	MEDIUM
1069	400	136	30.93	47.15	16.22	MEDIUM
1070	401	143	24.49	24.66	0.17	MEDIUM
1071	400	130.7	24.83	24.83	0	MEDIUM
1072	400	125	16.26	17.85	1.59	MEDIUM

EXHIBIT JAL-20

GTS-RateCase2015_DR_IP_002-Q85(b)

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-085		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q085		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	March 26, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	William Edward Mojica	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 4B – TRANSMISSION PIPE ENGINEERING PROGRAMS

QUESTION 85

From Page 4B-19 to 4B-27, PG&E explains it Shallow Pipe Program.

a. Please provide in electronic format all documents, models, methodologies, or any other related source used that makes up the Shallow Pipe Program.
b. Please provide all AOCs for the Shallow Pipe Program.
c. Please provide all workpapers associated with the Shallow Pipe Program.

ANSWER 85

Attachments to this response have been marked CONFIDENTIAL and are submitted pursuant to a Non-Disclosure Agreement because they include confidential employee information.

a. In addition to the Chapter 4B testimony on pages 4B-19 through 4B-27, PG&E has provided supporting workpapers for the Shallow Pipe program. The expense-related workpapers are on pages WP 4B-11 through WP 4B-13 and the capital expenditure-related workpaper pages are on WP 4B-20 through WP 4B-22 (see part c for additional details).

   Also, in support of pursuing this programmatic approach to addressing Shallow Pipe locations, PG&E has attached the three Risk Management Procedures (RMPs) referenced in workpapers on page WP 4B-20:

   - RMP–01 Risk Management Procedure as attachment GTS-RateCase2015_DR_IndicatedProducers_002-Q085Atch01CONF,
   - RMP–03 Third Party Damage Threat Algorithm as attachment GTS-RateCase2015_DR_IndicatedProducers_002-Q085Atch02CONF, and

- RMP–06 Gas Transmission Integrity Management Program as attachment GTS-RateCase2015_DR_IndicatedProducers_002-Q085Atch03CONF.

PG&E has included another attachment that identifies the approximately 411 miles of shallow pipe, which are the basis of the rate case forecast for the Shallow Pipe program. The information in the attachment is organized by pipeline route, segment number, mile point range, length (in miles), and risk level resulting from the component of the engineering analysis shown on Figure 4B-6 in testimony on page 4B-23:

- GTS-RateCase2015_DR_IndicatedProducers_002-Q085Atch04.

b. As noted in the Chapter 4B testimony beginning on page 4B-23, the first step in the Shallow Pipe program is to identify shallow pipe locations and use engineering analysis to prioritize them into high, medium or low-risk locations congruent with the Shallow Pipe Program Engineering Analysis Decision Tree depicted in Figure 4B-6. Additionally, it is through this engineering analysis that PG&E will determine the pipeline locations that will become projects versus those that can be addressed through routine maintenance. In an effort to provide the best protection to the public, mitigation projects will be prioritized for execution by Average Occupancy Count (AOC) in the year following the engineering analysis.

As the engineering analysis forecast is not yet complete, mitigation projects have not yet been identified, thus the AOC prioritization has not yet taken place.

c. The expense workpapers supporting Chapter 4B specific to the Shallow Pipe program can be found on pages WP 4B-11 through WP 4B-13, and the workpapers associated with capital expenditures are on pages WP 4B-20 through WP 4B-22. The Shallow Pipe program workpapers include:

- Shallow Pipe Program Expense Cost Summary (pages WP 4B-11 and WP 4B-12),
- Shallow Pipe Program Expense Cost Calculator (page WP 4B-13),
- Shallow Pipe Program Capital Cost Summary (pages WP 4B-20 and WP 4B- 21), and
- Shallow Pipe Program Capital Cost Calculator (page WP 4B-22).

EXHIBIT JAL-21

GTS-RateCase2015_DR_IS_004-Q005

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_004-Q05		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_004-Q05		
Request Date:	June 6, 2014	Requester DR No.:	004
Date Sent:	June 26, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Bennie Barnes	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: WITNESS BENNIE BARNES, CHAPTER 4A – TRANSMISSION PIPE INTEGRITY AND EMERGENCY RESPONSE PROGRAMS

QUESTION 5

Starting on Page 4A-51, PG&E explains it Vintage Pipe Replacement Program.

(a) What is PG&E's definition of "vintage pipe"?

(b) Please clarify the following:

(i) What is the total mileage of pipe PG&E has classified as vintage pipe?

(ii) What is the total mileage of vintage pipe PG&E plans to remove and replace?

(iii) How much of the 47% of pipe placed in service prior to 1961, mentioned on Page 4A-51 Lines 5 to 8, is vintage pipe that PG&E plans to remove and replace?

(iv) Please provide the forecast miles of vintage pipe replacement for each year for 2014, 2015, 2016, and 2017.

(v) Please provide the remaining mileage of vintage pipe PG&E plans to replace after 2017.

(c) What percentage of the 47% of pipeline placed in service prior to 1961 does PG&E plan to replace between now and 2017? Please note this question does not ask for the percentage of pipe to be replaced under the Vintage Pipe Replacement Program alone, but for total pipe replacement under all of PG&E's programs. Pipe replacement should include pipe under the Vintage Pipe Replacement Program as well as pipe replacement under other programs.

(d) What percentage of the 47% of pipeline placed in service prior to 1961 does PG&E plan to replace between now and 2025? Please note this question does not ask for the percentage of pipe to be replaced under the Vintage Pipe Replacement Program, but for total pipe replacement under all of PG&E's programs. Pipe replacement should include pipe under the Vintage Pipe Replacement Program as well as pipe replacement under other programs.

(e) Under what program will PG&E replace pipe identified in (c) that is not part of the Vintage Pipe Replacement Program? Please provide:

(i) Each program that will replace pipe placed in service prior to 1961;

(ii) The total mileage of pipe PG&E will replace under that program;

(iii) How much of a percentage of pipe replacement under each program makes up the 47% of pipe placed in service prior to 1961;

(iv) The timeframe in which PG&E will replace pipe under different programs.

(f) What is the total mileage of pipe placed in service *during* or *after* 1961 that PG&E forecasts to replace?

(i) Under what program(s) will PG&E replace pipe placed into service during or after 1961?

(ii) What is the total mileage of pipe for each program identified in (f)(i) that PG&E will replace?

(iii) What is the timeframe for pipe replacement for each program identified in (f)(i)? Please provide total mileage forecast for each year for 2014, 2015, 2016, and 2017.

(g) Please provide a table or tables illustrating:

(i) Total miles of pipe installed before 1961;

(ii) Total miles of pipe installed before 1961 that PG&E plans to replace;

(iii) All programs that will contribute to replacing pipe installed before 1961;

(iv) Total miles under each program identified in (h)(iii) that will replace pipe installed before 1961.

(h) Please provide a table or tables illustrating:

(i) Total miles of pipe installed during or after 1961;

(ii) Total miles of pipe installed during or after 1961 that PG&E plans to replace;

(iii) All programs that will contribute to replacing pipe installed during or after 1961;

(iv) Total miles under each program identified in (h)(iii) that will replace pipe installed during or after 1961.

(i) Do any pipeline replacement programs overlap with one another in regards to location and mileage of pipeline replacement? For example, is any pipe that needs to be replaced in the Vintage Pipeline Replacement Program also the same pipe that will be replaced in the Shallow Pipe Replacement Program or another program? This inquiry should apply to all overlapping pipeline replacement programs and not just the Vintage Pipeline Replacement and Shallow Pipe Replacement Programs.

(i) If so, please identify what pipeline replacement programs overlap with one another and the overlapping pipeline replacement miles between each overlapping program. For example, the X number of miles in the Vintage Pipeline Replacement Program at location Y are the same X number of miles PG&E plans to replace in the Shallow Pipe Replacement Program. This inquiry should apply to all overlapping pipeline replacement programs and not just the Vintage Pipeline Replacement and Shallow Pipe Replacement Programs.

ANSWER 5

a) PG&E considers "vintage pipe" to include pipe manufactured or constructed and fabricated using certain historic practices that are no longer being used today. Historic fabrication and construction methods include pipe that was installed using wrinkle bends, mechanical/compression couplings, miter bends and other non-standard fittings like orange peel reducers, chill ring welds, bell and spigot, or pipe that was constructed with the acetylene girth welding process. PG&E's Vintage Pipeline Replacement program targets the threat posed by the presence of these construction and fabrication threats as they interact with outside forces such as land movement.

b) PG&E's clarification is as follows:

   i. As described in Chapter 4A on page 4A-52, PG&E has identified approximately 630 miles of transmission pipe, with characteristics that make it more susceptible to certain construction threats. Of those 630 miles, PG&E has further identified approximately 370 miles of vintage pipe where fabrication and construction threats interact with land movement, which is the focus for PG&E's Vintage Pipe Replacement Program.

   ii. As described in Chapter 4A on page 4A-54, for the 2015 Gas Transmission and Storage (GT&S) Rate Case period, PG&E expects to replace approximately 20 miles of vintage pipe per year, thereby reducing the risk posed by these interacting threats for over 90 percent of the population living within the Potential Impact Radius of PG&E's pipelines by the end of 2017.

   iii. Approximately 57 miles of the 60 miles of vintage pipe that PG&E plans to replace were placed into service prior to 1961.

   iv. As part of the Public Safety Enhancement Plan (PSEP) pipe replacement program, PG&E forecasts replacing approximately 82 miles in 2014. As part of the Vintage Pipe Replacement Program, PG&E forecasts replacing approximately 21 miles in 2015, approximately 21 miles in 2016, and approximately 16 miles in 2017, as shown in Chapter 4A workpaper pages 4A-711 to 4A-721.

   v. PG&E expects to have approximately 315 miles of pipeline containing vintage pipe characteristics interacting with land movement remaining after the 2015 GT&S Rate Case period ending in 2017.

c) PG&E plans to replace approximately 2% of the 47% of pipeline placed in service prior to 1961 between now and 2017 within the Vintage Pipe Replacement Program. PG&E notes that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service prior to 1961.

d) PG&E plans to replace approximately 12% of the 47% of pipeline placed in service prior to 1961 between now and 2025 within the Vintage Pipe Replacement Program.

PG&E notes that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service prior to 1961.

e) Outside of the Vintage Pipe Replacement program, no other program is targeted with the specific purpose of replacing pipe that was placed in service prior to 1961. As stated in parts (c) and (d) above, for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service prior to 1961.

   i. While there are other programs that could produce pipe replacement, none of these programs has as its specific goal the intent to replace pipe placed in service prior to 1961. The programs in addition to the Vintage Pipe Replacement Program that may involve pipe replacement and may replace pipe that was placed in service prior to 1961 are:

      Chapter 4A
      - Hydrostatic Testing
      - Earthquake Fault Crossings
      - Direct Assessment
      - In-Line Inspection
      - Valve Automation
      - Inoperable and Hard to Operate Valves

      Chapter 4B
      - Shallow Pipe Program
      - Work Required by Others
      - Class Location Program
      - Water and Levee Crossing Program

      Chapter 6
      - Simple Station Rebuilds
      - Complex Station Rebuilds
      - Transmission Terminal Upgrades
      - Station Engineering Critical Assessment Phase 1 and 2
      - Station Hydrostatic Testing

      Chapter 7
      - Corrosion Control

      Chapter 8
      - Pipeline Maintenance
      - Expense Projects

   ii. As stated in parts (c) and (d) above, for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service prior to 1961.

   iii. See the response to (e)(ii) above.

iv. Many of these programs are ongoing programs, so the timeframe in which PG&E will replace pipe under those programs is also ongoing over the long term. Programs that have a defined population of work in which potential pipe replacement could occur are Hydrostatic Testing (2023 to 2026) and Valve Automation (timeframe still being determined).

f) PG&E forecasts to replace approximately 0.27 miles of pipe placed into service during or after 1961 in the Vintage Pipe Replacement Program during the 2015 GT&S Rate Case period. As stated in parts (c) and (d) above, for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service during or after 1961.

i. See response to e) i. above for the same programs that may involve pipe replacement of pipe that was placed in service during or after 1961.

ii. As stated in parts (c) and (d) above, for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced for pipe that was placed in service during or after 1961.

iii. Many of these programs are ongoing programs, so the timeframe in which PG&E will replace pipe under those programs is also ongoing over the long term. Programs that have a defined population of work in which potential pipe replacement could occur are Hydrostatic Testing (2023 to 2026) and Valve Automation (timeframe still being determined). For the PSEP Pipe Replacement Program year 2014, the miles of post-1961 pipe planned to be replaced is approximately 5 miles. For the Vintage Pipe Replacement Program years 2015, 2016 and 2017, the miles of post-1961 pipe planned to be replaced is 0.27 miles. The Hydrostatic Testing program and the Valve Automation Program have not yet determined the specific segments of pipe to be replaced and therefore cannot provide miles of post-1961 pipe replacement included in those programs.

g) Please see the following table.

PHMSA Reported Transmission Miles as of 3/2013			
	Transmission System	Vintage Pipe Characteristics with Interacting Land Movement Threat	GT&S Rate Case Plan To Replace (2015 - 2017)
Pre- 1961	3001.02	353.51	57.43
Post-1961	2714.61	19.48	0.27
Totals	5715.63	372.99	57.70

i. Please see the table above for total miles of pipe installed before 1961.

ii. Please see the table above for the total miles of pipe installed before 1961 that PG&E plans to replace as part of the Vintage Pipe Replacement Program. Please note that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced.

iii. For all programs that will contribute to replacing pipe installed before 1961, please see the response to part (e)(i) above.

iv. For total miles under the Vintage Pipe Replacement program, see the response for (g)(i). Please note that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced.

h) Please see the table provided in response to part (g), above.

i. Please see the table in the response to part (g) for total miles of pipe installed during and after 1961.

ii. Please see the table in the response to part (g) for total miles of pipe installed during and after 1961 that PG&E plans to replace as part of the Vintage Pipe Replacement Program. Please note that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced.

iii. For all programs that will contribute to replacing pipe installed during or after 1961, please see part (f)(i) above.

iv. For total miles under the Vintage Pipe Replacement program, see the response for (f). Please note that for other programs involving pipe replacement, the specific site on the pipeline has not yet been determined and, therefore, PG&E cannot account for how many total miles of pipe would be replaced.

i) No, there are no overlaps in pipe replacement where specific segments of pipe replacement are known. Please note that for programs where specific sites for pipe replacement have not yet been determined, PG&E will continue to overlay that information to ensure there is no overlap. Furthermore, where there is overlap, PG&E uses a risk basis for performing the same level of work on the next level of risk from its targeted pipe replacement list (e.g., There is a larger Vintage Pipe Replacement program list that is prioritized by risk and Total Occupancy Count (TOC). PG&E plans to continue to work from that list in risk based order to meet the requested miles of pipe replacement).

i. Not applicable. Please see the response to (i) above.

EXHIBIT JAL-22

GTS-RateCase2015_DR_IP_002-Q072(b)

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-072		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q072		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	June 6, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Bennie Barnes	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 4A – TRANSMISSION PIPE INTEGRITY AND EMERGENCY RESPONSE PROGRAMS

QUESTION 72

On page 4A-35, lines 27-31, PG&E discusses providing temporary gas service to customers through LNG/CNG. As it relates to providing temporary gas supplies for customers, please provide the following:

a. The number of projects that were supported by LNG/CNG resources from 2011 to 2014, broken down month-by-month.

b. The number of projects that are forecasted to be supported by LNG/CNG resources for 2015-2017, broken down month-by-month.

c. The number disruptions of service incidents that occurred for (1) core customers and (2) noncore customers for 2011-2014, broken down month-by-month, due to the inability of LNG/CNG to support the needed gas supplies.

d. What are the current penalties for disruptions of service?

e. For each disruption of service listed in (c), please provide any economic compensation provided to the affected party(s).

f. For each disruption of service listed in (c), please provide the duration of the disruption.

g. For each disruption of service listed in (c), please provide any notice given to customers about the disruption of service.

h. If PG&E provided any notice of disruption of service, please provide the dates of all disruptions that lasted longer than the notice period and how long disruption continued after the notice period.

i. For each disruption of service listed in (c), please provide a detailed description of the nature of the work being performed that caused the disruption.

j. For each disruption of service listed in (c), please provide the alternative delivery options that were (1) considered and (2) implemented.

k. How many disruptions of service are forecasted for (1) core customers and (2) noncore customers for 2015-2017 due to the inability of LNG/CNG to support the needed gas supplies?

ANSWER 72

PG&E is interpreting this question as referring to the hydrotest projects conducted under its Pipeline Safety Enhancement Plan (PSEP) as referenced on page 4A-35 lines 27-31, of the 2015 Gas Transmission and Storage Rate Case Testimony. The following responses relate to providing temporary gas supplies for customers during PSEP hydrotest projects.

a. PG&E is providing an estimate of the number of PSEP outages/projects what were supported with portable Liquefied Natural Gas (LNG) or Compressed Natural Gas (CNG) as follows:
   - 20 outages/projects for 2011;
   - 81 outages/projects for 2012;
   - 101 outages/projects for 2013; and
   - 9 outages/projects from January 2014 through April 2014.

   PG&E does not have a month by month breakdown of this work.

b. PG&E has not begun to engineer the 2015-2017 strength tests and therefore we have not yet determined which projects will require LNG/CNG to maintain customer service.

c. Please see the table below for the number of service disruptions on PSEP projects due to LNG/CNG equipment inability to support the needed gas supplies from 2011-2014. The customers affected were all Core customers. All disruptions were unplanned.

Year	Core/Non-Core	Customer	Duration of disruption	PSEP Project	LNG/CNG work/ cause of disruption
2012	Core	8 residential customers	Less than 1 day	Hydrotest	This is unmanned equipment. The tanks vented due to the regulators remaining open resulting from the ice formation in the regulators.
2012	Core	1 commercial customer	Less than 1 day	Hydrotest	This is unmanned equipment. The tanks vented due to the regulators remaining open

					resulting from the ice formation in the regulators.
2012	Core	1 commercial customer	Less than 1 day	Hydrotest	Operator was switching from one depleting CNG tube trailer to a full CNG tube trailer and mistakenly turned the wrong valve resulting in the loss of service to the customer.

d. There are currently no penalties for disruption of gas service. Please see Section A. "General" of PG&E's Gas Rule 14[1] and Section I. "Unsafe Apparatus or Condition" of Gas Rule 11[2].

e. PG&E is not aware of any economic compensation that was provided for the service disruptions listed in part (c).

f. Please refer to part (c).

g. As all of the disruptions in part (c) were unplanned, no notice was given to customers. For the two commercial customer incidents, the customers were contacted by PG&E after the fact for an explanation of the outage. The communications were conducted via email or phone.

h. Not Applicable.

i. Please refer to part (c).

j. LNG/CNG is used to supply gas service when other options such as alternative feeds or parallel lines are not available as a backup to provide gas service during hydrostatic testing projects. Therefore, for the disruptions of service listed in part (c), no other delivery options were available to be considered or implemented.

k. PG&E has not begun to engineer the 2015-2017 strength tests and therefore we have not determined which projects will require LNG/CNG to maintain customer service.

[1] PG&E's Gas Rule 14 is available on the world wide web at this location: http://www.pge.com/tariffs/tm2/pdf/GAS_RULES_14.pdf

[2] PG&E's Gas Rule 11 is available on the world wide web at this location: http://www.pge.com/tariffs/tm2/pdf/GAS_RULES_11.pdf

EXHIBIT JAL-23

GTS-RateCase2015_DR_IP_002-Q017

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-017		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q017		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	March 26, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	Bennie Barnes	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

CHAPTER 1 – INTRODUCTION AND POLICY

QUESTION 17

On Page 1-12, Lines 12 to 14, PG&E mentions that it has "a comprehensive plan to strength test or replace all in-service natural gas transmission lines that have not previously been strength tested."

a. What is PG&E's comprehensive plan?

b. How does PG&E propose to apply its comprehensive plan?

c. What is the time period in which it will take PG&E to implement its comprehensive plan?

d. Please state separately the capital expenditures and expenses related to executing PG&E's comprehensive plan.

    ii. Identify the category of cost in which these costs are included in this proceeding.

    iii. Please provide in electronic format all documents, models, methodologies, or any other related source of PG&E's comprehensive plan.

ANSWER 17

a. PG&E's comprehensive strength test plan for 2015-2017 is available in the "Hydrostatic Testing" section of Chapter 4A in the Gas Transmission & Storage (GT&S) Rate Case Testimony on pages 4A-38 to 4A-43.

b. The application of PG&E's comprehensive strength test plan is explained in the 2015 GT&S testimony in Chapter 4A on pages 4A-38 to 4A-43. Further details of its application may also be found in the Chapter 4A workpapers on pages WP 4A-49 to WP 4A-61 and WP 4A-487 through 4A-488.

c. As stated in the 2015 GT&S testimony on page 4A-33, "At the pace proposed in this case, PG&E will strength test or replace all of PG&E's gas transmission pipeline, not previously tested, in roughly 12 -15 years from the start of strength testing in 2011."

d. The capital expenditures and expenses related to executing PG&E's comprehensive plan within the 2015 Rate Case period is found in testimony in Table 4A-8 (Expense) and Table 4A-9 (Capital) on page 4A-32.

   i. The category of cost is found in testimony in Table 4A-8 (Expense) and Table 4A-9 (Capital) on page 4A-32.

   ii. See PG&E's 2015 GT&S testimony, Chapter 4A, section 3, "Hydrostatic Testing", testimony pages 4A-38 to 4A-43 and workpapers on pages WP 4A-49 to WP 4A-61 and WP 4A-487 through 4A-488.

   See also PG&E's Pipeline Safety Enhancement Plan filed in August 2011 (R.11-02-019) for information on the PSEP Phase 1 strength testing program. For specific information see Chapter 3 pages 3-29 to 3-31, pages 3-41 to 3-47, page 3-54, page 3-65 and the workpapers supporting Chapter 3 on pages WP 3-758 to WP 3-1277.

EXHIBIT JAL-24

GTS-RateCase2015_DR_ORA_058-Q01.b

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	ORA_058-01		
PG&E File Name:	GTS-RateCase2015_DR_ORA_058-Q01		
Request Date:	May 30, 2014	Requester DR No.:	ORA-GT&S-58
Date Sent:	July 2, 2014	Requesting Party:	Office of Ratepayer Advocates
PG&E Witness:		Requester:	Tom Roberts

SUBJECT: HYDROTEST CAPITAL EXPENDITURE COST ESTIMATE

Note for all questions: In many of the following requests, a basis question is asked which is followed by more detailed questions in sub questions labeled a, b, c, etc. All parts of the question must be addressed, including the basic question, for the response to be considered complete. All references to pages, figures, and tables are to the application and workpapers filed December 19, 2013 in this proceeding. Provide all files in their native format. Where files are linked, provide files grouped such that links can remain active. If links cannot be maintained, explain why and provide versions of the files that provide the maximum degree of functionality, e.g., active formulas, macros, and links within files.

QUESTION 1

Table 4A-9 lists recorded capital expenditures for 2011 and 2012. Provide the following regarding recorded capital expenditures for hydrotesting:

a) Describe the processes and accounting systems that convert labor hours, material expenditures, and other expenditures charged to PSEP into these recorded capital expenditures.

b) Every expenditure associated with PSEP hydrotesting should be charged to an appropriate predefined account. Provide a list of all accounts that are compiled to obtain the recorded expenditures in Table 4A-9, and a description of the type of expenditures to be charged to each account.

c) Provide a breakdown of the 2011 and 2012 recorded expenditures in Table 4A-9 by each account provided in response to question b) above.

d) Provide a breakdown of the 2013 recorded expenditures by each account provided in response to question b) above, and the 2014 Q1 and Q2 recorded expenditures when they become available.

e) Provide a breakdown of the recorded capital expenditures for each completed PSEP hydrotest project by each account provided in response to question b) above.

f) Describe any and all changes in PG&E's accounting process that impact how hydrotest capital expenditures are recorded within the PSEP program, 2011-2014, such that expenditures for one year are not directly comparable to another.

g) Describe any and all changes in PG&E's accounting process that impact how hydrotest capital expenditures were recorded for the PSEP program, and how they are forecasted for GT&S.

h) Describe any and all anticipated changes in PG&E's accounting process that impact how hydrotest capital expenditures are forecasted in GT&S, and how they will be recorded in GT&S.

ANSWER 1

a) On June 12, 2014, PG&E provided an overview of PG&E's accounting systems to ORA. Please see attachment GTS_RateCase_2015_ORA_056-Q01Atch01.

b) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch01, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing for 2011 and 2012
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing LNG/CNG for 2011 and 2012
- GTS-RateCase2015_DR_ORA_058-Q01Atch03, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing for 2013
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1d List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing LNG/CNG for 2013

c) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch01, tab titled, 2011&2012 Hydro_C_byPObyAObyCE, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing for 2011 and 2012. Any differences between recorded and WP are due to timing differences with order shifts.
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1c 2011&12 Recorded, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing LNG/CNG for 2011 and 2012

d) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch03, tab titled, 2013HydrobyPObyAObyCE, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing for 2013.
- GTS-RateCase2015_DR_ORA_058-Q01Atch04, tab titled, 2013HydroCNGLNGbyPObbyAObyCE, which provides all account (Cost

Elements) recorded spend at the actual order associated with Hydrostatic Testing LNG/CNGfor 2013.

- It is expected that 2014 Q1 recorded expenditures will be available after July 7th and 2014 Q2 recorded expenditures will be available after August 2nd.

e) Refer to GTS-RateCase2015_DR_ORA_058-Q01Atch01 through Atch04, and the tabs titled,

- 2011&2012Hydro_CbyPObyAObyCE- Atch01
- ORA 58 1c 2011&12 Recorded- Atch02
- 2013HydrobyPObyAObyCE- Atch03
- 2013HydroCNGLNGbyPObyAObyCC- Atch04

which provide all account (Cost Elements) recorded spend and the actual order associated with completed capital pipeline replacement in support of hydro-tests covering the period 2011 through 2013.

f) PG&E is not aware of any changes in PG&E's accounting process that impacted how hydrotest capital expenditures were or will be recorded within the PSEP program, 2011-2014, such that expenditures for one year are not directly comparable to another.

g) PG&E is not aware of any changes in PG&E's accounting process that impact how hydrotest capital expenditures were recorded for the PSEP program, and how they are forecasted for GT&S.

h) PG&E does not anticipate changes in PG&E's accounting process that impact how hydrotest capital expenditures are forecasted in GT&S, and how they will be recorded in GT&S.

EXHIBIT JAL-25

GTS-RateCase2015_DR_IS_010-Q01;

GTS-RateCase2015_DR_ORA_058-Q01.b;

GTS-RateCase2015_DR_ORA_059-Q04;

GTS-RateCase2015_DR_ORA_059-Q04Atch01;

GTS-RateCase2015_DR_ORA_059-Q04Atch02

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedShippers_010-01		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedShippers_010-Q01		
Request Date:	July 18, 2014	Requester DR No.:	010
Date Sent:	August 1, 2014	Requesting Party:	Indicated Shippers
PG&E Witness:	Ben Campbell	Requester:	Evelyn Kahl/John McIntyre

QUESTION 1

Please provide all recorded capital expenditures and expenses for all PG&E hydrostatic testing performed in 2013. Please identify:

(a) Each line segment hydrostatically tested;

(b) Specific work completed on that segment, including all work associated with hydostatic testing as well as any other work performed on the segment at the time;.

(c) The cost associated with hydrostatically testing each segment; and

(d) The cost associated with any other work beyond hydrostatic testing.

ANSWER 1

The responses to the questions above can be found in previous data requests provided to ORA listed below. Using these, Indicated Shippers can do all the cost analysis that is required above.

PG&E's response to GTS-RateCase2015_DR_ORA_058-Q01 includes the capital costs for 2013 in attachment GTS-RateCase2015_DR_ORA_058-Q01Atch03.

GTS-RateCase2015_DR_ORA_059-Q04Atch02 includes all of the Expense costs by order for 2013.

GTS-RateCase2015_DR_ORA_059-Q04Atch01 includes all of the projects listed out with both Capital and expense orders as well as mile points and years completed. This can be used to lookup costs for 2013 by either the capital or expense orders in their respective attachments.

(a) Please reference GTS_RateCase2015_DR_IndicatedShippers_010-Q01Atch01.

The segments listed in the data are GIS 1.0 segments, built form GIS 1.0 at the inception of the Pipeline Safety Enhancement Plan (PSEP) in 2011.

(b) PG&E does not track specific work completed by segment, other than if it was tested or cleared by records. However, by looking at GTS-RateCase2015_DR_ORA_059-Q04Atch01, if there is capital work associated with a PSEP hydrotest project completed, that project will have a capital order and can be referenced in GTS-RateCase2015_DR_ORA_058-Q01Atch01 or GTS-RateCase2015_DR_ORA_058-Q01Atch03.

(c) Cost of a single segment is not tracked. Costs are tracked only at a project level.

(d) All the activities performed are believed to be essential to the Hydrotest program. Any costs related to the work to perform hydrostatic testing can be referenced in the orders in the above mentioned attachments.

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	ORA_058-01		
PG&E File Name:	GTS-RateCase2015_DR_ORA_058-Q01		
Request Date:	May 30, 2014	Requester DR No.:	ORA-GT&S-58
Date Sent:	July 2, 2014	Requesting Party:	Office of Ratepayer Advocates
PG&E Witness:		Requester:	Tom Roberts

SUBJECT: HYDROTEST CAPITAL EXPENDITURE COST ESTIMATE

Note for all questions: In many of the following requests, a basis question is asked which is followed by more detailed questions in sub questions labeled a, b, c, etc. All parts of the question must be addressed, including the basic question, for the response to be considered complete. All references to pages, figures, and tables are to the application and workpapers filed December 19, 2013 in this proceeding. Provide all files in their native format. Where files are linked, provide files grouped such that links can remain active. If links cannot be maintained, explain why and provide versions of the files that provide the maximum degree of functionality, e.g., active formulas, macros, and links within files.

QUESTION 1

Table 4A-9 lists recorded capital expenditures for 2011 and 2012. Provide the following regarding recorded capital expenditures for hydrotesting:

a) Describe the processes and accounting systems that convert labor hours, material expenditures, and other expenditures charged to PSEP into these recorded capital expenditures.

b) Every expenditure associated with PSEP hydrotesting should be charged to an appropriate predefined account. Provide a list of all accounts that are compiled to obtain the recorded expenditures in Table 4A-9, and a description of the type of expenditures to be charged to each account.

c) Provide a breakdown of the 2011 and 2012 recorded expenditures in Table 4A-9 by each account provided in response to question b) above.

d) Provide a breakdown of the 2013 recorded expenditures by each account provided in response to question b) above, and the 2014 Q1 and Q2 recorded expenditures when they become available.

e) Provide a breakdown of the recorded capital expenditures for each completed PSEP hydrotest project by each account provided in response to question b) above.

f) Describe any and all changes in PG&E's accounting process that impact how hydrotest capital expenditures are recorded within the PSEP program, 2011-2014, such that expenditures for one year are not directly comparable to another.

g) Describe any and all changes in PG&E's accounting process that impact how hydrotest capital expenditures were recorded for the PSEP program, and how they are forecasted for GT&S.

h) Describe any and all anticipated changes in PG&E's accounting process that impact how hydrotest capital expenditures are forecasted in GT&S, and how they will be recorded in GT&S.

ANSWER 1

a) On June 12, 2014, PG&E provided an overview of PG&E's accounting systems to ORA. Please see attachment GTS_RateCase_2015_ORA_056-Q01Atch01.

b) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch01, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing for 2011 and 2012
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing LNG/CNG for 2011 and 2012
- GTS-RateCase2015_DR_ORA_058-Q01Atch03, tab titled, ORA 58 1b List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing for 2013
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1d List of Cost Elements, which provides the complete list of accounts (Cost Elements) and descriptions for the associated recorded expenditures for Hydrostatic Testing LNG/CNG for 2013

c) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch01, tab titled, 2011&2012 Hydro_C_byPObyAObyCE, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing for 2011 and 2012. Any differences between recorded and WP are due to timing differences with order shifts.
- GTS-RateCase2015_DR_ORA_058-Q01Atch02, tab titled, ORA 58 1c 2011&12 Recorded, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing LNG/CNG for 2011 and 2012

d) Refer to:

- GTS-RateCase2015_DR_ORA_058-Q01Atch03, tab titled, 2013HydrobyPObyAObyCE, which provides all account (Cost Elements) recorded spend at the actual order associated with Hydrostatic Testing for 2013.
- GTS-RateCase2015_DR_ORA_058-Q01Atch04, tab titled, 2013HydroCNGLNGbyPObbyAObyCE, which provides all account (Cost

Elements) recorded spend at the actual order associated with Hydrostatic Testing LNG/CNGfor 2013.

- It is expected that 2014 Q1 recorded expenditures will be available after July 7th and 2014 Q2 recorded expenditures will be available after August 2nd.

e) Refer to GTS-RateCase2015_DR_ORA_058-Q01Atch01 through Atch04, and the tabs titled,

- 2011&2012Hydro_CbyPObyAObyCE- Atch01
- ORA 58 1c 2011&12 Recorded- Atch02
- 2013HydrobyPObyAObyCE- Atch03
- 2013HydroCNGLNGbyPObyAObyCC- Atch04

which provide all account (Cost Elements) recorded spend and the actual order associated with completed capital pipeline replacement in support of hydro-tests covering the period 2011 through 2013.

f) PG&E is not aware of any changes in PG&E's accounting process that impacted how hydrotest capital expenditures were or will be recorded within the PSEP program, 2011-2014, such that expenditures for one year are not directly comparable to another.

g) PG&E is not aware of any changes in PG&E's accounting process that impact how hydrotest capital expenditures were recorded for the PSEP program, and how they are forecasted for GT&S.

h) PG&E does not anticipate changes in PG&E's accounting process that impact how hydrotest capital expenditures are forecasted in GT&S, and how they will be recorded in GT&S.

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	ORA_059-04		
PG&E File Name:	GTS-RateCase2015_DR_ORA_059-Q04		
Request Date:	June 3, 2014	Requester DR No.:	ORA-GT&S-59
Date Sent:	July 2, 2014	Requesting Party:	Office of Ratepayer Advocates
PG&E Witness:	Ben Campbell	Requester:	Tom Roberts

SUBJECT: HYDROTEST EXPENSE COST ESTIMATE

Note for all questions: In many of the following requests, a basis question is asked which is followed by more detailed questions in sub questions labeled a, b, c, etc. All parts of the question must be addressed, including the basic question, for the response to be considered complete. All references to pages, figures, and tables are to the application and workpapers filed December 19, 2013 in this proceeding unless otherwise noted. Provide all files in their native format. Where files are linked, provide files grouped such that links can remain active. If links cannot be maintained, explain why and provide versions of the files that provide the maximum degree of functionality, e.g. active formulas, macros, and links within files.

QUESTION 4

Provide a table in MS Excel format which includes the following for each PSEP hydrotest project completed as of the date of this request. If it appears that the “other” costs in part p) below will generally exceed 10% of the total recorded costs in part k) below, contact the originator to discuss prior to compiling the requested table.

a) Original PSRS number
b) “New” PSRS number, if applicable,
c) Project description,
d) Project completion date, consistent with PG&E’s response to question 1 above
e) Estimated operational or “Ops” date from the original PSEP application
f) Estimated cost in original PSEP application,
g) Actual duration of PG&E presence on site in days,
h) Actual project length in feet,
i) Primary outside diameter,
j) Yes/No response: Does more than 10% of the length from h) above have a diameter other than that in i) above?
k) Recorded total project cost
l) Each of the individual cost components listed in response to question 2 above

m) Yes/No response: Was more than one pressurization cycle required?

n) Yes/No response: Did a test failure occur?

o) Number of cleaning runs required,

p) Other recorded costs, such that the sum of all costs provided in 2) above equals the total cost in k) above. List all accounting codes for costs included and a description of the work billed to these codes, if not provided previously.

ANSWER 4

Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 for a spreadsheet containing the requested information.

a) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column F titled "Original [Pipeline Safety Enhancement Plan] PSEP [Project Status Reporting System] PSRS (if applicable)" for the original PSRS number.

b) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column G titled "Tracking PSRS ID" for the new PSRS number.

c) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch02, Column B titled "Order Description" for Project Name

d) Please see response to GTS-RateCase2015_DR_ORA_059-Q01 for completion date explanation.

e) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column Y titled "Tie in Date." The tie in date of a hydrotest is the date it can return to operations, but will still accumulate charges for site remediation.

f) The estimated cost in the Pipeline Safety Enhancement Plan (PSEP) updated application database is not tracked since these projects were split into multiple projects. The original project costs can be gathered by referencing the original PSRS number in the original PSEP application in R. 11-02-019.

g) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Columns X and Y titled "Mob Date" and "Tie in Date" respectively. The Mob date and tie in dates provide guidance as to onsite duration, however, remediation of the site will take place post tie in and can vary significantly.

h) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column V titled "Feet Ft." for the actual project length in feet.

i) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column Z titled "Line Diameter" for the primary outside diameter.

j) Only the primary diameter was tracked. It would require a complete data set of segment level detail for all tests which is available in the PSEP Updated Application database.

k) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch02 for 2011 through 2013 recorded project cost.

l) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch03 for cost components (referred to as cost elements).

m) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column AC titled "Greater than 1 cycle (Y,N)." data available is tracked in the instance where there was leak or failure during the test. If for other unknown reasons (such as equipment malfunction) a second pressurization cycle was required, that information is not available except in the as-built package.

n) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column AB titled "Leak/Rupture (Y,N)" for identifying if a test failure occurred.

o) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch01 Column AA titled "# Cleaning Runs" for the number of cleaning runs required.

p) Refer to attachment GTS-RateCase2015_DR_ORA_059-Q04Atch04 for recorded cost by hydrotest project by account (referred to as cost elements)

PMO ID	P6 Project Name	Portfolio Year	Work Type	Original PSEP PSRS (if applicable)	Tracking PSRS ID	Tracking Order Number	Tracking Order MAT Code	Order #1 (Expense)	Order #1 MAT	Order #2 (Capital)	Order #2 MAT	Order #3 (IM)	Order #3 MAT	Order #4 (Other_a)	Order #4 MAT	Order #5 (Other_b)	Order #5 MAT	MP1	MP2	Ft.	Tracking PSRS Description	Mob Date	Tie In Date	Line Diameter	# Cleaning Runs	Leak/Rupture (Y,N)	Greater than 1 cycle (Y,N)
TC-019-12	TC-019-12, L-153, Camera, Oakland	2012	Camera	23582	25852	41617913	IIH	41617913	IIH									22.87	25.11	11827.2	L-153_2 C-019-12 MP 22.87 TO MP 25.11	03/12/12 A	05/30/12 A	24	N/A	N	N
TC-020-12	TC-020-12, L-153, Camera, Oakland	2012	Camera	23582	25855	41599879	IIH	41599879	IIH	30923305	2H2							25.11	27.88	14625.6	L-153_2 C-020-12 MP 25.11 TO MP 27.88	03/20/12 A	11/27/12 A	24	N/A	N	N
TC-047C-11	TC-047C-11, L-153, Camera, Oakland	2012	Camera	24548	24547	41497360	KE1	41660676	KE1									20.07	22.87	14784	L-153 C-047C-11MP 20.08 TO MP 22.87	03/01/12 A	04/04/12 A	24	N/A	N	N
TIM-403-14	TIM-403-14, DFM-1817-01, Cut Out, Watsonville	2013	Cut out	N/A	31723	41951094	KE1	41951094	KE1					2034785	IIH			3.21	8.5	27931.2	*CANCDFM-1817-01 TEST 5.29MI MP 3.21-8.5	10/28/13 A	12/05/13 A	10.75	N/A	N	N
T-002-11	T-002-11, L-101, Test, San Jose	2011	Test Performed	23500	24652	41474062	KE1	41474062	KE1									0.62	3.08	12988.8	L-101 TEST 0.10MI MP 0.62-3.08 PH1	05/23/11 A	06/11/11 A	36	0	N	N
T-003-11	T-003-11, L-101, Test, Santa Clara	2011	Test Performed	23500	24526	41497342	KE1	41497342	KE1									3.08	4.66	8342.4	L-101 TEST 0.08MI MP 3.07-4.66 PH1	05/23/11 A	06/11/11 A	36	0	N	N
T-007-11	T-007-11, L-105A, Test, Emeryville	2011	Test Performed	23542	24653	41474064	KE1	41474064	KE1									38	41	15840	L-105A TEST 2.16MI MP 38.00-41.00 PH1	08/26/11 A	10/05/11 A	30	2	N	N
T-009-11	T-009-11, L-105A-1, Test, Emeryville	2011	Test Performed	N/A	24701	41502564	KE1	41502564	KE1									0	0.004	21.12	L-105A-1 TEST 0.01MI MP 0.00-0.04 PH1	08/26/11 A	09/21/11 A	30	0	N	N
T-010-11	T-010-11, L-105C, Test, Oakland	2011	Test Performed	24204	24661	41482858	KE1	41482858	KE1									0	1.77	9345.6	L-105C TEST 1.57MI MP 0.00-1.77 PH1	08/11/11 A	08/31/11 A	24	3	N	N
T-011-11	T-011-11, L-105N, Test, Newark	2011	Test Performed	24560	24206	41482920	KE1	41482920	KE1									11.07	11.86	4171.2	L-105N_1 TEST 0.83MI MP 11.07-11.86 PH1	05/11/11 A	06/12/11 A	24	0	N	N
T-015-11	T-015-11, L-105N, Test, San Leandro	2011	Test Performed	24560	24558	41497369	KE1	41497369	KE1									27.94	28.13	1003.2	L-105N_1 TEST 0.20MI MP 27.94-28.13 PH1	08/28/11 A	09/16/11 A	26	2	N	N
T-016-11	T-016-11, L-105N, Test, Oakland	2011	Test Performed	24560	24559	41497370	KE1	41497370	KE1									28.13	28.64	2692.8	L-105N_1 TEST 0.51MI MP 28.13-28.64 PH1	08/29/11 A	09/30/11 A	34	2	N	N
T-017-11	T-017-11, L-105N, Test, Oakland	2011	Test Performed	24560	26093	41497371	KE1	41497371	KE1									28.64	30.63	10507.2	L-105N_1 TEST 1.94MI MP 28.64-30.63 PH1	09/16/11 A	10/25/11 A	30	3	N	N
T-017-12	T-017-12, L-132, Test, San Bruno	2011	Test Performed	23557	26104	41474074	KE1	41474074	KE1									40.04	40.0837	230.736	L-132_2 TEST 0.02MI MP 40.04-40.08 PH1	11/15/11 A	11/22/11 A	30	0	N	N
T-019-11	T-019-11, L-114, Test, Brentwood	2011	Test Performed	24084	24703	41502566	KE1	41502566	KE1									16.5233	16.586	331.056	L-114 TEST 0.06MI MP 16.52-16.59 PH1	08/30/11 A	09/20/11 A	24	2	N	N
T-020-11	T-020-11, L-131, Test, Sunol	2011	Test Performed	24699	24702	41502565	KE1	41502565	KE1									42.34	42.42	422.4	L-131_1 TEST 0.03MI MP 42.34-42.42 PH1	07/14/11 A	07/30/11 A	24	0	N	N
T-022N-11	T-022N-11, L-131, Test, Fremont	2011	Test Performed	24699	24486	41497302	KE1	41497302	KE1									50.7075	51.43	3814.8	L-131_1 TEST 3.28MI MP 50.70-55.50 PH1	09/17/11 A	10/21/11 A	34	4	N	N
T-022S-11	T-022S-11, L-131, Test, Fremont	2011	Test Performed	24699	24486	41497302	KE1	41497302	KE1									51.43	55.5	21489.6	L-131_1 TEST 3.28MI MP 50.70-55.50 PH1	09/17/11 A	10/21/11 A	30	6	N	N
T-024-11	T-024-11, L-132, Test, Milpitas	2011	Test Performed	24537	24545	41497359	KE1	41497359	KE1									0.945	1.88	4936.8	L-132_1 TEST 0.86MI MP 0.94-1.88 PH1	10/03/11 A	10/25/11 A	24	13	N	N
T-025A-11	T-025A-11, L-132, Test, Santa Clara	2011	Test Performed	24537	23508	41474078	KE1	41474078	KE1									3.05	4	5016	L-132_1 TEST 0.80MI MP 3.05-4.00 PH1	06/06/11 A	06/22/11 A	24	0	N	N
T-026-11	T-026-11, L-132, Test, Sunnyvale	2011	Test Performed	24537	24529	41497346	KE1	41497346	KE1									4.92	7.1	11510.4	L-132_1 TEST 2.13MI MP 4.92-7.10 PH1	08/24/11 A	10/17/11 A	24	18	N	N
T-027-11	T-027-11, L-132, Test, Sunnyvale	2011	Test Performed	24537	24538	41497354	KE1	41497354	KE1									7.1	8.54	7603.2	L-132_1 TEST 1.42MI MP 7.10-8.54 PH1	08/17/11 A	09/14/11 A	24	11	N	N
T-028-11	T-028-11, L-132, Test, Mountain View	2011	Test Performed	24537	24535	41497352	KE1	41497352	KE1									8.54	10.32	9398.4	L-132_1 TEST 1.43MI MP 8.54-10.32 PH1	07/12/11 A	08/18/11 A	24	5	N	N
T-029-11	T-029-11, L-132, Test, Mountain View	2011	Test Performed	24537	24533	41497350	KE1	41497350	KE1									10.32	13.95	19166.4	L-132_1 TEST 2.70MI MP 10.32-13.95 PH1	08/01/11 A	09/19/11 A	24	4	N	N
T-030-11	T-030-11, L-132, Test, Palo Alto	2011	Test Performed	24537	24534	41497351	KE1	41497351	KE1									13.95	18.46	23812.8	L-132_1 TEST 4.48MI MP 13.95-18.46 PH1	08/05/11 A	11/18/11 A	24	11	Y	Y
T-031-11	T-031-11, L-132, Test, Menlo Park	2011	Test Performed	24537	24532	41497349	KE1	41497349	KE1									18.4621	23.1638	24824.98	L-132_1 TEST 3.90MI MP 18.46-23.16 PH1	08/08/11 A	11/18/11 A	24	6	Y	Y
T-032-11	T-032-11, L-132, Test, Woodside	2011	Test Performed	24537	26091	41497353	KE1	41497353	KE1									23.1638	25.5957	12840.43	L-132_1 TEST 1.45MI MP 23.16-25.60 PH1	08/22/11 A	11/18/11 A	24	7	N	N
T-033-11	T-033-11, L-132, Test, Highlands-Baywood Park	2011	Test Performed	24537	24541	41497356	KE1	41497356	KE1									29.06	31.95	15259.2	L-132_1 TEST 2.78MI MP 29.06-31.95 PH1	08/31/11 A	11/17/11 A	30	17	N	N
T-034-11	T-034-11, L-132, Test, Hillsborough	2011	Test Performed	24537	24539	41497355	KE1	41497355	KE1									31.95	34.68	14414.4	L-132_1 TEST 1.82MI MP 31.95-34.68 PH1	08/31/11 A	11/17/11 A	30	13	N	N
T-035-11	T-035-11, L-132, Test, Burlingame	2011	Test Performed	24537	24543	41497357	KE1	41497357	KE1									34.68	38.39	19588.8	L-132_1 TEST 0.79MI MP 34.68-38.39 PH1	09/02/11 A	11/17/11 A	36	11	N	N
T-040-11	T-040-11, L-132A, Test, Mountain View	2011	Test Performed	23480	24655	41474079	KE1	41474079	KE1									0.007	1.4532	7635.936	L-132A TEST 0.81MI MP 0.00-1.45 PH1	04/26/11 A	05/25/11 A	24	0	N	N
T-041-11	T-041-11, L-132A, Test, Mountain View	2011	Test Performed	23480	24697	41502561	KE1	41502561	KE1									1.4589	1.4659	36.96	L-132A TEST 0.01MI MP 1.45-1.47 PH1	04/26/11 A	05/25/11 A	16	0	N	N
T-042-11	T-042-11, L-147, Test, San Carlos	2011	Test Performed	24548	23512	41474081	KE1	41474081	KE1									0.02	0.85	4382.4	L-147 TEST 0.43MI MP 0.02-0.85 PH1	09/06/11 A	10/29/11 A	24	3	N	N
T-043A-11	T-043A-11, L-147, Test, San Carlos	2011	Test Performed	24548	24656	41497361	KE1	41497360	KE1									0.85	1.5	3432	L-147 TEST 0.11MI MP 1.50-3.40 PH1	09/06/11 A	10/29/11 A	24	4	N	N
T-043B-11	T-043B-11, L-147, Test, San Carlos	2011	Test Performed	24548	24656	41497361	KE1	41497361	KE1									1.5	3.4	10032	L-147 TEST 0.11MI MP 1.50-3.40 PH1	09/06/11 A	10/29/11 A	20	2	N	N
T-044-11	T-044-11, L-153, Test, Fremont	2011	Test Performed	24554	24553	41497365	KE1	41497365	KE1									0.0038	3.45	18195.94	L-153_1 TEST 3.54MI MP 0.00-3.45 PH1	07/12/11 A	08/06/11 A	30	4	N	N
T-045-11	T-045-11, L-153, Test, Union City	2011	Test Performed	24554	23519	41474085	KE1	41474085	KE1									9.2	13.61	23284.8	L-153_1 TEST 3.96MI MP 9.20-13.61 PH1	06/03/11 A	07/11/11 A	30	0	N	N
T-046-11	T-046-11, L-153, Test, Hayward	2011	Test Performed	24554	24550	41497362	KE1	41497362	KE1									13.615	17.62	21146.4	L-153_1 TEST 3.98MI MP 13.61-17.62 PH1	06/04/11 A	07/14/11 A	30	0	N	N
T-047B-11	T-047B-11, L-153, Test, San Leandro	2011	Test Performed	24554	24552	41497364	KE1	41497364	KE1									18.03	20.06	10718.4	L-153_1 TEST 2.01MI MP 18.03-20.06 PH1	09/28/11 A	11/20/11 A	30	9	N	N
T-049E-11	T-049E-11, L-191, Test, Pittsburg	2011	Test Performed	24555	23526	41474088	KE1	41474088	KE1									6.4753	7.72	6572.016	L-191 TEST 5.68MI MP 6.47-9.44 PH1	09/28/11 A	11/03/11 A	24	3	N	N
T-049W-11	T-049W-11. L-191, Test, Pittsburg	2011	Test Performed	24555	23526	41474088	KE1	41474088	KE1									7.72	9.44	9081.6	L-191 TEST 5.68MI MP 6.47-9.44 PH1	09/28/11 A	11/15/11 A	24	4	N	N
T-051-11	T-051-11, L-300A, Test, Newberry Springs	2011	Test Performed	24495	23543	41474053	KE1	41474053	KE1									121.8722	122.6788	4258.848	L-300A_1 TEST 0.40MI MP 121.87-122.68 PH	05/20/11 A	06/12/11 A	34	0	N	N
T-052-11	T-052-11, L-300A, Test, Newberry Springs	2011	Test Performed	24495	24487	41497303	KE1	41497303	KE1									127.0327	127.9306	4740.912	L-300A_1 TEST 0.90MI MP 127.03-127.93 PH	05/20/11 A	06/12/11 A	34	0	N	N
T-054B-11	T-054B-11, L-300A, Test, Barstow	2011	Test Performed	24495	24506	41497322	KE1	41497322	KE1									155.075	156.4	6996	L-300A T-054-11 MP 151.07 TO MP 156.40	09/06/11 A	10/04/11 A	34	0	N	N
T-055-11	T-055-11, L-300A, Test, Barstow	2011	Test Performed	24495	24507	41497323	KE1	41497323	KE1									156.4	157.86	7708.8	L-300A_1 TEST 1.47MI MP 156.40-157.86 PH	09/06/11 A	10/04/11 A	26	0	N	N
T-056S-11	T-056S-11, L-300A, Test, Barstow	2011	Test Performed	24495	24508	41497324	KE1	41497324	KE1									157.86	159.33	7761.6	L-300A_1 TEST 0.29MI MP 157.86-159.33 PH	09/06/11 A	10/04/11 A	34	0	N	N
T-060-11	T-060-11, L-300A, Test, Arvin	2011	Test Performed	24495	24502	41497318	KE1	41497318	KE1									256.22	257.0763	4521.264	L-300A_1 TEST 0.86MI MP 256.22-257.08 PH	07/29/11 A	08/12/11 A	34	1	N	N
T-062-11	T-062-11, L-300A, Test, Kettleman City	2011	Test Performed	24495	24491	41497307	KE1	41497307	KE1									345.02	345.26	1267.2	L-300A_1 TEST 0.28MI MP 245.02-245.26 PH	06/16/11 A	06/30/11 A	34	0	N	N
T-063-11	T-063-11, L-300A, Test, Avenal	2011	Test Performed	24495	24490	41497306	KE1	41497306	KE1									353.56	353.85	1531.2	L-300A_1 TEST 0.32MI MP 353.56-353.85 PH	06/16/11 A	06/30/11 A	34	0	N	N
T-064-11	T-064-11, L-300A, Test, Paicines	2011	Test Performed	24495	24504	41497320	KE1	41497320	KE1									414.79	416.977	11547.36	L-300A_1 TEST 0.84MI MP 414.79-416.98 PH	11/19/11 A	12/08/11 A	34	0	N	N
T-065A-11	T-065A-11, L-300A, Test, Paicines	2011	Test Performed	24495	24489	41497305	KE1	41497305	KE1									450	450.8299	4381.872	L-300A_1 TEST 0.45MI MP 445.59-446.48 PH	09/13/11 A	09/28/11 A	34	0	N	N
T-065B-11	T-065B-11, L-300A, Test, Hollister	2011	Test Performed	24495	24489	41497305	KE1	41497305	KE1									445.5937	446.4777	4667.52	L-300A_1 TEST 0.45MI MP 445.59-446.48 PH	09/06/11 A	09/28/11 A	34	0	N	N
T-067A-11	T-067A-11, L-300A, Test, San Martin	2011	Test Performed	24495	24511	41497327	KE1	41497327	KE1									477.77	478.06	1531.2	L-300A_1 TEST 0.93MI MP 475.26-478.06 PH	09/30/11 A	10/27/11 A	34	0	N	N
T-067B-11	T-067B-11, L-300A, Test, San Martin	2011	Test Performed	24495	24511	41497327	KE1	41497327	KE1									475.26	475.77	2692.8	L-300A_1 TEST 0.93MI MP 475.26-478.06 PH	09/30/11 A	10/27/11 A	34	0	N	N
T-068-11	T-068-11, L-300A, Test, Morgan Hill	2011	Test Performed	24495	24509	41497325	KE1	41497325	KE1									480.7432	483.7562	15908.64	L-300A_1 TEST 1.13MI MP 480.74-483.76 PH	10/15/11 A	11/09/11 A	34	0	N	N
T-070-11	T-070-11, L-300A, Test, San Jose	2011	Test Performed	23497	24496	41497312	KE1	41497312	KE1									490.48	490.63	792	L-300A_2 TEST 0.04MI 490.48-490.63 PH1	07/12/11 A	08/08/11 A	34	0	N	N
T-071-11	T-071-11, L-300A, Test, San Jose	2011	Test Performed	24495	24497	41497313	KE1	41497313	KE1									490.66	493.59	15470.4	L-300A_1 TEST 2.68MI MP 490.66-493.59 PH	06/28/11 A	08/08/11 A	34	4	N	N
T-072-11	T-072-11, L-300A, Test, San Jose	2011	Test Performed	24495	24494	41497310	KE1	41497310	KE1									493.59	496.05	12988.8	L-300A_1 TEST 2.28MI MP 493.59-496.05 PH	06/23/11 A	08/08/11 A	34	0	N	N
T-073-11	T-073-11, L-300A, Test, San Jose	2011	Test Performed	24495	24492	41497308	KE1	41497308	KE1									496.36	499.77	18004.8	L-300A_1 TEST 3.31MI MP 496.36-499.77 PH	07/12/11 A	08/08/11 A	34	0	N	N
T-074-11	T-074-11, L-300A, Test, Milpitas	2011	Test Performed	24495	24493	41497309	KE1	41497309	KE1									499.77	502.23	12988.8	L-300A_1 TEST 1.08MI MP 499.77-502.23 PH	07/12/11 A	08/08/11 A	34	0	N	N
T-075-11	T-075-11, L-300A-1, Test, Barstow	2011	Test Performed	24492	23546	41474054	KE1	41474054	KE1									156.4	157.86	7708.8	L-300A-1 TEST 0.61MI MP 156.40-157.86 PH	09/06/11 A	10/04/11 A	26	0	N	N
T-076-11	T-076-11, L-300B, Test, Barstow	2011	Test Performed	24521	24516	41497332	KE1	41497332	KE1									0.1548	0.458	1600.896	L-300B_1 TEST 0.31MI MP 0.15-0.46 PH1	08/08/11 A	08/30/11 A	34	0	N	N
T-077-11	T-077-11, L-300B, Test, Newberry Springs	2011	Test Performed	24521	23549	41474055	KE1	41474055	KE1									126.883	127.4994	3254.592	L-300B_1 TEST 0.60MI MP 126.88-127.50 PH	06/04/11 A	06/21/11 A	34	0	N	N
T-079A-11	T-079A-11, L-300B, Test, Barstow	2011	Test Performed	24521	24525	41497341	KE1	41497341	KE1									152.73	155.26	13358.4	L-300B_1 TEST 2.25MI MP 152.73-160.88 PH	10/01/11 A	10/20/11 A	34	0	N	N
T-079B-11	T-079B-11, L-300B, Test, Barstow	2011	Test Performed	24521	24525	41497341	KE1	41497341	KE1									160.712	160.88	887.04	L-300B_1 TEST 2.25MI MP 152.73-160.88 PH	10/01/11 A	10/20/11 A	34	0	N	N
T-080-11	T-080-11, L-300B, Test, Tehachapi	2011	Test Performed	24521	24519	41497335	KE1	41497335	KE1									237.4451	240.56	16446.67	L-300B_1 TEST 0.56MI MP 240.56-242.66 PH	08/10/11 A	09/01/11 A	34	0	N	N
T-081-11	T-081-11, L-300B, Test, Arvin	2011	Test Performed	24521	24518	41497334	KE1	41497334	KE1									256.66	257.5096	4485.888	L-300B_1 TEST 0.85MI MP 256.66-257.51 PH	08/03/11 A	09/01/11 A	34	1	N	N
T-082-11	T-082-11, L-300B, Test, Bakersfield	2011	Test Performed	24521	24522	41497338	KE1	41497338	KE1									263.46	264.46	5280	L-300B_1 TEST 0.91MI MP 263.46-264.46 PH	08/10/11 A	09/01/11 A	34	1	N	N
T-084A-11	T-084A-11, L-300B, Test, Avenal	2011	Test Performed	24521	24513	41497329	KE1	41497329	KE1									353.5369	353.82	1494.768	L-300B_1 TEST 0.59MI MP 353.53-353.82 PH	06/29/11 A	07/26/11 A	34	1	N	N
T-084B-11	T-084B-11, L-300B, Test, Avenal	2011	Test Performed	24521	24513	41497329	KE1	41497329	KE1									354.018	354.3115	1549.68	L-300B_1 TEST 0.59MI MP 353.53-353.82 PH	06/29/11 A	07/26/11 A	34	1	N	N
T-085-11	T-085-11, L-300B, Test, Cantua Creek	2011	Test Performed	24521	24512	41497328	KE1	41497328	KE1									384.063	384.9005	4422	L-300B_1 TEST 0.56MI MP 384.06-384.90 PH	06/18/11 A	06/30/11 A	34	0	N	N
T-086-11	T-086-11, L-300B, Test, Paicines	2011	Test Performed	24521	24520	41497336	KE1	41497336	KE1									414.7928	418.03	17092.42	L-300B_1 TEST 0.91MI MP 414.79-418.03 PH	11/19/11 A	12/15/11 A	34	0	N	N
T-087A-11	T-087A-11, L-300B, Test, Hollister	2011	Test Performed	24521	26092	41497337	KE1	41497337	KE1									450.7828	450.8	90.816	L-300B_1 TEST 1.12MI MP 445.49-450.80 PH	09/02/11 A	10/13/11 A	34	0	N	N
T-087B-11	T-087B-11, L-300B, Test, Hollister	2011	Test Performed	24521	26092	41497337	KE1	41497337	KE1									450.05	450.7794	3851.232	L-300B_1 TEST 1.12MI MP 445.49-450.80 PH	09/08/11 A	10/13/11 A	34	0	N	N
T-087C-11	T-087C-11, L-300B, Test, Hollister/Tres Pinos	2011	Test Performed	24521	26092	41497337	KE1	41497337	KE1									445.49	446.5	5332.8	L-300B_1 TEST 1.12MI MP 445.49-450.80 PH	09/02/11 A	10/13/11 A	34	0	N	N
T-089N-11	T-089N-11, L-300B, Test, San Jose	2011	Test Performed	24521	24515	41497331	KE1	41497331	KE1									489.3301	490.915	8368.272	L-300B_1 TEST 2.35MI MP 484.01-490.92 PH	08/04/11 A	09/10/11 A	34	1	N	N
T-089S-11	T-089S-11, L-300B, Test, San Jose	2011	Test Performed	24521	24515	41497331	KE1	41497331	KE1									484.0126	484.72	3735.072	L-300B_1 TEST 2.35MI MP 484.01-490.92 PH	08/04/11 A	09/10/11 A	34	1	N	N
T-090A-11	T-090A-11, L-300B, Test, San Jose	2011	Test Performed	24521	24517	41497333	KE1	41497333	KE1									490.94	493.9	15628.8	L-300B_1 TEST 10.46MI MP 490.94-502.62 P	08/04/11 A	09/10/11 A	34	1	N	N
T-090B-11	T-090B-11, L-300B, Test, San Jose	2011	Test Performed	24521	24517	41497333	KE1	41497333	KE1									493.9	496.37	13041.6	L-300B_1 TEST 10.46MI MP 490.94-502.62 P	08/04/11 A	09/10/11 A	34	0	N	N
T-090C-11	T-090C-11, L-300B, Test, San Jose	2011	Test Performed	24521	24517	41497333	KE1	41497333	KE1									496.37	499.33	15628.8	L-300B_1 TEST 10.46MI MP 490.94-502.62 P	08/04/11 A	09/10/11 A	34	0	N	N
T-090D-11	T-090D-11, L-300B, Test, San Jose	2011	Test Performed	24521	24517	41497333	KE1	41497333	KE1									499.33	502.62	17371.2	L-300B_1 TEST 10.46MI MP 490.94-502.62 P	08/04/11 A	09/10/11 A	34	0	N	N
T-093A-11	T-093A-11, L-400-3, Test, Antioch	2011	Test Performed	23551	23551	41474058	KE1	41474058	KE1									293.41	297.87	23548.8	L-400-3 TEST 1.61MI MP 293.40-297.87 PH1	09/20/11 A	11/21/11 A	26	1	N	N
T-093B-11	T-093B-11, L-400-3, Test, Sherman Island	2011	Test Performed	23551	23551	41474058	KE1	41474058	KE1									293.4	297.86	23548.8	L-400-3 TEST 1.61MI MP 293.40-297.87 PH1	09/20/11 A	11/08/11 A	26	3	N	N
T-096A-11	T-096A-11, SP5, Test, Oakley	2011	Test Performed	24162	31374	9715461	34A							9715461	34A			2.4	3.87	7761.6	SP5 T-96A-11 E&W 3.87MI MP 0.00-3.87	04/28/11 A	05/27/11 A	24	0	N	N
T-096B-11	T-096B-11, SP5, Test, Antioch	2011	Test Performed	24162	31374	9715461	34A							9715461	34A			0	2.4	12672	SP5 T-96A-11 E&W 3.87MI MP 0.00-3.87	04/28/11 A	05/27/11 A	24	0	N	N
T-109E-11	T-109E-11, L-148, Test, Modesto	2011	Test Performed	23513	26090	41474082	KE1	41474082	KE1									14.6	16.115	7999.2	L-148 TEST 3.00MI MP 14.60-17.63 PH1	10/17/11 A	10/28/11 A	8.625	1	N	N
T-109W-11	T-109W-11, L-148, Test, Modesto	2011	Test Performed	23513	26090	41474082	KE1	41474082	KE1									16.115	17.63	7999.2	L-148 TEST 3.00MI MP 14.60-17.63 PH1	10/17/11 A	11/03/11 A	8.625	0	N	N
T-112-11	T-112-11, L-191, Test, Pittsburg	2011	Test Performed	24555	24555	41497367	KE1	41497367	KE1									9.47	10.58	5860.8	L-191 TEST 1.09MI MP 9.47-10.58 PH1	10/10/11 A	11/15/11 A	24	5	N	N
T-115-11	T-115-11, L-300A, Test, Bakersfield	2011	Test Performed	23497	25181	41535680	KF1	41535680	KF1									288.9604	291.4411	13098.1	L-300A_2 TEST 288.96-291.44 PH1	09/25/11 A	10/11/11 A	34	0	N	N
T-116A-11	T-116A-11, L-300A, Test, Bakersfield	2011	Test Performed	23497	26088	41474039	KE1	41474039	KE1									267.935	268.654	3796.32	L-300A_1 TEST MP 269.51-269.83 PH1	10/26/11 A	11/21/11 A	34	0	N	N
T-116B-11	T-116B-11, L-300A, Test, Bakersfield	2011	Test Performed	23497	26088	41474039	KE1	41474039	KE1									269.51	269.833	1705.44	L-300A_1 TEST MP 269.51-269.83 PH1	10/26/11 A	11/21/11 A	34	0	N	N
T-117-11	T-117-11, L-300B, Test, Bakersfield	2011	Test Performed	24521	25340	41545511	KE1	41545511	KE1									283.85	284.62	4065.6	L-300B_1 TEST 0.76MI MP 283.85-284.62 PH	10/17/11 A	10/31/11 A	34	0	Y	Y
T-118A-11	T-118A-11, L-300A, Test, Tehachapi	2011	Test Performed	23497	25393	41587446	KE1	41587446	KE1									239.57	241.6	10718.4	L-300A_2 TEST 4.05MI 239.57-243.74 PH1	11/03/11 A	11/21/11 A	34	0	N	N
T-118B-11	T-118B-11, L-300A, Test, Tehachapi	2011	Test Performed	23497	25393	41587446	KE1	41587446	KE1									241.6	243.74	11299.2	L-300A_2 TEST 4.05MI 239.57-243.74 PH1	11/03/11 A	11/21/11 A	34	0	N	N
T-120-11	T-120-11, L-300A, Test, Fresno	2011	Test Performed	23497	25395	41587448	KE1	41587448	KE1									384.65	385.55	4752	L-300A_2 TEST 0.82MI 384.65-385.55 PH1	11/07/11 A	11/19/11 A	34	0	N	N
T-121-11	T-121-11, L-303, Test, Livermore	2011	Test Performed	23536	25770	41592685	KF1	41592685	KF1									26.555	27.672	5897.76	T-121 L-303 MP 26.555 TO MP 27.672	11/02/11 A	11/19/11 A	36	6	N	N
T-122-11	T-122-11, DFM-0211-01, Test, Burlingame	2011	Test Performed	23566	25459	41598529	KE1	41598529	KE1									0	0.74	3907.2	DFM-0211-01 TEST 0.68MI MP 0.00-0.68 PH1	10/27/11 A	10/29/11 A	8.625	0	N	N
TV-023-11	TV-023-11, L-131, Repl & Video, Milpitas	2011	Test Performed	24699	24647	41502562	KE1	41502562	KE1									57.46	57.47	52.8	L-131_1 TEST 0.01MI MP 57.46-57.47 PH1	05/24/11 A	05/25/11 A	30	0	N	N

PMO ID	P6 Project Name	Portfolio Year	Work Type	Original PSEP PSRS (if applicable)	Tracking PSRS ID	Tracking Order Number	Tracking Order MAT Code	Order #1 (Expense)	Order #1 MAT	Order #2 (Capital)	Order #2 MAT	Order #3 (IM)	Order #3 MAT	Order #4 (Other_a)	Order #4 MAT	Order #5 (Other_b)	Order #5 MAT	MP1	MP2	Ft.	Tracking PSRS Description	Mob Date	Tie In Date	Line Diameter	# Cleaning Runs	Leak/Rupture (Y,N)	Greater than 1 cycle (Y,N)
TV-036A-11	TV-036A-11, L-132, Test & Video, San Bruno	2011	Test Performed	24537	24479	41497344	KE1	41497344	KE1									40.0837	42.34	11913.26	L-132_1 TEST 1.46MI MP 40.08-42.34 PH1	05/18/11 A	11/22/11 A	30	0	N	N
TV-036B-11	TV-036B-11, L-132, Test & Video, San Bruno	2011	Test Performed	24537	24481	41497345	KE1	41497345	KE1									43.34	43.61	1425.6	L-132_1 TEST 1.48MI MP 43.34-43.61 PH1	05/18/11 A	11/22/11 A	30	0	N	N
TV-047A-11	TV-047A-11, L-153, Test & Video, San Leandro	2011	Test Performed	24554	24551	41497363	KE1	41497363	KE1									17.65	18.01	1900.8	L-153_1 TEST 0.34MI MP 17.65-18.01 PH1	06/30/11 A	08/02/11 A	30	2	N	N
PR-002-12	PR-002-12, DFM-2405-01, Test from Dig, Fremont	2012	Test Performed	N/A	26332	41644891	KF1	41644891	KF1									0.553	0.62	353.76	TBD	04/09/12 A	04/28/12 A	4.5	0	Y	Y
PR-003-12	PR-003-12, L-131, Test, Milpitas	2012	Test Performed	N/A	26331	41640372	KF1	41640372	KF1									0	0.1752	925.056	TBD	03/19/12 A	04/09/12 A	12.75	2	N	N
PR-004-12	PR-004-12, L-300B, Test, Needles	2012	Test Performed	N/A	27828	41717164	KF1	41717164	KF1									0.24	0.24	0	TBD	08/03/12 A	08/05/12 A	34	0	N	N
PR-005-12	PR-005-12, L-148, Test, Modesto	2012	Test Performed	N/A	27899	41719452	KF1	41719452	KF1									0	0	0	TBD	08/24/12 A	09/07/12 A	8.625	0	N	N
TIM-013A-12	TIM-013A-12, L-109, Test, Daly City	2012	Test Performed	23505	27284	41821631	KE1	41821631	KE1					6115668	2H2	41617910	IIH	41.9	43.473	8305.44	L-109 TIM-013A-12 PSEP FUND	08/20/12 A	11/08/12 A	30	1	N	N
T-013B-12	T-013B-12, L-109, Test, Daly City	2012	Test Performed	23505	26265	41637747	KE1	41637747	KE1									43.492	44.7195	6481.2	L-109 TEST 0.99MI MP 43.49-44.72 PH1	08/20/12 A	11/08/12 A	30	3	N	N
T-018-12	T-018-12, L-132, Test, San Francisco	2012	Test Performed	23557	25850	41599878	KE1	41599878	KE1	30909592	2H2							48.44	49.98	8131.2	L-132_2 TEST 1.80MI MP 48.44-49.98 PH1	05/28/12 A	07/11/12 A	24	1	N	N
TIM-019-12	TIM-019-12, L-153, Test, Oakland	2012	Test Performed	23582	26478	41650741	IIH	41650741	IIH	30935893	2H2							22.87	25.11	11827.2	L-153_2 T-019-12 MP 22.87 TO MP 25.110	07/23/12 A	10/19/12 A	24	4	N	N
TIM-020-12	TIM-020-12, L-153, Test, Oakland	2012	Test Performed	23582	26475	41650662	IIH	41650662	IIH									25.11	27.76	13992	L-153_2 T-020-12 MP 25.11 TO MP 27.88	10/16/12 A	11/27/12 A	24	1	N	N
T-021-12	T-021-12, L-191-1, Test, Pittsburg	2012	Test Performed	23511	25857	41613029	KE1	41613029	KE1	30903145	2H2							9.5862	9.94	1868.064	L-191-1 TEST 0.36MI MP 9.58-9.94 PH1	02/27/12 A	03/30/12 A	20	2	N	N
TIM-024-12	TIM-024-12, DFM-0813-01, Test, San Jose	2012	Test Performed	23861	25862	41617915	IIH	41617915	IIH									0.0293	1.2862	6636.432	DFM-0813-01 T-024-12 MP 0 TO MP 1.286	09/05/12 A	11/05/12 A	12.75	2	N	N
T-025-12	T-025-12, L-100, Test, San Jose	2012	Test Performed	23496	25863	41617916	KE1	41617916	KE1	30900898	2H2							138.43	143.853	28633.44	L-100 TEST 5.23MI MP 138.43-143.85 PH1	03/19/12 A	06/07/12 A	20	32	N	N
T-025B-11	T-025B-11, L-132, Test, Santa Clara	2012	Test Performed	24537	27746	41709445	KE1	41709445	KE1									4.29	4.92	3326.4	L-132_1 TEST 0.63MI MP 4.29-4.92 PH1	07/11/12 A	08/27/12 A	24	16	N	N
T-026-12	T-026-12, L-100, Test, San Jose	2012	Test Performed	23496	25865	41600042	KE1	41600042	KE1									143.853	147.77	20681.76	L-100 TEST 4.28MI MP 143.85-147.77 PH1	03/19/12 A	06/07/12 A	20	32	N	N
T-027-12	T-027-12, L-100, Test, Milpitas	2012	Test Performed	23496	25868	41600043	KE1	41600043	KE1									147.77	150.13	12460.8	L-100 TEST 2.36MI MP 147.77-150.13 PH1	03/19/12 A	06/07/12 A	24	32	N	N
TIM-037-11	TIM-037-11, L-132, Test, South San Francisco	2012	Test Performed	24537	24544	41497358	KE1	41497358	KE1									43.61	46.57	15628.8	L-132_1 TEST 2.96MI MP 43.61-46.57 PH1	07/31/12 A	09/07/12 A	30	1	N	N
T-038-11	T-038-11, L-132, Test, San Francisco	2012	Test Performed	24537	24530	41497347	KE1	41497347	KE1	30905854	2H2							46.61	48.44	9662.4	L-132_1 TEST 1.95MI MP 46.61-48.44 PH1	05/14/12 A	06/12/12 A	24	2	N	N
T-039B-11	T-039B-11, L-132, Test, San Francisco	2012	Test Performed	24537	24531	41497348	KE1	41497348	KE1	30924989	2H2							49.98	51.5	8025.6	L-132_1 TEST 1.53MI MP 49.98-51.50 PH1	05/28/12 A	07/11/12 A	24	1	N	N
T-040-12	T-040-12, DFM-7221-10, Test, Salida	2012	Test Performed	23467	25893	41617923	KE1	41617923	KE1									7.208	9.652	12904.32	DFM-7221-10 TEST 2.46MI MP 7.20-9.65 PH1	04/02/12 A	04/29/12 A	12.75	5	N	N
T-044-12	T-044-12, L-138, Test, Fresno	2012	Test Performed	23510	25899	41617925	KE1	41617925	KE1	30906151	2H2							22.55	28.64	32155.2	L-138 TEST 6.11MI MP 22.55-28.64 PH1	06/19/12 A	08/03/12 A	16	1	N	N
T-045-12	T-045-12, L-138, Test, Fresno	2012	Test Performed	23510	25901	41600052	KE1	41600052	KE1	30915235	2H2							28.64	35.91	38385.6	L-138 TEST 7.25MI MP 28.64-35.91 PH1	06/19/12 A	08/03/12 A	16	1	N	N
T-047-12	T-047-12, L-138, Test, Fresno	2012	Test Performed	23510	25810	41600054	KE1	41600054	KE1	30941125	2H2							45.39	45.56	897.6	L-138 TEST 0.18MI MP 45.39-45.56 PH1	08/21/12 A	09/19/12 A	12.75	1	N	N
T-047C-11	T-047C-11, L-153, Test, Oakland	2012	Test Performed	24554	26476	41650674	KE1	41650674	KE1	30928809	2H2							20.06	22.87	14836.8	L-153_1 TEST 2.80MI MP 20.06-22.87 PH1	07/23/12 A	10/19/12 A	24	5	N	N
T-048-12	T-048-12, L-142N, Test, Bakersfield	2012	Test Performed	23493	25812	41617926	KE1	41617926	KE1									0	3.159	16679.52	L-142N TEST 3.14MI MP 0.00-3.16 PH1	03/26/12 A	05/04/12 A	16	13	N	N
T-049-12	T-049-12, L-142N, Test, Bakersfield	2012	Test Performed	23493	25816	41600055	KE1	41600055	KE1	30906273	2H2							3.159	6.6854	18619.39	L-142N TEST 3.53MI MP 3.15-6.69 PH1	03/26/12 A	05/04/12 A	16	6	N	N
T-052-12	T-052-12, L-142S, Test, Bakersfield	2012	Test Performed	23495	25821	41617927	KE1	41617927	KE1									0.02	0.69	3537.6	L-142S TEST 0.66MI MP 0.02-0.69 PH1	06/04/12 A	07/13/12 A	10.75	14	N	N
T-053-12	T-053-12, L-142S, Test, Bakersfield	2012	Test Performed	23495	25822	41600058	KE1	41600058	KE1									3.21	3.87	3484.8	L-142S TEST 0.67MI MP 3.21-3.87 PH1	06/04/12 A	07/13/12 A	10.75	5	N	N
T-054-12	T-054-12, L-142S, Test, Bakersfield	2012	Test Performed	23495	25824	41600059	KE1	41600059	KE1	30914193	2H2							10.445	11.48	5464.8	L-142S TEST 1.04MI MP 10.44-11.48 PH1	07/02/12 A	07/25/12 A	12.75	2	N	N
T-055-12	T-055-12, L-300A, Test, Tehachapi	2012	Test Performed	23497	25826	41617928	KE1	41617928	KE1									230.32	231.2	4646.4	L-300A_2 TEST 0.88MI MP 230.32-231.20 PH	08/01/12 A	09/07/12 A	34	0	N	N
T-057E-11	T-057E-11, L-300A, Test, San Bernardino	2012	Test Performed	24495	24499	41497315	KE1	41497315	KE1									181.446	182.3365	4701.84	L-300A_1 TEST 1.08MI MP 181.44-182.34 PH	02/07/12 A	03/22/12 A	34	0	N	N
T-057W-11	T-057W-11, L-300A, Test, Kern	2012	Test Performed	24495	26783	41663877	KE1	41663877	KE1									187.849	188.408	2951.52	L-300A_1 TEST 0.58MI MP 187.84-188.41 PH	02/07/12 A	03/22/12 A	34	0	N	N
T-059-12	T-059-12, L-300A, Test, Bakersfield	2012	Test Performed	23497	25830	41600062	KE1	41600062	KE1									277.89	278.12	1214.4	L-300A_2 TEST 0.23MI 277.89-278.12 PH1	07/06/12 A	07/28/12 A	34	0	N	N
T-061-12	T-061-12, L-300A, Test, Coalinga	2012	Test Performed	23497	25394	41587447	KE1	41587447	KE1									372.499	374.572	10945.44	L-300A_2 TEST 2.12MI 372.49-374.57 PH1	01/09/12 A	01/30/12 A	34	0	N	N
T-073-12	T-073-12, L-021F, Test, San Rafael	2012	Test Performed	23535	25849	41600067	KE1	41600067	KE1	30905855	2H2							19.17	20.09	4857.6	L-021F TEST 0.06MI MP 19.17-20.09 PH1	04/17/12 A	05/22/12 A	12.75	2	N	N
T-079-12	T-079-12, L-119A, Test, Davis	2012	Test Performed	23552	25858	41617940	KE1	41617940	KE1	30930683	2H2							0.0035	3.824	20172.24	L-119A TEST 3.90MI MP 0.00-3.82 PH1	07/20/12 A	09/07/12 A	12.75	22	N	N
T-089-12	T-089-12, L-210B, Test, Fairfield	2012	Test Performed	23525	25877	41617945	KE1	41617945	KE1	30933445								7.4976	10.8217	17551.25	L-210B TEST 3.25MI MP 7.49-10.82 PH1	08/01/12 A	10/05/12 A	16	14	N	N
T-090-12	T-090-12, L-210B, Test, Fairfield	2012	Test Performed	23525	25879	41600073	KE1	41600073	KE1	30934866	2H2							10.8217	15.6107	25285.92	L-210B TEST 5.14MI MP 10.82-15.61 PH1	08/01/12 A	10/05/12 A	16	9	Y	Y
T-091-12	T-091-12, L-210B, Test, Fairfield	2012	Test Performed	23525	25881	41600074	KE1	41600074	KE1	30940455	2H2							15.6107	20.222	24347.66	L-210B TEST 4.95MI MP 15.61-20.22 PH1	08/29/12 A	10/24/12 A	16	10	N	N
T-092-12	T-092-12, L-210B, Test, Napa	2012	Test Performed	23525	25883	41600075	KE1	41600075	KE1									22.98	25.98	15840	L-210B TEST 2.82MI MP 22.98-25.98 PH1	09/25/12 A	10/15/12 A	16	6	N	N
T-096-12	T-096-12, DFM-1816-01, Test, Santa Cruz	2012	Test Performed	23929	25890	41600077	KE1	41600077	KE1	30916687	2H2							16.3	18.25	10296	DFM-1816-01_2 TEST 1.96MI MP 16.30-18.25	06/26/12 A	07/27/12 A	10.75	0	N	N
T-097-12	T-097-12, L-148, Test, Modesto	2012	Test Performed	23513	25892	41617948	KE1	41617948	KE1	30905851	2H2							0	6.06	31996.8	L-148 TEST 6.06MI MP 0.00-6.06 PH1	03/05/12 A	04/03/12 A	8.625	19	N	N
T-099-12	T-099-12, L-148, Test, Modesto	2012	Test Performed	23513	25898	41600079	KE1	41600079	KE1	30905853	2H2							6.06	12.58	34425.6	L-148 TEST 6.52MI MP 6.06-12.58 PH1	03/22/12 A	04/24/12 A	8.625	1	N	N
T-100-12	T-100-12, L-148, Test, Modesto	2012	Test Performed	23513	25900	41600080	KE1	41600080	KE1	30906149	2H2							12.58	14.62	10771.2	L-148 TEST 2.02MI MP 12.58-14.62 PH1	04/13/12 A	05/19/12 A	8.625	2	N	N
TIM-101-11	TIM-101-11, DFM-1816-01, Test, Watsonville	2012	Test Performed	24484	24484	41497300	KE1	41497300	KE1	30920588	2H2							3.441	8.44	26394.72	DFM-1816-01_1 TEST 5.74MI MP 3.44-8.44 P	07/25/12 A	08/31/12 A	8.625	1	N	N
TIM-102A-12	TIM-102A-12, L-118A, Test, Fresno	2012	Test Performed	23548	25905	41622644	IIH	41622644	IIH									0	0.18	950.4	L-118A T102A-12 MP 0.00 TO MP 0.180	05/03/12 A	05/23/12 A	8.625	1	N	N
T-102D-12	T-102D-12, L-118A, Test, Chowchilla	2012	Test Performed	23548	25908	41622647	KE1	41622647	KE1	30915236	2H2							37.38	37.71	1742.4	L-118A TEST 0.32MI MP 37.38-37.71 PH1	05/23/12 A	06/19/12 A	8.625	1	N	N
T-102F-12	T-102F-12, L-118A, Test, Merced	2012	Test Performed	23548	25913	41622649	KE1	41622649	KE1	30915237	2H2							58.21	58.74	2798.4	L-118A TEST 0.53MI MP 58.21-58.74 PH1	06/08/12 A	07/10/12 A	8.625	1	N	N
T-104-12	T-104-12, L-132, Test, San Carlos	2012	Test Performed	24537	25917	41622651	KE1	41622651	KE1	30933446	2H2							25.6	29.06	18268.8	L-132_1 TEST 3.56MI MP 25.60-29.06 PH1	07/26/12 A	09/27/12 A	24	25	N	N
T-110-12	T-110-12, L-300A, Test, Hollister	2012	Test Performed	24495	25926	41622656	KE1	41622656	KE1									446.4777	449.706	17045.42	L-300A_1 TEST 3.32MI MP 446.47-449.71 PH	08/06/12 A	08/31/12 A	34	0	N	N
TIM-114-11	TIM-114-11, L-109, Test, Mountain View	2012	Test Performed	23505	25179	41534902	KE1	41534902	KE1									7.57	8.72	6072	L-109 TEST 1.35MI MP 7.57-8.72 PH1	04/17/12 A	06/19/12 A	24	5	N	Y
T-122-12	T-122-12, L-300B, Test, Topock	2012	Test Performed	24521	25928	41617909	KE1	41617909	KE1									0.1294	0.1549	134.64	L-300B_1 TEST 0.03MI MP 0.12-0.15 PH1	02/13/12 A	03/28/12 A	34	0	N	N
TIM-123-12	TIM-123-12, L-109, Test, Hillsborough	2012	Test Performed	N/A	26320	41640537	IIH	41640537	IIH	30939046	2H2							30.52	32.4378	10125.98	L-109 T-123-12 MP 31.52 TO MP 32.806	09/06/12 A	11/16/12 A	22	21	N	N
TIM-125-12	TIM-125-12, L-109, Test, Redwood City	2012	Test Performed	N/A	26322	41640539	IIH	41640539	IIH	30923314	2H2							21.422	22.225	4239.84	L-109 T-125-12 MP 21.422 TO MP 22.225	07/09/12 A	08/03/12 A	22	4	N	N
TIM-126-12	TIM-126-12, L-109, Test, Menlo Park	2012	Test Performed	N/A	26323	41640620	IIH	41640620	IIH									18.56	19.55	5227.2	L-109 T-126-12 MP 18.56 TO MP 19.55	07/09/12 A	08/03/12 A	22	4	N	N
TIM-130-12	TIM-130-12, DFM-3017-01, Test, Walnut Creek	2012	Test Performed	N/A	26324	41640621	IIH	41640621	IIH					6115669	2H2	41821633	KE1	0.8157	3.92	16390.7	DFM-3017-01 TIM-130-12 MP0.816 TO MP3.92	06/12/12 A	08/10/12 A	8.625	1	N	N
TIM-131-12	TIM-131-12, DFM-3017-01, Test, Danville	2012	Test Performed	23906	26325	41640622	KE1	41640622	KE1					6115669	2H2			3.92	7.54	19113.6	DFM-3017-01 TEST 3.41MI MP 3.92-7.54 PH1	06/12/12 A	08/10/12 A	8.625	1	N	N
TIM-133-12	TIM-133-12, DFM-7224-01, Test, Modesto	2012	Test Performed	N/A	26310	41641190	IIH	41641190	IIH									5.34	6.02	3590.4	DFM-7224-01 TIM-133-12 MP 5.34 TO MP 6.0	07/18/12 A	08/11/12 A	8.625	1	N	N
TIM-134A-12	TIM-134A-12, L-107, Test, Sunol	2012	Test Performed	N/A	26311	41641195	IIH	41641195	IIH									18.69	26.01	38649.6	L-107 TIM-134A-12 MP 23.204TO MP 24.4203	09/21/12 A	09/21/12 A	22	0	N	N
TIM-136-12	TIM-136-12, DFM-1614-01, Test, Lodi	2012	Test Performed	23847	26326	41640623	KE1	41640623	KE1	30920175	2H2	41822275	IIH					0	3.9	20592	DFM-1614-01 TEST 3.90MI MP 0.00-3.90 PH1	09/28/12 A	11/03/12 A	6.625	9	Y	Y
TIM-140-12	TIM-140-12, L-103, Test, Prunedale	2012	Test Performed	23502	26327	41640624	IIH	41640624	IIH									15.6417	15.86	1152.624	L-103 TEST 0.40MI MP 15.64-15.86 PH1	09/06/12 A	10/16/12 A	12.75	0	N	N
TIM-142-12	TIM-142-12, L-103, Test, Salinas	2012	Test Performed	23502	26329	41640626	KE1	41640626	KE1	30918416	2H2							27.16	27.26	528	L-103 TEST 0.10MI MP 27.16-27.26 PH1	10/08/12 A	10/27/12 A	12.75	1	N	N
TIM-143-12	TIM-143-12, DFM-0405-01, Test, Napa	2012	Test Performed	N/A	26330	41640627	IIH	41640627	IIH	30929279	2H2							3.87	13	48206.4	DFM-0405-01 T-143-12 MP 3.87 TO MP13.0	08/14/12 A	09/28/12 A	10.75	1	N	N
TIM-144-12	TIM-144-12, DFM-0405-01, Test, Yountville	2012	Test Performed	N/A	26337	41640628	IIH	41640628	IIH	30929279	2H2							3.87	13	48206.4	DFM-0405-01 T-144-12 MP3.87 TO MP13.0	08/14/12 A	09/28/12 A	10.75	1	N	N
TIM-146-12	TIM-146-12, DFM-0115-01, Test, Oakland	2012	Test Performed	23556	26338	41640629	KE1	41640629	KE1	30943090	2H2	41822364	IIH					0	0.4054	2140.512	DFM-0115-01 TEST 0.40MI MP 0.00-0.41 PH1	10/31/12 A	11/27/12 A	8.625	2	N	N
TIM-149-12	TIM-149-12, DFM-0813-02, Test, San Jose	2012	Test Performed	N/A	26340	41640631	IIH	41640631	IIH									0	0.5	2640	DFM-0813-02 TEST 0.50MI MP 0.00-0.50PH1	09/05/12 A	11/05/12 A	6.625	2	N	N
TIM-150-12	TIM-150-12, DFM-0814-05, Test, San Jose	2012	Test Performed	N/A	26341	41640632	IIH	41640632	IIH									0	0.31	1636.8	DFM-0814-05 TEST 0.31MI MP 0.00-0.31 PH1	09/05/12 A	11/05/12 A	10.75	1	N	N
TIM-155-12	TIM-155-12, L-138D, Test, Fresno	2012	Test Performed	N/A	26317	41641285	IIH	41641285	IIH	30914280	2H2							45.1	46.64	8131.2	L-138D TIM-155-12 MP 45.10 TO MP 46.64	10/17/12 A	12/06/12 A	10.75	1	N	N
TIM-159-12	TIM-159-12, L-181B, Test, Aromas	2012	Test Performed	N/A	26318	41641286	IIH	41641286	IIH									4.0776	4.5077	2270.928	L-181B TIM-159-12 MP 4.08 TO MP 4.5077	06/11/12 A	07/07/12 A	16	1	N	N
TIM-160B-12	TIM-160B-12, DFM-7222-01, Test, Turlock	2012	Test Performed	N/A	26831	41665948	IIH	41665948	IIH	30923302	2H2							11.16	13.15	10507.2	*CANC* DFM-7222-01 TEST 13.55MI MP 0.	09/04/12 A	10/03/12 A	6.625	2	N	N
TIM-161-12	TIM-161-12, DFM-7223-01, Test, Modesto	2012	Test Performed	23472	26343	41640634	KE1	41640634	KE1	30909595	2H2							0.1436	8.3998	43592.74	DFM-7223-01 TEST 8.24MI MP 0.14-8.40 PH1	07/06/12 A	08/19/12 A	10.75	2	N	N
TIM-162-12	TIM-162-12, DFM-7224-09, Test, Modesto	2012	Test Performed	23474	31520	41640635	KE1	41640635	KE1	30939383	2H2							0	1.35	7128	DFM-7224-09 T-162-12 MP 0.00 TO MP1.35	11/07/12 A	12/19/12 A	6.625	0	N	N
TIM-166-12	TIM-166-12, DFM-1301-01, Test, Cotati	2012	Test Performed	N/A	26620	41656115	IIH	41656115	IIH									4.18	4.63	2376	DFM-1301-01 TEST 4.40MI MP 0.00-4.63 PH1	09/05/12 A	10/12/12 A	8.625	1	N	N
TIM-168-12	TIM-168-12, DFM-1614-08, Test, Lodi	2012	Test Performed	N/A	26622	41656201	IIH	41656201	IIH	30930380	2H2							0.56	1	2323.2	TIM-168-12 DFM-1614-08 MP 0.56 TO MP 1.0	07/23/12 A	08/13/12 A	4.5	1	N	N
TIM-169-12	TIM-169-12, L-197B, Test, Lodi	2012	Test Performed	N/A	26623	41656204	IIH	41656204	IIH	30923303	2H2	41822376	KE1					0	4.467	23585.76	TIM-169-12 L-197B MP 0.00 TO MP 4.40	08/01/12 A	09/21/12 A	6.625	23	N	N
T-172-12	T-172-12, L-131, Test, Livermore	2012	Test Performed	23874	25467	41687447	KF1	41687447	KF1									35.73	35.89	844.8	L-131 T-172-12 MP 35.73-35.87 CLASSW0034	07/19/12 A	08/12/12 A	24	2	N	N
T-173-12	T-173-12, DFM-7219-01, Test, Modesto	2012	Test Performed	23695	27568	41699030	JTC	41699030	JTC					8149081	KE1			0.0025	3.73	19681.2	DFM-7219-01 T-173-12 MP 0.00-3.73	08/07/12 A	08/31/12 A	4.5	2	N	N
TIM-175-12	TIM-175-12, L-109, Test, Stanford	2012	Test Performed	N/A	28135	41737020	IIH	41737020	IIH									16.93	17.1	897.6	L-109 TIM-175-12 MP 16.93 TO MP 17.01	08/13/12 A	10/25/12 A	24	3	N	N
T-176-12	T-176-12, L-301F, Test, Marina	2012	Test Performed	N/A	27772	41712455	JTC	41712455	JTC									7.114	7.933	4324.32	L-301F T-176-12 MP 7.23-7.63	08/09/12 A	08/25/12 A	16	1	N	N
TIM-177-12	TIM-177-12, L-119A, Test, Sacramento	2012	Test Performed	N/A	28133	41736391	IIH	41736391	IIH									16.12	16.4109	1535.952	L-119A TIM-177-12 MP 16.2225-16.4109	10/08/12 A	10/27/12 A	20	0	N	N
TIM-179-12	TIM-179-12, L-153-2, Test, Oakland	2012	Test Performed	24554	28253	41746698	IIH	41746698	IIH									0	0.03075	162.36	L-153_2 TIM-179-12 MP 0.00 -0.31	11/05/12 A	11/27/12 A	20	2	N	N
TIM-180-12	TIM-180-12, L-191-1, Test, Martinez	2012	Test Performed	N/A	28278	41748985	IIH	41748985	IIH									34.7	35.28	3062.4	L-191-1 TIM-180-12 MP 34.70-35.28	10/22/12 A	11/15/12 A	10.75	2	N	N
T-182-12	T-182-12, L-109, Test, Milpitas	2012	Test Performed	23724	28279	41748986	KE1	41748986	KE1									0.44	1.16	3801.6	L-109 TEST 0.72MI MP 0.44-1.16 PH1	09/19/12 A	10/26/12 A	30	10	N	N
T-183-12	T-183-12, L-300B, Test, Barstow	2012	Test Performed	24521	28448	41758570	KF1	41758570	KF1									152.448	152.6929	1293.072	L-300B T-183-12 MP 151.5762 TO MP 152.66	11/13/12 A	12/14/12 A	34	0	N	N
T-013C-12	T-013C-12, L-109, Test, Daly City	2013	Test Performed	23505	30025	41867295	KE1	41867295	KE1	30995279	2H2							44.7195	45.39	3540.24	L-109 TEST 0.22MI MP 44.72-45.39 PH1	07/26/13 A	09/12/13 A	30	1	N	N
T-015-12	T-015-12, L-131_2, Test, Oakley	2013	Test Performed	23874	25841	41613030	KE1	41613030	KE1									8.45	8.58	686.4	L-131_2 TEST 0.12MI MP 8.45-8.58 PH1	03/06/13 A	05/01/13 A	12.75	6	N	N
TIM-022B-12	TIM-022B-12, L-191-1, Test, Walnut Creek	2013	Test Performed	23511	25860	41600040	KE1	41600040	KE1									21.35	25.29	20803.2	L-191-1 TEST 6.82MI MP 21.35-25.29 PH1	06/03/13 A	08/23/13 A	16	1	N	N
TIM-022C-12	TIM-022C-12, L-191-1, Test, Walnut Creek	2013	Test Performed	23511	25860	41600040	KE1	41600040	KE1									19.65	21.35	8976	L-191-1 TEST 6.82MI MP 21.35-25.29 PH1	06/03/13 A	07/26/13 A	16	1	N	N
TIM-022D-12	TIM-022D-12, L-191-1, Test, Walnut Creek	2013	Test Performed	23511	25860	41600040	KE1	41600040	KE1									18.61	19.65	5491.2	L-191-1 TEST 6.82MI MP 21.35-25.29 PH1	06/03/13 A	07/26/13 A	20	1	N	N
T-023-12	T-023-12, L-191-1, Test, Martinez	2013	Test Performed	23511	25861	41600041	KE1	41600041	KE1	30977297	2H2							31.9	34.7	14784	L-191-1 TEST 2.94MI MP 31.90-35.83 PH1	07/09/13 A	10/15/13 A	10.75	3	N	N
T-028-12	T-028-12, DFM-2403-12, Test, Fremont	2013	Test Performed	24188	25870	41617917	KE1	41617917	KE1	30954845	2H2							0.05	2.8771	14927.09	DFM-2403-12 TEST 2.84MI MP 0.05-2.88 PH1	05/06/13 A	07/21/13 A	12.75	4	N	N
T-038-12	T-038-12, DFM-1615-01, Test, Modesto	2013	Test Performed	23856	25889	41617922	KE1	41617922	KE1	30963041	2H2							0.02	10.12	53328	DFM-1615-01 TEST 10.09MI MP 0.02-10.12 P	07/01/13 A	09/15/13 A	12.75	7	Y	Y
T-038B-11	T-038B-11, L-132, Test, Daly City	2013	Test Performed	24537	28473	41801221	KE1	41801221	KE1									46.6059	46.608	11.088	L-132_1 TEST 0.01MI MP 46.60-46.61 PH1	NA	02/25/13 A	24	0	N	N
T-039A-12	T-039A-12, DFM-1615-01, Test, Modesto	2013	Test Performed	23856	25891	41600049	KE1	41600049	KE1	30909593	2H2			8148963	KE1			10.12	14.88	25132.8	DFM-1615-01 TEST 1.89MI MP 10.12-14.88 P	07/10/13 A	10/18/13 A	12.75	2	Y	Y
TIM-042-12	TIM-042-12, L-057A-MD1, Test, McDonald Island	2013	Test Performed	24183	25897	41482931	KE1	41482931	KE1	30937949	2H2							0.0043	0.616	3229.776	L-057A-MD1 TEST 0.68MI MP 0.00-0.62 PH1	01/14/13 A	02/15/13 A	10.75	1	N	N
TIM-043-12	TIM-043-12, L-057A-MD1, Test, McDonald Island	2013	Test Performed	24183	25896	41600051	KE1	41600051	KE1									0.97	1.13	844.8	L-057A-MD1 TEST 0.16MI MP 0.97-1.13 PH1	01/14/13 A	02/15/13 A	8.625	1	N	N

PMO ID	P6 Project Name	Portfolio Year	Work Type	Original PSEP PSRS (if applicable)	Tracking PSRS ID	Tracking Order Number	Tracking Order MAT Code	Order #1 (Expense)	Order #1 MAT	Order #2 (Capital)	Order #2 MAT	Order #3 (IM)	Order #3 MAT	Order #4 (Other_a)	Order #4 MAT	Order #5 (Other_b)	Order #5 MAT	MP1	MP2	Ft.	Tracking PSRS Description	Mob Date	Tie In Date	Line Diameter	# Cleaning Runs	Leak/Rupture (Y,N)	Greater than 1 cycle (Y,N)
T-046-12	T-046-12, L-138, Test, Fresno	2013	Test Performed	23510	25902	41600053	KE1	41600053	KE1	30961361	2H2							35.91	38.38	13041.6	L-138 TEST 2.38MI MP 35.91-38.38 PH1	04/12/13 A	05/24/13 A	16	1	N	N
T-051A-12	T-051A-12, L-142N, Test, Bakersfield	2013	Test Performed	23493	25820	41600057	KE1	41600057	KE1					8148962	KE1			8.26	8.72	2428.8	L-142N TEST 4.75MI MP 8.26-8.70 PH1	07/01/13 A	09/21/13 A	12.75	1	N	N
T-051B-12	T-051B-12, L-142N, Test, Bakersfield	2013	Test Performed	23493	25820	41600057	KE1	41600057	KE1					8148962	KE1			8.55	8.61	316.8	L-142N TEST 4.75MI MP 8.26-8.70 PH1, L-142N-1 crossing	07/01/13 A	09/21/13 A	12.75	0	N	N
T-051C-12	T-051C-12, L-142N, Test, Bakersfield	2013	Test Performed	23493	25820	41600057	KE1	41600057	KE1					8148962	KE1			9.74	11.4	8764.8	L-142N TEST 4.75MI MP 8.26-8.70 PH1	07/01/13 A	09/21/13 A	12.75	3	N	N
T-051D-12	T-051D-12, L-142N, Test, Bakersfield	2013	Test Performed	23493	25820	41600057	KE1	41600057	KE1					8148962	KE1			11.4	12.57	6177.6	L-142N TEST 4.75MI MP 8.26-8.70 PH1	07/01/13 A	10/03/13 A	12.75	1	N	N
T-051E-12	T-051E-12, L-142N, Test, Bakersfield	2013	Test Performed	23493	25820	41600057	KE1	41600057	KE1					8148962	KE1			12.57	13.84	6705.6	L-142N TEST 4.75MI MP 8.26-8.70 PH1	07/01/13 A	10/19/13 A	12.75	1	Y	Y
TIM-065-12	TIM-065-12, L-021C, Test, Penngrove	2013	Test Performed	23533	25833	41617931	KE1	41617931	KE1	30994767	98C	41858965	IIH					35.05	43.32	43665.6	L-021C TEST 8.57MI MP 35.05-43.26 PH1	08/14/13 A	10/06/13 A	12.75	2	N	N
T-081-12	T-081-12, L-119B, Test, North Highlands	2013	Test Performed	23554	25864	41617941	KE1	41617941	KE1	31005950	2H2							2.18	6.8751	24790.13	L-119B TEST 6.42MI MP 2.23-6.88 PH1	08/14/13 A	10/07/13 A	12.75	4	N	N
T-082-12	T-082-12, L-119B, Test, Sacramento	2013	Test Performed	23554	25866	41600069	KE1	41600069	KE1									8.832	10.154	6980.16	L-119B TEST 1.62MI MP 8.89-10.15 PH1	03/28/13 A	04/27/13 A	12.75	4	N	N
T-091B-12	T-091B-12, L-210B, Test, Suisun City	2013	Test Performed	23525	28492	41801018	JTC	41801018	JTC	30994766	2H2							20.22	22.98	14572.8	L-210B T-091B-12 MP 20.22 TO MP 20.3285	08/12/13 A	09/17/13 A	16	4	N	N
T-093-12	T-093-12, L-210C, Test, Vallejo	2013	Test Performed	24216	25884	41617946	KE1	41617946	KE1	30978301	2H2							31.27	31.68	2164.8	L-210C TEST 2.59MI MP 31.27-31.68 PH1	04/01/13 A	05/04/13 A	24	2	N	N
T-101-12	T-101-12, DFM-3010-01, Test, Antioch	2013	Test Performed	23905	25904	41622643	KE1	41622643	KE1	30963869	2H2							0.65	1.27	3273.6	DFM-3010-01 TEST 0.60MI MP 0.64-1.27 PH1	01/21/13 A	02/04/13 A	4.5	0	N	Y
T-174-12	T-174-12, DFM-1816-05, Test, Watsonville	2013	Test Performed	23864	27569	41699027	JTC	41699027	JTC	30940456	98C			8149082	KE1			0	0.34	1795.2	DFM-1816-05 TEST 0.80MI MP 0.00-0.80 PH1	06/17/13 A	07/29/13 A	3.5	0	N	N
T-206-13	T-206-13, L-187, Test, King City	2013	Test Performed	23524	28395	41756005	KE1	41756005	KE1	30971918	2H2							22.82	33.04	53961.6	L-187 TEST 9.77MI MP 22.82-33.04 PH1	04/08/13 A	05/20/13 A	8.625	1	Y	Y
T-207-13	T-207-13, L-187, Test, Greenfield	2013	Test Performed	23524	28407	41756006	KE1	41756006	KE1	30977298	2H2							33.04	41.06	42345.6	L-187 TEST 8.13MI MP 33.04-41.08 PH1	04/08/13 A	06/13/13 A	8.625	1	Y	Y
T-208A-13	T-208A-13, L-187, Test, Soledad	2013	Test Performed	23524	28408	41756007	KE1	41756007	KE1	30977293	2H2							41.06	42.64	8342.4	L-187 TEST 5.72MI MP 41.08-42.64 PH1	05/22/13 A	06/28/13 A	8.625	1	N	N
T-208B-13	T-208B-13, L-187, Test, Soledad	2013	Test Performed	23524	28408	41756007	KE1	41756007	KE1	30977293	2H2							42.64	46.03	17899.2	L-187 TEST 5.72MI MP 41.08-42.64 PH1	05/22/13 A	07/26/13 A	8.625	1	N	N
T-208C-13	T-208C-13, L-187, Test, Soledad	2013	Test Performed	23524	28408	41756007	KE1	41756007	KE1	30977293	2H2							46.03	46.63	3168	L-187 TEST 5.72MI MP 41.08-42.64 PH1	05/22/13 A	08/09/13 A	8.625	1	N	N
T-209-13	T-209-13, L-187, Test, Soledad	2013	Test Performed	23524	28409	41756008	KE1	41756008	KE1	30980715	2H2							46.63	50.67	21331.2	L-187 TEST 4.39MI MP 46.63-50.67 PH1	06/20/13 A	08/17/13 A	8.625	1	N	N
T-210-13	T-210-13, L-187, Test, Gonzales	2013	Test Performed	23524	28410	41756009	KE1	41756009	KE1	30980717	2H2							50.67	56.55	31046.4	L-187 TEST 5.20MI MP 50.67-56.55 PH1	07/10/13 A	08/30/13 A	8.625	1	N	N
T-211A-13	T-211A-13, L-187, Test, Chualar	2013	Test Performed	23524	28411	41756012	KE1	41756012	KE1	30980718	2H2							56.55	60.03	18374.4	L-187 TEST 9.31MI MP 56.55-60.03 PH1	08/15/13 A	09/20/13 A	8.625	1	N	N
T-211B-13	T-211B-13, L-187, Test, Chualar	2013	Test Performed	23524	28411	41756012	KE1	41756012	KE1	30980718	2H2							60.03	65.7	29937.6	L-187 TEST 9.31MI MP 56.55-60.03 PH1	08/15/13 A	10/10/13 A	8.625	1	N	N
T-217-13	T-217-13, DFM-0215-01, Test, Belmont	2013	Test Performed	23570	27603	41744015	KE1	41744015	KE1	30974247	2H2							0.02	0.78	4012.8	DFM-0215-01 TEST 0.95MI MP 0.00-0.98 PH1	06/14/13 A	07/28/13 A	8.625	1	N	N
T-218-13	T-218-13, L-021B, Test, Napa	2013	Test Performed	23532	27604	41744017	KE1	41744017	KE1	30978456	2H2							0.01	2.32	12196.8	L-021B TEST 3.31MI MP 0.01-2.31 PH1	04/29/13 A	06/08/13 A	16	6	N	N
T-220-13	T-220-13, L-021B, Test, Petaluma	2013	Test Performed	23532	27606	41744221	KE1	41744221	KE1	30992991	2H2							10.64	14.8	21964.8	L-021B TEST 5.01MI MP 10.64-14.80 PH1	06/19/13 A	07/26/13 A	16	1	N	N
T-223A-13	T-223A-13, L-050A-1, Test, Marysville	2013	Test Performed	24212	27608	41744226	KE1	41744226	KE1	30971921	2H2							1.5621	2.87	6905.712	L-050A-1 TEST 0.64MI MP 1.56-2.25 PH1	05/06/13 A	07/12/13 A	8.625	4	N	N
T-224A-13	T-224A-13, DFM-0604-01, Test, Vacaville	2013	Test Performed	23565	27609	41744230	KE1	41744230	KE1	30965370	2H2							3.3277	4.711	7303.824	DFM-0604-01 TEST 0.77MI MP 0.00-0.30 PH1	05/21/13 A	06/21/13 A	6.625	1	N	N
T-225A-13	T-225A-13, DFM-0604-07, Test, Vacaville	2013	Test Performed	23569	27611	41744232	KE1	41744232	KE1	30985924	2H2							4.1	6.41	12196.8	DFM-0604-07 TEST 5.29MI MP 0.00-6.41 PH1	08/23/13 A	10/30/13 A	6.625	1	N	N
T-225B-13	T-225B-13, DFM-0604-07, Test, Vacaville	2013	Test Performed	23569	27611	41744232	KE1	41744232	KE1	30985924	2H2							0.0064	4.1	21614.21	DFM-0604-07 TEST 5.29MI MP 0.00-6.41 PH1	08/23/13 A	11/22/13 A	6.625	4	N	N
T-226-13	T-226-13, DFM-0817-01, Test, San Jose	2013	Test Performed	23876	27613	41744236	KE1	41744236	KE1	30961767	2H2	41858752	KE1					0	0.4687	2474.736	DFM-0817-01 TEST 0.48MI MP 0.00-0.47 PH1	03/11/13 A	04/04/13 A	8.625	1	N	N
T-227-13	T-227-13, DFM-1023-01, Test, Redding	2013	Test Performed	23892	29093	41802284	KE1	41802284	KE1	30985926	2H2							0.82	1.97	6072	DFM-1023-01 TEST 1.13MI MP 0.82-1.97 PH1	07/12/13 A	08/16/13 A	6.625	1	N	N
T-228-13	T-228-13, L-118B, Test, Madera	2013	Test Performed	23550	27614	41748703	KE1	41748703	KE1	30961318	2H2							1.04	7.72	35270.4	L-118B TEST 4.22MI MP 1.04-7.72 PH1	06/14/13 A	08/15/13 A	12.75	1	N	N
T-229A-13	T-229A-13, L-118B, Test, Madera	2013	Test Performed	23550	27615	41748704	KE1	41748704	KE1	30961319	2H2							8.46	8.72	1372.8	L-118B TEST 2.44MI MP 8.46-8.72 PH1	05/17/13 A	06/21/13 A	12.75	1	N	N
T-229C-13	T-229C-13, L-118B, Test, Madera	2013	Test Performed	23550	27615	41748704	KE1	41748704	KE1	30961319	2H2							8.72	10.87	11352	L-118B TEST 2.44MI MP 8.46-8.72 PH1	05/17/13 A	07/08/13 A	12.75	1	N	N
T-230-13	T-230-13, L-118B, Test, Madera	2013	Test Performed	23550	27617	41748705	KE1	41748705	KE1	30961360	2H2							10.87	20.07	48576	L-118B TEST 9.30MI MP 10.87-20.07 PH1	07/26/13 A	10/12/13 A	12.75	1	N	N
T-239-13	T-239-13, L-162A, Test, Tracy	2013	Test Performed	23499	27621	41748974	KE1	41748974	KE1	30983205	2H2							4.38	4.76	2006.4	L-162A TEST 0.35MI MP 4.41-4.76 PH1	07/12/13 A	08/14/13 A	10.75	2	N	N
T-240-13	T-240-13, L-162A, Test, Tracy	2013	Test Performed	23499	27622	41748975	KE1	41748975	KE1	30994765	2H2							7.77	9.03	6652.8	L-162A TEST 1.32MI MP 7.72-9.03 PH1	06/07/13 A	07/15/13 A	4.5	1	N	N
T-241-13	T-241-13, L-177B, Test, Chico	2013	Test Performed	23506	27623	41748976	KE1	41748976	KE1	30980307	2H2							0.86	7.51	35112	L-177B TEST 6.65MI MP 0.86-7.51 PH1	05/30/13 A	09/05/13 A	10.75	5	N	N
T-265-13	T-265-13, DFM-1004-01, Test, Orland	2013	Test Performed	23885	27645	41743422	KE1	41743422	KE1	30968089	98C							0.0139	4.7525	25019.81	DFM-1004-01 TEST 0.35MI MP 4.40-4.75 PH1	05/30/13 A	07/22/13 A	6.625	1	N	N
TIM-267-13	TIM-267-13, DFM-1813-02, Test, Marina	2013	Test Performed	23872	27648	41743424	KE1	41743424	KE1	30966753	2H2	41858961	KE1					8.5	9.71	6388.8	DFM-1813-02 TEST 1.12MI MP 8.76-9.71 PH1	08/05/13 A	09/23/13 A	10.75	1	N	N
T-268-13	T-268-13, DFM-1813-02, Test, Seaside	2013	Test Performed	23872	27632	41744767	KE1	41744767	KE1	30969903	2H2							11.75	12.05	1584	DFM-1813-02 TEST 0.41MI MP 11.75-12.05 P	07/01/13 A	08/12/13 A	10.75	1	N	N
T-269A-13	T-269A-13, DFM-1813-02, Test, Monterey	2013	Test Performed	23872	27649	41743426	KE1	41743426	KE1									12.52	12.95	2270.4	DFM-1813-02 TEST 3.88MI MP 12.52-12.95 P	07/01/13 A	08/12/13 A	10.75	1	N	N
T-269B-13	T-269B-13, DFM-1813-02, Test, Monterey	2013	Test Performed	23872	27649	41935324	IIH	41935324	IIH									12.95	16.39	18163.2	DFM-1813-02 TEST 3.88MI MP 12.52-12.95 P	07/23/13 A	09/12/13 A	10.75	1	N	N
TIM-269C-13	TIM-269C-13, DFM-1813-02, Test, Seaside	2013	Test Performed	N/A	31447	41935085	IIH	41935085	IIH									16.39	16.4	52.8	DFM 1813-02 TIM-269C-13 MP16.39-16.40	07/23/13 A	10/29/13 A	10.75	0	N	N
T-272A-13	T-272A-13, DFM-7223-01, Test, Turlock	2013	Test Performed	23472	27651	41743428	KE1	41743428	KE1	30992992	2H2							8.3998	9.475	5677.056	DFM-7223-01 TEST 1.69MI MP 8.40-9.48 PH1	08/12/13 A	10/24/13 A	10.75	1	Y	Y
T-272B-13	T-272B-13, DFM-7223-01, Test, Turlock	2013	Test Performed	23472	27651	41743428	KE1	41743428	KE1									9.475	10.1	3300	DFM-7223-01 TEST 1.69MI MP 8.40-9.48 PH1	08/12/13 A	10/08/13 A	10.75	2	Y	Y
TIM-273-13	TIM-273-13, DFM-7226-01, Test, Modesto	2013	Test Performed	23478	27652	41743429	KE1	41743429	KE1	30980719	2H2	41858751	IIH					0	4.59	24235.2	DFM-7226-01 TEST 4.75MI MP 0.00-4.59 PH1	04/29/13 A	06/08/13 A	8.625	2	N	N
TIM-274-13	TIM-274-13, GCUST5900, Test, Fremont	2013	Test Performed	N/A	27653	41743430	IIH	41743430	IIH									0	0.99	5227.2	GCUST5900 TIM-274-13 MP 0.07-0.49	06/04/13 A	06/15/13 A	6.625	0	N	N
T-279-13	T-279-13, SP4Z, Test, Antioch	2013	Test Performed	N/A	28245	97001461	34A							97001461	34A			8.43	8.93	2640	SP4Z T-279-13 MP 8.43 TO 8.93	03/06/13 A	05/01/13 A	12.75	9	N	N
T-281B-13	T-281B-13, L-191, Test, Antioch	2013	Test Performed	23748	28495	41801222	KE1	41801222	KE1	30841618	2H2							3.88	6.4437	13536.34	L-191 TEST 1.20MI MP 2.76-6.48 PH1	08/27/13 A	10/01/13 A	24	4	N	N
T-282A-13	T-282A-13, L-172A, Test, West Sacramento	2013	Test Performed	23926	30056	41867640	KE1	41867640	KE1	30986766	2H2							78.53	79.13	3168	L-172A TEST 0.78MI MP 78.53-79.11 PH1	08/23/13 A	10/25/13 A	12.75	1	N	N
T-282B-13	T-282B-13, L-172A-1, Test, West Sacramento	2013	Test Performed	23926	30056	41867640	KE1	41867640	KE1	30986766	2H2							78.53	78.72	1003.2	L-172A TEST 0.78MI MP 78.53-79.11 PH1	08/23/13 A	10/25/13 A	16	5	N	N
T-284-13	T-284-13, DFM-1815-02, Test, Monterey	2013	Test Performed	23769	30531	41899453	KE1	41899453	KE1									19.24	19.49	1320	DFM-1815-02 TEST 0.28MI MP 19.24-19.49	09/16/13 A	10/31/13 A	8.625	1	N	N
T-285-13	T-285-13, X6526, Test, Kettleman City	2013	Test Performed	N/A	27760	41710903	KE1	41710903	KE1					8148961	KE1			0.0015	0.2415	1267.2	T-285-13 X6526 TEST MP 0.00-0.26	07/01/13 A	10/08/13 A	24	1	Y	Y
TIM-286-13	TIM-286-13, L-021C, Test, Penngrove	2013	Test Performed	N/A	29909	41865228	HPJ	41865228	HPJ									33.54	34.84	6864	L-21C IC ASSESSMENT 2013 (T-286-13)	08/14/13 A	10/06/13 A	12.75	2	N	N
T-288A-13	T-288A-13, L-300B, Test, Bear Valley Springs	2013	Test Performed	23511	31511	41942319	KE1	41942319	KE1									241.27	242.91	8659.2	L-300B_1 TEST 1.22MI MP 240.56-242.66 PH	10/07/13 A	11/19/13 A	34	1	N	N
T-288B-13	T-288B-13, L-300B, Test, Bear Valley Springs	2013	Test Performed	23511	31511	41942319	KE1	41942319	KE1									240.56	241.27	3748.8	L-300B_1 TEST 1.22MI MP 240.56-242.66 PH	10/07/13 A	11/19/13 A	34	1	N	N
T-303B-14	T-303B-14, L-186, Test, Dos Palos	2013	Test Performed	23521	31108	41916188	KE1	41916188	KE1	31014597	2H2							10.14	19.17	47678.4	L-186 TEST 9.89MI MP 9.00-19.17 PH1	09/10/13 A	11/23/13 A	6.625	4	N	N
T-304-14	T-304-14, L-186, Test, Dos Palos	2013	Test Performed	23521	31109	41916192	KE1	41916192	KE1	31014594	2H2							19.17	26.66	39547.2	L-186 TEST 5.11MI MP 19.17-26.13 PH1	09/10/13 A	12/08/13 A	6.625	5	N	N
T-310-14	T-310-14, DFM-0141-01, Test, Crockett	2013	Test Performed	23560	23560	41756013	KE1	41756013	KE1									0	0.43	2270.4	DFM-0141-01 TEST 0.42MI MP 0.00-0.42 PH1	05/06/13 A	05/19/13 A	8.625	0	N	N
T-318A-14	T-318A-14, DFM-0604-06, Test, Vacaville	2013	Test Performed	23567	23567	41859416	KE1	41859416	KE1	31005351	2H2							0.49	2.84	12408	DFM-0604-06 TEST 2.31MI MP 0.49-2.84 PH1	08/08/13 A	10/09/13 A	4.5	1	N	N
T-318B-14	T-318B-14, DFM-0604-06, Test, Vacaville	2013	Test Performed	23567	23567	41859416	KE1	41859416	KE1	31005351	2H2							0	0.49	2587.2	DFM-0604-06 TEST 2.31MI MP 0.49-2.84 PH1	08/08/13 A	10/30/13 A	4.5	1	N	N
T-331A-14	T-331A-14, DFM-1501-01, Test, Yuba City	2013	Test Performed	23911	31386	41858968	KE1	41858968	KE1	30987346	2H2							0.04	3.99	20856	DFM-1501-01 TEST 5.31MI MP 0.04-3.99 PH1	05/13/13 A	07/24/13 A	3.5	1	N	Y
T-331B-14	T-331B-14, DFM-1501-01, Test, Yuba City	2013	Test Performed	23911	31386	41858968	KE1	41858968	KE1	30987346	2H2							4.47	5.76	6811.2	DFM-1501-01 TEST 5.31MI MP 0.04-3.99 PH1	05/13/13 A	10/30/13 A	3.5	0	N	N
T-333-14	T-333-14, DFM-1502-02, Test, Marysville	2013	Test Performed	23548	29511	41842134	KE1	41842134	KE1	30974402	2H2							0	1.6	8448	DFM-1502-02 TEST 1.60MI MP 0.00-1.60 PH1	05/06/13 A	07/02/13 A	4.5	3	N	N
T-337-14	T-337-14, DFM-1603-03, Test, Manteca	2013	Test Performed	23733	31372	41931283	KE1	41931283	KE1	31019976	2H2							0.021	0.49	2476.32	DFM-1603-03 TEST 0.46MI MP 0.02-0.49 PH1	09/23/13 A	10/22/13 A	8.625	3	N	N
T-355-14	T-355-14, L-300B, Test, Backersfield	2013	Test Performed	24219	29707	41918261	KE1	41918261	KE1									269.33	272.07	14467.2	L-300B_2 TEST 3.80MI MP 269.38-272.40 PH	10/07/13 A	10/30/13 A	34	1	N	N
T-360-14	T-360-14, DFM-7226-13, Test, Modesto	2013	Test Performed	23483	23483	41859176	KE1	41859176	KE1	30981032	2H2							0	0.25	1320	DFM-7226-13 TEST 0.25MI MP 0.00-0.25 PH1	04/29/13 A	06/08/13 A	8.625	1	Y	Y
TS-003-13	TS-003-13, GCUST5814, Test, Palo Alto	2013	Test Performed	N/A	30220	41877582	KE1	41877582	KE1									0.01	1	5227.2	GCUST5814 NITROGEN TEST	06/17/13 A	07/17/13 A	4.5	0	N	N
TS-004-13	TS-004-13, L-148, Test, Manteca	2013	Test Performed	N/A	30514	41896934	KE1	41896934	KE1					41893984	KE1			0	0	100	L-148 PRESSURE RESTORATION REPAIRS	06/28/13 A	07/15/13 A	8.625	0	N	N
T-001-11	T-001-11, L-21A_1, Test, Petaluma	2011	Verified.w/Credit	24210	24210	41482922	KE1	41482922	KE1									24.49	24.58	475.2	L-021A_1 TEST 0.09MI MP 24.49-24.58 PH1	NA	NA	NA	NA	NA	NA
T-008-11	T-008-11, L-105A, Test, Richmond	2011	Verified.w/Credit	23542	23542	NA	KE1											44.56	46.91	12408	L-105A TEST 2.16MI MP 38.00-41.00 WBS	NA	NA	NA	NA	NA	NA
T-014-11	T-014-11, L-105N, Test, Hayward	2011	Verified.w/Credit	23491	23491	NA	KE1											21.3	21.7	2112	*CANC*L-105N_2 TEST 0.48MI MP21.24-21.70	NA	NA	NA	NA	NA	NA
T-018-11	T-018-11, L-107, Test, Fremont	2011	Verified.w/Credit	N/A	NA	NA	KE1											30.1954	32.16	10373.09	NA	NA	NA	NA	NA	NA	NA
T-021-11	T-021-11, L-131, Test, Fremont	2011	Verified.w/Credit	24699	23534	41474032	KE1	41474032	KE1									49.36	50.57	6388.8	L-131 T-021-11 MP 49.36 TO MP 50.57	NA	NA	NA	NA	NA	NA
T-050-11	T-050-11, L-300A, Test, Topock	2011	Verified.w/Credit	24495	24498	41497314	KE1	41497314	KE1									0.2855	0.9442	3477.936	L-300A T-050-11 MP 0.29 TO MP 0.94	NA	NA	NA	NA	NA	NA
T-053-11	T-051-11, L-300A, Test, Barstow	2011	Verified.w/Credit	24495	24505	41497321	KE1	41497321	KE1									150.26	151.06	4224	L-300A T-053-11 MP 150.26 TO MP 151.06	NA	NA	NA	NA	NA	NA
T-054A-11	T-054A-11, L-300A, Test, Barstow	2011	Verified.w/Credit	24495	24506	41497322	KE1	41497317	KE1									151.07	156.4	28142.4	L-300A T-054-11 MP 151.07 TO MP 156.40	NA	NA	NA	NA	NA	NA
T-056N-11	T-056N-11, L-300A, Test, Barstow	2011	Verified.w/Credit	24495	24508	41497324	KE1	41497324	KE1									159.33	160.1392	4272.576	L-300A_1 TEST 0.29MI MP 157.86-159.33 PH	NA	NA	NA	NA	NA	NA
T-058-11	T-058-11, L-300A, Test, North Edwards	2011	Verified.w/Credit	24495	24500	41497316	KE1	41497316	KE1									198.9292	201.7	14629.82	L-300A T-058-11 MP 198.93 TO MP 201.22	NA	NA	NA	NA	NA	NA
T-059-11	T-059-11, L-300A, Test, Tehachapi	2011	Verified.w/Credit	24495	24501	41497317	KE1	41497317	KE1									237.4404	238	2954.688	L-300A T-059-11 MP 237.44 TO MP 238.00	NA	NA	NA	NA	NA	NA
T-061-11	T-061-11, L-300A, Test. Bakersfield	2011	Verified.w/Credit	24495	24503	41497319	KE1	41497319	KE1									268.9522	269.5356	3080.352	L-300A T-061-11 MP 268.95 TO MP 269.53	NA	NA	NA	NA	NA	NA
T-066-11	T-066-11, L-300A, Test, Hollister	2011	Verified.w/Credit	24495	24488	41497304	KE1	41497304	KE1									450.83	454.3289	18474.19	L-300A T-066-11 MP 450.83 TO MP 454.33	NA	NA	NA	NA	NA	NA
T-069N-11	T-069N-11, L-300A, Test, San Jose	2011	Verified.w/Credit	24495	26087	41497311	KE1	41497311	KE1									487.78	488.7782	5270.496	L-300A T-069N-11 MP 487.78 TO MP 488.19	NA	NA	NA	NA	NA	NA
T-069S-11	T-069S-11, L-300A, Test, San Jose	2011	Verified.w/Credit	24495	24510	41497326	KE1	41497326	KE1									484.95	487.78	14942.4	L-300A T-069S-11 MP 485.14 TO MP 487.78	NA	NA	NA	NA	NA	NA
T-078-11	T-078-11, L-300B, Test, Barstow	2011	Verified.w/Credit	24521	24524	41497340	KE1	41497340	KE1									143.246	144.24	5248.32	L-300B T-078-11 MP 143.25 TO MP 144.24	NA	NA	NA	NA	NA	NA
T-083-11	T-083-11, L-300B, Test, Rosedale	2011	Verified.w/Credit	24521	24523	41497339	KE1	41497339	KE1									286.3162	286.9185	3180.144	L-300B T-083-11 MP 286.32 TO MP 286.92	NA	NA	NA	NA	NA	NA
T-088-11	T-088-11, L-300B, Test, Morgan Hill	2011	Verified.w/Credit	24521	24514	41497330	KE1	41497330	KE1									472.65	478.1	28776	L-300B T-088-11 MP 472.65 TO MP 478.10	NA	NA	NA	NA	NA	NA
T-091-11	T-091-11, L-301G, Test, Hollister	2011	Verified.w/Credit	N/A	NA	NA	KE1											0	0	0	NA	NA	NA	NA	NA	NA	NA
T-095-11	T-095-11, SP3, Test, Vine Hill	2011	Verified.w/Credit	24160	24160	97000510	34A							97000510	34A			180.91	181.4	2587.2	SP3 TEST 0.49MI MP 180.91-181.40 PH1	NA	NA	NA	NA	NA	NA
T-099-11	T-099-11, DFM-1816-01, Test, Watsonville	2011	Verified.w/Credit	24484	24483	41497239	KE1	41497239	KE1									1.19	1.53	1795.2	DFM-1816-01 T-099-11 MP 1.19 TO MP 1.53	NA	NA	NA	NA	NA	NA
T-100-11	T-100-11, DFM-1816-01, Test, Watsonville	2011	Verified.w/Credit	24484	23833	41474014	KE1	41474014	KE1									1.53	3.4394	10081.63	DFM-1816-01_1 TEST 1.53-3.44 PH1	NA	NA	NA	NA	NA	NA
T-110-11	T-110-11, L-191, Test, Antioch	2011	Verified.w/Credit	24555	NA	NA	KE1											2.74	2.76	105.6	NA	NA	NA	NA	NA	NA	NA
T-111-11	T-111-11, L-153, Test, Union City	2011	Verified.w/Credit	24554	24658	41497366	KE1	41497366	KE1									9.18	9.2	105.6	L-153 T-111-11 MP 3.59 TO MP 9.20	NA	NA	NA	NA	NA	N
T-113-11	T-113-11, L-101, Test, Palo Alto	2011	Verified.w/Credit	23500	23500	NA	KE1											10.402	10.52	623.04	L-101 TEST 0.18MI MP 0.62-4.66 WBS	NA	NA	NA	NA	NA	NA
T-009-12	T-009-12, DFM-0407-01, Test, Napa	2012	Verified.w/Credit	25832	25831	41599874	KE1	41599874	KE1									0.4357	0.5879	803.616	DFM-0407-01 T-009-12 MP 0.44 TO MP 0.59	NA	NA	NA	NA	NA	NA
T-011-12	T-011-12, DFM-1401-01, Test, San Francisco	2012	Verified.w/Credit	23934	25834	41617908	IIH	41617908	IIH									0.0057	0.19	973.104	DFM-1401-01 T-011-12 MP 0.00 TO MP 0.786	NA	NA	NA	NA	NA	NA
T-012-12	T-012-12, L-105N, Test, Oakland	2012	Verified.w/Credit	24560	24560	NA	KE1											26.58	27.94	7180.8	L-105N_1TEST 4.88MI MP 11.07-30.63	NA	NA	NA	NA	NA	NA

PMO ID	P6 Project Name	Portfolio Year	Work Type	Original PSEP PSRS (if applicable)	Tracking PSRS ID	Tracking Order Number	Tracking Order MAT Code	Order #1 (Expense)	Order #1 MAT	Order #2 (Capital)	Order #2 MAT	Order #3 (IM)	Order #3 MAT	Order #4 (Other_a)	Order #4 MAT	Order #5 (Other_b)	Order #5 MAT	MP1	MP2	Ft.	Tracking PSRS Description	Mob Date	Tie In Date	Line Diameter	# Cleaning Runs	Leak/Rupture (Y,N)	Greater than 1 cycle (Y,N)
T-014-12	T-014-12, L-109, Test, San Francisco	2012	Verified.w/Credit	23505	25840	41599876	KE1	41599876	KE1									48.21	48.84	3326.4	L-109 T-014-12 MP 48.21 TO MP 48.84	NA	NA	NA	NA	NA	NA
T-032-12	T-032-12, L-303, Test, Livermore	2012	Verified.w/Credit	23536	23536	41474056	KE1	41474056	KE1									20.2896	20.43	741.312	L-303 T-032-12 MP 19.21 TO 20.43	NA	NA	NA	NA	NA	NA
T-034-12	T-034-12, L-306, Test, Paso Robles	2012	Verified.w/Credit	23529	25880	41600046	KE1	41600046	KE1									41.58	43.7	11193.6	L-306 T-034-12 MP 41.58 TO MP 43.7	NA	NA	NA	NA	NA	NA
T-036-12	T-036-12, L-306, Test, Morro Bay	2012	Verified.w/Credit	23529	25885	41600048	KE1	41600048	KE1									68.38	70.02	8659.2	L-306 T-036-12 MP 68.38 TO MP 70.02	NA	NA	NA	NA	NA	NA
T-037-12	T-037-12, DFM-1202-01, Test, Fresno	2012	Verified.w/Credit	24187	25887	41617921	KE1	41617921	KE1									0	2.13	11246.4	DFM-1202-01 T-037-12 MP 0 TO MP 2.13	NA	NA	NA	NA	NA	NA
T-039-12	T-039-12, DFM-1615-01, Test, Salida	2012	Verified.w/Credit	23856	25891	41600049	KE1	41600049	KE1	30909593	2H2							12.33	13.5606	6497.568	DFM-1615-01 TEST 1.89MI MP 10.12-14.88 P	NA	NA	NA	NA	NA	NA
T-041-12	T-041-12, DFM-7221-10, Test, Salida	2012	Verified.w/Credit	23467	25895	41600050	KE1	41600050	KE1									12.84	15.35	13252.8	DFM-7221-10 T-041-12 MP 12.08 TO MP 15.9	NA	NA	NA	NA	NA	NA
T-050-12	T-050-12, L-142N, Test, Bakersfield	2012	Verified.w/Credit	23493	25819	41600056	KE1	41600056	KE1									7.7	8.19	2587.2	L-142N T-050-12 MP 7.70 TO MP 8.19	NA	NA	NA	NA	NA	NA
T-057-12	T-057-12, L-300A, Test, Tehachapi	2012	Verified.w/Credit	23497	25828	41600060	KE1	41600060	KE1									243.74	244.03	1531.2	L-300A_2 T-057-12 MP 245.85 TO MP 246.81	NA	NA	NA	NA	NA	NA
T-063-12	T-063-12, L-401, Test, Tracy	2012	Verified.w/Credit	23531	NA	NA	KE1											323.4439	326.7649	17534.88	NA	NA	NA	NA	NA	NA	NA
T-064-12	T-064-12, L-021A, Test, Napa	2012	Verified.w/Credit	23881	23881	41473973	KE1	41473973	KE1									16.96	17.314	1869.12	L-021A_2 TEST 0.36MI MP 16.96-17.31 PH1	NA	NA	NA	NA	NA	NA
T-067-12	T-067-12, L-021D, Test, Sonoma	2012	Verified.w/Credit	24208	24208	41482921	KE1	41482921	KE1									24.67	24.95	1478.4	L-021D TEST 0.28MI MP 24.67-24.95 PH1	NA	NA	NA	NA	NA	NA
T-068-12	T-068-12, L-021E, Test, Ukiah	2012	Verified.w/Credit	24207	25839	41617933	KE1	41617933	KE1									116.16	116.46	1584	L-021E T-068-12 MP 116.16 TO MP 116.46	NA	NA	NA	NA	NA	NA
TIM-076-12	TIM-076-12, DFM-0611-02, Test_Verified Portion, Sacramento	2012	Verified.w/Credit	23577	25854	41617937	IIH	41617937	IIH									1.08	1.9	4329.6	DFM-0611-02 TIM-076B-12 MP 0.00-1.91	NA	NA	NA	NA	NA	NA
TIM-078-12	TIM-078-12, DFM-0651-01, Test, Sacramento	2012	Verified.w/Credit	23843	23843	41473966	KE1	41473966	KE1									1.0111	1.87	4534.992	DFM-0651-01 TEST 0.86MI MP 1.01-1.87 PH1	NA	NA	NA	NA	NA	NA
T-084-12	T-084-12, L-172A, Test, Zamora	2012	Verified.w/Credit	23501	25869	41600070	KE1	41600070	KE1									48.9764	49.7402	4032.864	L-172A T-084-12 MP 48.98 TO MP 49.74	NA	NA	NA	NA	NA	NA
T-088-12	T-088-12, L-200A-1, Test, Rio Vista	2012	Verified.w/Credit	24264	25875	41617944	KE1	41617944	KE1									1.0807	1.4194	1788.336	L-200A-1 T-088-12 MP 1.08 TO MP 1.42	NA	NA	NA	NA	NA	NA
TIM-098-11	T-116-12, L-300B, Test, Watsonville	2012	Verified.w/Credit	24484	24485	41497301	KE1	41497301	KE1									0	1.19	6283.2	DFM-1816-01 T-098-11 MP 0.00 TO MP 1.19	NA	NA	NA	NA	NA	NA
TIM-103-12	TIM-103-12, L-105N, Test, Hayward	2012	Verified.w/Credit	23491	25915	41622650	KE1	41622650	KE1									21.24	21.7	2428.8	L-105N_2 T-103-12 MP 21.24 TO MP 21.70	NA	NA	NA	NA	NA	NA
T-105-12	T-105-12, L-132, Test, Milpitas	2012	Verified.w/Credit	24537	25919	41622652	KE1	41622652	KE1									0.7456	0.9402	1027.488	L-132_1 T-105-12 MP 0.74 TO MP 0.95	NA	NA	NA	NA	NA	NA
T-108-12	T-108-12, SP5, Test, Antioch	2012	Verified.w/Credit	24162	27599	97001401	34A							97001401	34A			5.4	5.57	897.6	SP5 T-108-12 MP 5.4-5.57	NA	NA	NA	NA	NA	NA
T-116-12	T-116-12, L-300B, Test, Bear Valley Springs	2012	Verified.w/Credit	24521	25916	41622682	KE1	41622682	KE1									241.33	241.97	3379.2	L-300B_1 T-116-12 MP 241.33 TO MP 242.66	NA	NA	NA	NA	NA	NA
T-033-12	T-033-12, L-306, Test, Kettleman City	2013	Verified.w/Credit	23529	25878	41617920	KE1	41617920	KE1									0	0.17	897.6	L-306 T-033-12 MP 0.00 TO MP 0.17	NA	NA	NA	NA	NA	NA
T-035-12	T-035-12, L-306, Test, Atascadero	2013	Verified.w/Credit	23529	25882	41600047	KE1	41600047	KE1									54.48	57.87	17899.2	L-306 T-035-12 MP 54.48 TO MP 57.87	NA	NA	NA	NA	NA	NA
T-042A-12	T-042A-12, L-057A-MD1, Test, McDonald Island	2013	Verified.w/Credit	24183	25897	41482931	KE1	41482931	KE1									0.616	0.97	1869.12	L-057A-MD1 TEST 0.68MI MP 0.00-0.62 PH1	NA	NA	NA	NA	NA	NA
T-044A-12	T-044A-12, L-138, Test, Fresno	2013	Verified.w/Credit	23510	25899	41617925	KE1	41617925	KE1	30906151	2H2							22.04	22.54	2640	L-138 TEST 6.11MI MP 22.55-28.64 PH1	NA	NA	NA	NA	NA	NA
T-047A-12	T-047A-12, L-138, Test, Fresno	2013	Verified.w/Credit	23510	25810	41600054	KE1	41600054	KE1	30941125	2H2							45.09	45.39	1584	L-138 TEST 0.18MI MP 45.39-45.56 PH1	NA	NA	NA	NA	NA	NA
T-071-12	T-071-12, L-021F, Test, Novato	2013	Verified.w/Credit	23535	25846	41600065	KE1	41600065	KE1									9.43	11.72	12091.2	L-021F T-071-12 MP 9.43 TO MP 9.57	NA	NA	NA	NA	NA	NA
T-072-12	T-072-12, L-021F, Test, Novato	2013	Verified.w/Credit	23535	25848	41600066	KE1	41600066	KE1									11.72	13.92	11616	L-021F T-072-12 MP 11.73 TO MP 13.92	NA	NA	NA	NA	NA	NA
T-074-12	T-074-12, L-021G, Test, Petaluma	2013	Verified.w/Credit	23538	25851	41617935	KE1	41617935	KE1									0	2.54	13411.2	L-021G T-074-12 MP 0.00 TO MP 2.54	NA	NA	NA	NA	NA	NA
TIM-076A-12	TIM-076A-12, DFM-0611-02, Test, Sacramento	2013	Verified.w/Credit	23557	25854	41617937	IIH	41617937	IIH									1.9	1.91	52.8	DFM-0611-02 TIM-076B-12 MP 0.00-1.91	NA	NA	NA	NA	NA	NA
T-081A-12	T-081A-12, L-119B, Test, North Highlands	2013	Verified.w/Credit	23554	25864	41617941	KE1	41617941	KE1									0	0.591	3120.48	L-119B TEST 6.42MI MP 2.23-6.88 PH1	NA	NA	NA	NA	NA	NA
T-083-12	T-083-12, L-172A, Test, Arbuckle	2013	Verified.w/Credit	23501	25867	41617942	KE1	41617942	KE1									35.51	35.85	1795.2	L-172A T-083-12 MP 35.51 TO MP 35.85	NA	NA	NA	NA	NA	NA
T-084A-12	T-087A-12, L-172A, Test, Sacramento	2013	Verified.w/Credit	23501	25869	41600070	KE1	41600070	KE1									48.97	49.74	4065.6	L-172A T-084-12 MP 48.98 TO MP 49.74	NA	NA	NA	NA	NA	NA
T-085-12	T-085-12, L-172A, Test, Yolo	2013	Verified.w/Credit	23501	25871	41600071	KE1	41600071	KE1									55.4031	58.6016	16888.08	L-172A T-085-12 MP 55.403 TO MP 58.602	NA	NA	NA	NA	NA	NA
T-086-12	T-086-12, L-172A, Test, Woodland	2013	Verified.w/Credit	23501	25873	41600072	KE1	41600072	KE1									66.53	67.5	5121.6	L-172A T-086-12 MP 66.53 TO MP 67.50	NA	NA	NA	NA	NA	NA
T-101A-12	T-101-12, DFM-3010-01, Test, Antioch	2013	Verified.w/Credit	23905	25904	41622643	KE1	41622643	KE1									0	0.65	3432	DFM-3010-01 TEST 0.60MI MP 0.64-1.27 PH1	NA	NA	NA	NA	NA	NA
T-109-12	T-109-12, L-300A, Test, Paicines	2013	Verified.w/Credit	23497	25924	41622655	KE1	41622655	KE1									414.527	414.79	1388.64	L-300A_2 T-109-12 MP 414.57 TO MP 414.79	NA	NA	NA	NA	NA	NA
TIM-142A-12	TIM-142A-12, L-103, Test, Salinas	2013	Verified.w/Credit	23502	26329	41640626	KE1	41640626	KE1	30918416	2H2							25.46	27.77	12196.8	L-103 TEST 0.10MI MP 27.16-27.26 PH1	NA	NA	NA	NA	NA	NA
TIM-163-12	TIM-163-12, DFM-7224-12, Test, Modesto	2013	Verified.w/Credit	N/A	26345	41640636	KE1	41640636	KE1			41822375	IIH					0.25	0.48	1214.4	DFM-7224-12 TIM-163-12 MP 0.25 TO MP0.73	NA	NA	NA	NA	NA	NA
TIM-164-12	TIM-164-12, DFM-7227-05, Test, Modesto	2013	Verified.w/Credit	24214	26346	41640637	KE1	41640637	KE1									0	0.19	1003.2	DFM-7227-05 TIM-164-12 MP 0.00 TO MP0.19	NA	NA	NA	NA	NA	NA
T-216A-13	T-216A-13, DFM-0210-01, Test, Half Moon Bay	2013	Verified.w/Credit	24215	27600	41744012	KE1	41744012	KE1									0.01	2.95	15523.2	DFM-0201-01 T-216A-13 MP 0.00-2.95	NA	NA	NA	NA	NA	NA
T-216B-13	T-216B-13, DFM-0210-01, Test, Half Moon Bay	2013	Verified.w/Credit	24215	27602	41744014	KE1	41744014	KE1									2.95	6.67	19641.6	DFM-0201-01 T-216B-13 MP 2.95-6.62	NA	NA	NA	NA	NA	NA
T-224B-13	T-224B-13, DFM-0604-01, Test, Dixon	2013	Verified.w/Credit	23565	27610	41744231	KE1	41744231	KE1									0	0.2992	1579.776	DFM-0604-01 T-224B-13 MP 0.00-0.30	NA	NA	NA	NA	NA	NA
T-232-13	T-232-13, DFM-1202-02, Test, Fresno	2013	Verified.w/Credit	24186	27618	41748961	KE1	41748961	KE1									2	2.39	2059.2	DFM-1202-02 T-232-13 MP 2.00-2.39	NA	NA	NA	NA	NA	NA
T-233-13	T-233-13, DFM-1202-16, Test, Fresno	2013	Verified.w/Credit	23901	29714	41847376	KE1	41847376	KE1									0.08	2.58	13200	DFM-1202-16 TEST 4.62MI MP 0.08-2.58 PH1	NA	NA	NA	NA	NA	NA
T-234-13	T-234-13, DFM-1209-02, Test, Selma	2013	Verified.w/Credit	23903	23903	41473980	KE1	41473980	KE1									0.01	1.4694	7705.632	DFM-1209-02 T-234-13 1.48MI MP 0.00-1.47	NA	NA	NA	NA	NA	NA
T-237-13	T-237-13, DFM-1519-01, Test, Rocklin	2013	Verified.w/Credit	23545	23545	41474066	KE1	41474066	KE1									1.48	2.02	2851.2	DFM-1519-01 TEST 0.55MI MP 1.48-2.03 PH1	NA	NA	NA	NA	NA	NA
T-238-13	T-238-13, DFM-1603-01, Test, Lathrop	2013	Verified.w/Credit	24272	27620	41748970	KE1	41748970	KE1									0.5046	0.5857	428.208	DFM-1603-01 TEST 1.23MI MP 0.50-0.59 PH1	NA	NA	NA	NA	NA	NA
T-242-13	T-242-13, DFM-1815-02, Test, Salinas	2013	Verified.w/Credit	23877	27624	41749020	KE1	41749020	KE1									7.23	9.97	14467.2	DFM-1815-02 T-242-13 MP 6.50-10.03	NA	NA	NA	NA	NA	NA
T-243-13	T-243-13, DFM-1815-02, Test, Carmel	2013	Verified.w/Credit	23877	27625	41749033	KE1	41749033	KE1									10.51	14.75	22387.2	DFM-1815-02 TEST 10.02MI MP 6.50-16.85 P	NA	NA	NA	NA	NA	NA
TIM-247-13	TIM-247-13, DFM-1816-15, Test, Felton	2013	Verified.w/Credit	23870	27628	41744498	KE1	41744498	KE1			41858962	IIH					0	6.01	31732.8	DFM-1816-15 TEST 6.04MI MP 0.00-6.01 PH1	NA	NA	NA	NA	NA	NA
T-252-13	T-252-13, L-331A, Test, Gustine	2013	Verified.w/Credit	24220	27630	41744765	KE1	41744765	KE1									8.061	8.4	1789.92	L-331A TEST 0.34MI MP 8.06-8.40 PH1	NA	NA	NA	NA	NA	NA
T-253-13	T-253-13, DFM-7218-01, Test, Modesto	2013	Verified.w/Credit	24197	27631	41744766	KE1	41744766	KE1									0	1.317	6953.76	DFM-7218-01 T-253-13 MP 0.00-1.32	NA	NA	NA	NA	NA	NA
T-255-13	T-255-13, DFM-7226-02, Test, Tracy	2013	Verified.w/Credit	23481	31393	41473946	KE1	41473946	KE1									3.47	3.86	2059.2	DFM-7226-02 TEST 0.39MI MP 3.47-3.86 PH1	NA	NA	NA	NA	NA	NA
T-257-13	T-257-13, L-108, Test, Lodi	2013	Verified.w/Credit	N/A	27637	41744771	KE1	41744771	KE1									48.5025	49.0302	2786.256	L-108 TIM-257-13 MP 48.50-49.04	NA	NA	NA	NA	NA	NA
TIM-258-13	T-258-13, L-109, Test, San Francisco	2013	Verified.w/Credit	N/A	27638	41744772	KE1	41744772	KE1									50.04	50.65	3220.8	L-109 TIM-258-13 MP 50.04-50.65	NA	NA	NA	NA	NA	NA
T-277-13	T-277-13, DFM-1617-01, Test, Tracy	2013	Verified.w/Credit	24274	NA	NA	KE1											0.0025	0.82	4316.4	NA	NA	NA	NA	NA	NA	NA
T-281A-13	T-281A-13, L-191, Test, Antioch	2013	Verified.w/Credit	23748	28495	41801222	KE1	41801222	KE1	31023807	2H2							2.76	3.86	5808	L-191 TEST 1.20MI MP 2.76-6.48 PH1	NA	NA	NA	NA	NA	NA

			Data		
Order	**Order Description**	**MAT**	**Sum of 2011 Actual**	**Sum of 2012 Actual**	**Sum of 2013 Actual**
41473946	DFM-7226-02 TEST 0.39MI MP 3.47-3.86 PH1	KE1		$ 5	
41473966	DFM-0651-01 TEST 0.86MI MP 1.01-1.87 PH1	KE1		$ -	
41473973	L-021A_2 TEST 0.36MI MP 16.96-17.31 PH1	KE1		$ 0	
41473980	DFM-1209-02 T-234-13 1.48MI MP 0.00-1.47	KE1	$ 3,023	$ (3,023)	
41474014	DFM-1816-01_1 TEST 1.53-3.44 PH1	KE1	$ 13,985	$ 2,813	
41474032	L-131 T-021-11 MP 49.36 TO MP 50.57	KE1	$ 242,341	$ 8,749	
41474039	L-300A_1 TEST MP 269.51-269.83 PH1	KE1	$ 1,944,734	$ 1,074,640	$ 2,146
41474053	L-300A_1 TEST 0.40MI MP 121.87-122.68 PH	KE1	$ 4,628,014	$ 16,968	$ 3,978
41474054	L-300A-1 TEST 0.61MI MP 156.40-157.86 PH	KE1	$ 817,639	$ 56,099	$ 1,194
41474055	L-300B_1 TEST 0.60MI MP 126.88-127.50 PH	KE1	$ 2,685,619	$ 439,209	$ 2,595
41474056	L-303 T-032-12 MP 19.21 TO 20.43	KE1		$ 83,189	
41474058	L-400-3 TEST 1.61MI MP 293.40-297.87 PH1	KE1	$ 2,072,538	$ 2,105,962	
41474062	L-101 TEST 0.10MI MP 0.62-3.08 PH1	KE1	$ 2,594,877	$ 22,712	$ 2,182
41474064	L-105A TEST 2.16MI MP 38.00-41.00 PH1	KE1	$ 3,266,675	$ 263,873	
41474066	DFM-1519-01 TEST 0.55MI MP 1.48-2.03 PH1	KE1	$ 1,849	$ (1,849)	
41474074	L-132_2 TEST 0.02MI MP 40.04-40.08 PH1	KE1	$ 39,403	$ 282,800	$ 1,406
41474078	L-132_1 TEST 0.80MI MP 3.05-4.00 PH1	KE1	$ 3,268,093	$ 737,206	$ (734,688)
41474079	L-132A TEST 0.81MI MP 0.00-1.45 PH1	KE1	$ 2,036,055	$ 11,075	$ (38,961)
41474081	L-147 TEST 0.43MI MP 0.02-0.85 PH1	KE1	$ 2,469,534	$ 1,087,946	
41474082	L-148 TEST 3.00MI MP 14.60-17.63 PH1	KE1	$ 1,103,461	$ 725,564	$ 8,317
41474085	L-153_1 TEST 3.96MI MP 9.20-13.61 PH1	KE1	$ 2,443,710	$ 62,048	$ 17
41474088	L-191 TEST 5.68MI MP 6.47-9.44 PH1	KE1	$ 1,892,803	$ 909,565	$ 62
41482858	L-105C TEST 1.57MI MP 0.00-1.77 PH1	KE1	$ 1,977,601	$ 68,882	
41482920	L-105N_1 TEST 0.83MI MP 11.07-11.86 PH1	KE1	$ 979,253	$ 7,441	
41482922	L-021A_1 TEST 0.09MI MP 24.49-24.58 PH1	KE1	$ 5,669	$ (5,669)	
41482931	L-057A-MD1 TEST 0.68MI MP 0.00-0.62 PH1	KE1		$ 281,775	$ 1,170,180
41497239	DFM-1816-01 T-099-11 MP 1.19 TO MP 1.53	KE1	$ 10,034	$ 2,603	
41497300	DFM-1816-01_1 TEST 5.74MI MP 3.44-8.44 P	KE1	$ 2,807,031	$ 3,288,247	$ 68,934
41497301	DFM-1816-01 T-098-11 MP 0.00 TO MP 1.19	KE1	$ 10,721	$ 1,653	
41497302	L-131_1 TEST 3.28MI MP 50.70-55.50 PH1	KE1	$ 1,808,876	$ 512,479	$ 1,096
41497303	L-300A_1 TEST 0.90MI MP 127.03-127.93 PH	KE1	$ 2,222,351	$ 2,346	$ 155
41497304	L-300A T-066-11 MP 450.83 TO MP 454.33	KE1	$ 14,028	$ 4,697	
41497305	L-300A_1 TEST 0.45MI MP 445.59-446.48 PH	KE1	$ 3,140,588	$ 112,893	
41497306	L-300A_1 TEST 0.32MI MP 353.56-353.85 PH	KE1	$ 1,715,695	$ 17,777	
41497307	L-300A_1 TEST 0.28MI MP 245.02-245.26 PH	KE1	$ 2,812,965	$ 84,393	
41497308	L-300A_1 TEST 3.31MI MP 496.36-499.77 PH	KE1	$ 1,314,743	$ 450,096	
41497309	L-300A_1 TEST 1.08MI MP 499.77-502.23 PH	KE1	$ 2,810,570	$ 40,480	
41497310	L-300A_1 TEST 2.28MI MP 493.59-496.05 PH	KE1	$ 3,037,938	$ 24,182	
41497311	L-300A T-069N-11 MP 487.78 TO MP 488.19	KE1	$ 21,265	$ 1,835	
41497312	L-300A_2 TEST 0.04MI 490.48-490.63 PH1	KE1	$ 1,624,815	$ 229,741	$ 2,476
41497313	L-300A_1 TEST 2.68MI MP 490.66-493.59 PH	KE1	$ 1,980,900	$ 414,924	
41497314	L-300A T-050-11 MP 0.29 TO MP 0.94	KE1	$ 90,014	$ 502	
41497315	L-300A_1 TEST 1.08MI MP 181.44-182.34 PH	KE1	$ 973,168	$ 1,284,769	$ 10,995
41497316	L-300A T-058-11 MP 198.93 TO MP 201.22	KE1	$ 6,819	$ 1,848	
41497317	L-300A T-059-11 MP 237.44 TO MP 238.00	KE1	$ 9,760	$ 1,703	
41497318	L-300A_1 TEST 0.86MI MP 256.22-257.08 PH	KE1	$ 2,023,332	$ 121,693	
41497319	L-300A T-061-11 MP 268.95 TO MP 269.53	KE1	$ 9,132	$ 664	$ 16
41497320	L-300A_1 TEST 0.84MI MP 414.79-416.98 PH	KE1	$ 640,195	$ 1,751,686	$ 2,252
41497321	L-300A T-053-11 MP 150.26 TO MP 151.06	KE1	$ 20,857	$ 2,129	
41497322	L-300A T-054-11 MP 151.07 TO MP 156.40	KE1	$ 1,179,582	$ 107,230	$ 2,411
41497323	L-300A_1 TEST 1.47MI MP 156.40-157.86 PH	KE1	$ 1,167,313	$ 38,163	$ 2,593
41497324	L-300A_1 TEST 0.29MI MP 157.86-159.33 PH	KE1	$ 2,289,949	$ 142,567	$ 2,560
41497325	L-300A_1 TEST 1.13MI MP 480.74-483.76 PH	KE1	$ 573,686	$ 1,784,788	
41497326	L-300A T-069S-11 MP 485.14 TO MP 487.78	KE1	$ 12,162	$ 539	
41497327	L-300A_1 TEST 0.93MI MP 475.26-478.06 PH	KE1	$ 831,137	$ 1,774,819	$ 891
41497328	L-300B_1 TEST 0.56MI MP 384.06-384.90 PH	KE1	$ 1,323,839	$ 297,241	
41497329	L-300B_1 TEST 0.59MI MP 353.53-353.82 PH	KE1	$ 2,432,506	$ 1,301,723	$ 1,984

41497330	L-300B T-088-11 MP 472.65 TO MP 478.10	KE1	$ 91,018	$ 17,399	$ 2,083
41497331	L-300B_1 TEST 2.35MI MP 484.01-490.92 PH	KE1	$ 4,481,509	$ 400,782	$ 2,014
41497332	L-300B_1 TEST 0.31MI MP 0.15-0.46 PH1	KE1	$ 3,499,299	$ 113,309	$ 4,199
41497333	L-300B_1 TEST 10.46MI MP 490.94-502.62 P	KE1	$ 6,223,515	$ 543,787	$ 6,118
41497334	L-300B_1 TEST 0.85MI MP 256.66-257.51 PH	KE1	$ 1,153,475	$ 80,526	
41497335	L-300B_1 TEST 0.56MI MP 240.56-242.66 PH	KE1	$ 2,386,040	$ 137,494	$ 2,208
41497336	L-300B_1 TEST 0.91MI MP 414.79-418.03 PH	KE1	$ 399,794	$ 1,552,134	$ 1,960
41497337	L-300B_1 TEST 1.12MI MP 445.49-450.80 PH	KE1	$ 3,882,095	$ 494,090	
41497338	L-300B_1 TEST 0.91MI MP 263.46-264.46 PH	KE1	$ 1,648,579	$ 74,323	$ 1,363
41497339	L-300B T-083-11 MP 286.32 TO MP 286.92	KE1	$ 21,544	$ (612)	
41497340	L-300B T-078-11 MP 143.25 TO MP 144.24	KE1	$ 31,905	$ 279	$ 94
41497341	L-300B_1 TEST 2.25MI MP 152.73-160.88 PH	KE1	$ 2,431,596	$ 205,190	$ 2,662
41497342	L-101 TEST 0.08MI MP 3.07-4.66 PH1	KE1	$ 153,922	$ 6,192	
41497344	L-132_1 TEST 1.46MI MP 40.08-42.34 PH1	KE1	$ 1,196,285	$ 185,247	$ 1,372
41497345	L-132_1 TEST 1.48MI MP 43.34-43.61 PH1	KE1	$ 149,892	$ 68,703	$ 9,009
41497346	L-132_1 TEST 2.13MI MP 4.92-7.10 PH1	KE1	$ 1,386,141	$ 258,414	$ 9,370
41497347	L-132_1 TEST 1.95MI MP 46.61-48.44 PH1	KE1	$ 608,874	$ 2,162,485	$ 10,407
41497348	L-132_1 TEST 1.53MI MP 49.98-51.50 PH1	KE1	$ 180,896	$ 2,539,963	$ 5,477
41497349	L-132_1 TEST 3.90MI MP 18.46-23.16 PH1	KE1	$ 2,921,963	$ 1,675,324	$ 1,317
41497350	L-132_1 TEST 2.70MI MP 10.32-13.95 PH1	KE1	$ 2,412,499	$ 169,679	
41497351	L-132_1 TEST 4.48MI MP 13.95-18.46 PH1	KE1	$ 4,217,940	$ 2,044,126	$ 1,875
41497352	L-132_1 TEST 1.43MI MP 8.54-10.32 PH1	KE1	$ 2,890,755	$ 196,240	$ (2,591)
41497353	L-132_1 TEST 1.45MI MP 23.16-25.60 PH1	KE1	$ 1,511,237	$ 930,568	
41497354	L-132_1 TEST 1.42MI MP 7.10-8.54 PH1	KE1	$ 4,936,996	$ 121,875	$ 1,288
41497355	L-132_1 TEST 1.82MI MP 31.95-34.68 PH1	KE1	$ 2,553,821	$ 1,148,562	
41497356	L-132_1 TEST 2.78MI MP 29.06-31.95 PH1	KE1	$ 2,537,654	$ 1,175,438	
41497357	L-132_1 TEST 0.79MI MP 34.68-38.39 PH1	KE1	$ 3,521,553	$ 1,372,628	$ 1,875
41497358	L-132_1 TEST 2.96MI MP 43.61-46.57 PH1	KE1	$ 130,983	$ 3,593,256	$ (65,271)
41497359	L-132_1 TEST 0.86MI MP 0.94-1.88 PH1	KE1	$ 1,260,946	$ 368,452	
41497360	L-153 C-047C-11MP 20.08 TO MP 22.87	KE1	$ 727,061	$ 13,715	$ 25,630
41497361	L-147 TEST 0.11MI MP 1.50-3.40 PH1	KE1	$ 380,652	$ 236,024	$ 384
41497362	L-153_1 TEST 3.98MI MP 13.61-17.62 PH1	KE1	$ 2,121,676	$ 104,944	$ 8
41497363	L-153_1 TEST 0.34MI MP 17.65-18.01 PH1	KE1	$ 2,548,497	$ 765,982	$ 2,528
41497364	L-153_1 TEST 2.01MI MP 18.03-20.06 PH1	KE1	$ 1,728,776	$ 2,465,512	$ 75,175
41497365	L-153_1 TEST 3.54MI MP 0.00-3.45 PH1	KE1	$ 2,412,686	$ 486,304	
41497366	L-153 T-111-11 MP 3.59 TO MP 9.20	KE1	$ 3,968	$ 1,677	
41497367	L-191 TEST 1.09MI MP 9.47-10.58 PH1	KE1	$ 789,812	$ 604,945	
41497369	L-105N_1 TEST 0.20MI MP 27.94-28.13 PH1	KE1	$ 1,748,970	$ 253,933	$ 62
41497370	L-105N_1 TEST 0.51MI MP 28.13-28.64 PH1	KE1	$ 1,054,381	$ 355,956	$ 62
41497371	L-105N_1 TEST 1.94MI MP 28.64-30.63 PH1	KE1	$ 2,457,571	$ 896,891	$ 980
41502561	L-132A TEST 0.01MI MP 1.45-1.47 PH1	KE1	$ 134,198	$ 7,713	$ 1,228
41502562	L-131_1 TEST 0.01MI MP 57.46-57.47 PH1	KE1	$ 29,526	$ 5,526	$ 403
41502564	L-105A-1 TEST 0.01MI MP 0.00-0.04 PH1	KE1	$ 104,821	$ 61,013	$ 62
41502565	L-131_1 TEST 0.03MI MP 42.34-42.42 PH1	KE1	$ 1,151,445	$ 96,464	
41502566	L-114 TEST 0.06MI MP 16.52-16.59 PH1	KE1	$ 1,344,423	$ 112,699	$ 1,052
41534902	L-109 TEST 1.35MI MP 7.57-8.72 PH1	KE1	$ 43,701	$ 1,758,161	$ 8,011
41545511	L-300B_1 TEST 0.76MI MP 283.85-284.62 PH	KE1	$ 716,990	$ 764,890	$ 1,004
41587446	L-300A_2 TEST 4.05MI 239.57-243.74 PH1	KE1	$ 2,059,895	$ 2,076,877	$ 155
41587447	L-300A_2 TEST 2.12MI 372.49-374.57 PH1	KE1	$ 354,731	$ 2,511,321	$ 2,010
41587448	L-300A_2 TEST 0.82MI 384.65-385.55 PH1	KE1	$ 1,155,547	$ 532,739	
41598529	DFM-0211-01 TEST MP 0.02-0.68 PH1	KE1	$ 240,127	$ 8,155	$ 1,425
41599874	DFM-0407-01 T-009-12 MP 0.44 TO MP 0.59	KE1		$ 4,639	
41599876	L-109 T-014-12 MP 48.21 TO MP 48.84	KE1		$ 105,466	
41599878	L-132_2 TEST 1.80MI MP 48.44-49.98 PH1	KE1		$ 2,040,661	$ 6,471
41599879	L-153_2 C-020-12 MP 25.11 TO MP 27.88	IIH		$ 246,077	$ 569,208
41600040	L-191-1 TEST 6.82MI MP 21.35-25.29 PH1	KE1	$ 1,307	$ 67,271	$ 4,511,601
41600041	L-191-1 TEST 2.94MI MP 31.90-35.83 PH1	KE1		$ 50,893	$ 2,869,513
41600042	L-100 TEST 4.28MI MP 143.85-147.77 PH1	KE1		$ 1,879,868	$ 44,904
41600043	L-100 TEST 2.36MI MP 147.77-150.13 PH1	KE1		$ 994,338	$ 13,209
41600046	L-306 T-034-12 MP 41.58 TO MP 43.7	KE1	$ 965	$ 75,378	$ 3,011
41600047	L-306 T-035-12 MP 54.48 TO MP 57.87	KE1	$ 1,158	$ 59,920	$ 3,468
41600048	L-306 T-036-12 MP 68.38 TO MP 70.02	KE1	$ 1,053	$ 24,254	$ 1,541

41600049	DFM-1615-01 TEST 1.89MI MP 10.12-14.88 P	KE1	$ 443	$ 108,347	$ 2,579,329
41600050	DFM-7221-10 T-041-12 MP 12.08 TO MP 15.9	KE1		$ 6,683	
41600051	L-057A-MD1 TEST 0.16MI MP 0.97-1.13 PH1	KE1		$ 239,550	$ 912,012
41600052	L-138 TEST 7.25MI MP 28.64-35.91 PH1	KE1		$ 1,965,519	$ 78,715
41600053	L-138 TEST 2.38MI MP 35.91-38.38 PH1	KE1		$ 62,871	$ 2,511,294
41600054	L-138 TEST 0.18MI MP 45.39-45.56 PH1	KE1		$ 1,275,738	$ 13,959
41600055	L-142N TEST 3.53MI MP 3.15-6.69 PH1	KE1	$ 519	$ 1,807,309	$ 4,141
41600056	L-142N T-050-12 MP 7.70 TO MP 8.19	KE1		$ 8,174	
41600057	L-142N TEST 4.75MI MP 8.26-8.70 PH1	KE1	$ 700	$ 52,009	$ 8,472,903
41600058	L-142S TEST 0.67MI MP 3.21-3.87 PH1	KE1	$ 913	$ 1,326,094	$ 1,800
41600059	L-142S TEST 1.04MI MP 10.44-11.48 PH1	KE1	$ 1,901	$ 1,152,328	$ 1,038
41600060	L-300A_2 T-057-12 MP 245.85 TO MP 246.81	KE1		$ 5,135	
41600062	L-300A_2 TEST 0.23MI 277.89-278.12 PH1	KE1	$ 75	$ 1,387,606	$ 495
41600065	L-021F T-071-12 MP 9.43 TO MP 9.57	KE1		$ 30,992	$ 2,113
41600066	L-021F T-072-12 MP 11.73 TO MP 13.92	KE1		$ 17,144	$ 2,160
41600067	L-021F TEST 0.06MI MP 19.17-20.09 PH1	KE1		$ 2,333,183	$ (10,530)
41600069	L-119B TEST 1.62MI MP 8.89-10.15 PH1	KE1	$ 101	$ 52,806	$ 1,105,092
41600070	L-172A T-084-12 MP 48.98 TO MP 49.74	KE1	$ 807	$ 9,805	
41600071	L-172A T-085-12 MP 55.403 TO MP 58.602	KE1	$ 126	$ 494,624	$ 425,086
41600072	L-172A T-086-12 MP 66.53 TO MP 67.50	KE1	$ 404	$ 15,781	
41600073	L-210B TEST 5.14MI MP 10.82-15.61 PH1	KE1		$ 2,997,999	$ (24,220)
41600074	L-210B TEST 4.95MI MP 15.61-20.22 PH1	KE1		$ 2,314,875	$ 90,068
41600075	L-210B TEST 2.82MI MP 22.98-25.98 PH1	KE1		$ 1,513,671	$ 25,248
41600077	DFM-1816-01_2 TEST 1.96MI MP 16.30-18.25	KE1		$ 3,771,786	$ (334,422)
41600079	L-148 TEST 6.52MI MP 6.06-12.58 PH1	KE1	$ 546	$ 1,772,480	$ 1,334
41600080	L-148 TEST 2.02MI MP 12.58-14.62 PH1	KE1		$ 2,167,477	$ 5,137
41613029	L-191-1 TEST 0.36MI MP 9.58-9.94 PH1	KE1		$ 1,732,935	$ 16,734
41613030	L-131_2 TEST 0.12MI MP 8.45-8.58 PH1	KE1		$ 103,685	$ 788,988
41617908	DFM-1401-01 T-011-12 MP 0.00 TO MP 0.786	IIH	$ 562	$ 95,951	$ 1,708
41617909	L-300B_1 TEST 0.03MI MP 0.12-0.15 PH1	KE1		$ 443,774	$ 2,671
41617913	L-153_2 C-019-12 MP 22.87 TO MP 25.11	IIH		$ 17,933	$ 84,311
41617915	DFM-0813-01 T-024-12 MP 0 TO MP 1.286	IIH		$ 540,463	$ 15,651
41617916	L-100 TEST 5.23MI MP 138.43-143.85 PH1	KE1	$ 262	$ 4,639,139	$ 113,937
41617917	DFM-2403-12 TEST 2.84MI MP 0.05-2.88 PH1	KE1		$ 104,635	$ 3,391,798
41617920	L-306 T-033-12 MP 0.00 TO MP 0.17	KE1	$ 2,057	$ 133,585	$ 18,753
41617921	DFM-1202-01 T-037-12 MP 0 TO MP 2.13	KE1		$ 19,528	$ 574
41617922	DFM-1615-01 TEST 10.09MI MP 0.02-10.12 P	KE1	$ 3,146	$ 220,951	$ 5,764,012
41617923	DFM-7221-10 TEST 2.46MI MP 7.20-9.65 PH1	KE1		$ 1,366,986	$ 2,988
41617925	L-138 TEST 6.11MI MP 22.55-28.64 PH1	KE1		$ 1,989,689	$ 5,836
41617926	L-142N TEST 3.14MI MP 0.00-3.16 PH1	KE1	$ 1,150	$ 1,949,710	$ 8,732
41617927	L-142S TEST 0.66MI MP 0.02-0.69 PH1	KE1		$ 1,223,265	$ 1,709
41617928	L-300A_2 TEST 0.88MI MP 230.32-231.20 PH	KE1	$ 4,027	$ 1,699,159	$ 21,456
41617931	L-021C TEST 8.57MI MP 35.05-43.26 PH1	KE1	$ 807	$ 56,711	$ 1,530,178
41617933	L-021E T-068-12 MP 116.16 TO MP 116.46	KE1		$ 7,940	
41617935	L-021G T-074-12 MP 0.00 TO MP 2.54	KE1		$ 38,863	$ 7,863
41617937	DFM-0611-02 TIM-076B-12 MP 0.00-1.91	IIH		$ 14,912	$ (13,828)
41617940	L-119A TEST 3.90MI MP 0.00-3.82 PH1	KE1	$ 479	$ 2,474,792	$ 14,840
41617941	L-119B TEST 6.42MI MP 2.23-6.88 PH1	KE1	$ 101	$ 16,840	$ 2,036,817
41617942	L-172A T-083-12 MP 35.51 TO MP 35.85	KE1	$ 1,009	$ 1,348	
41617944	L-200A-1 T-088-12 MP 1.08 TO MP 1.42	KE1		$ 3,863	$ 260
41617945	L-210B TEST 3.25MI MP 7.49-10.82 PH1	KE1		$ 1,869,231	$ 15,133
41617946	L-210C TEST 2.59MI MP 31.27-31.68 PH1	KE1		$ 23,046	$ 2,474,443
41617948	L-148 TEST 6.06MI MP 0.00-6.06 PH1	KE1	$ 5,168	$ 2,133,412	$ 5,467
41622643	DFM-3010-01 TEST 0.60MI MP 0.64-1.27 PH1	KE1		$ 228,309	$ 909,691
41622644	L-118A T102A-12 MP 0.00 TO MP 0.180	IIH		$ 1,074,550	$ 7,511
41622647	L-118A TEST 0.32MI MP 37.38-37.71 PH1	KE1		$ 939,258	$ 6,831
41622649	L-118A TEST 0.53MI MP 58.21-58.74 PH1	KE1		$ 1,304,909	$ 5,175
41622650	L-105N_2 T-103-12 MP 21.24 TO MP 21.70	KE1		$ 1,983	$ 250
41622651	L-132_1 TEST 3.56MI MP 25.60-29.06 PH1	KE1		$ 3,446,705	$ 89,641
41622652	L-132_1 T-105-12 MP 0.74 TO MP 0.95	KE1		$ 3,395	$ 125
41622655	L-300A_2 T-109-12 MP 414.57 TO MP 414.79	KE1		$ 11,258	$ 3,450
41622656	L-300A_1 TEST 3.32MI MP 446.47-449.71 PH	KE1		$ 2,721,535	$ 20,741

41637747	L-109 TEST 0.99MI MP 43.49-44.72 PH1	KE1		$ 2,185,837	$ 69,340
41640537	L-109 T-123-12 MP 31.52 TO MP 32.806	IIH		$ 3,314,693	$ 252,261
41640539	L-109 T-125-12 MP 21.422 TO MP 22.225	IIH		$ 1,808,575	$ 7,616
41640620	L-109 T-126-12 MP 18.56 TO MP 19.55	IIH		$ 2,088,859	$ 7,731
41640621	DFM-3017-01 TIM-130-12 MP0.816 TO MP3.92	IIH		$ 339,292	$ 9,155
41640622	DFM-3017-01 TEST 3.41MI MP 3.92-7.54 PH1	KE1		$ 1,236,857	$ 11,752
41640623	DFM-1614-01 TEST 3.90MI MP 0.00-3.90 PH1	KE1		$ 2,691,055	$ 248,880
41640624	L-103 TEST 0.40MI MP 15.64-15.86 PH1	IIH		$ 1,067,661	$ 16,029
41640626	L-103 TEST 0.10MI MP 27.16-27.26 PH1	KE1		$ 1,277,845	$ 19,821
41640627	DFM-0405-01 T-143-12 MP 3.87 TO MP13.0	IIH		$ 3,565,960	$ 474,913
41640628	DFM-0405-01 T-144-12 MP3.87 TO MP13.0	IIH		$ 1,605,659	$ 83,381
41640629	DFM-0115-01 TEST 0.40MI MP 0.00-0.41 PH1	KE1		$ 1,283,992	$ 170,048
41640631	DFM-0813-02 T-149-12 MP 0.00 TO MP0.50	IIH		$ 852,964	$ 18,025
41640632	DFM-0814-05 T-150-12 MP 0.00 TO MP0.31	IIH		$ 716,203	$ 8,822
41640634	DFM-7223-01 TEST 8.24MI MP 0.14-8.40 PH1	KE1		$ 2,249,537	$ 16,427
41640635	DFM-7224-09 T-162-12 MP 0.00 TO MP1.35	KE1		$ 2,034,833	$ 262,825
41640636	DFM-7224-12 TIM-163-12 MP 0.25 TO MP0.73	KE1		$ 3,697	$ 1,054
41640637	DFM-7227-05 TIM-164-12 MP 0.00 TO MP0.19	KE1		$ 13,244	$ 1,541
41641190	DFM-7224-01 TIM-133-12 MP 5.34 TO MP 6.0	IIH		$ 1,299,183	$ 20,835
41641195	L-107 TIM-134A-12 MP 23.204TO MP 24.4203	IIH		$ 136,731	$ 17,498
41641285	L-138D TIM-155-12 MP 45.10 TO MP 46.64	IIH		$ 1,085,149	$ 98,674
41641286	L-181B TIM-159-12 MP 4.08 TO MP 4.5077	IIH		$ 1,575,312	$ 16,310
41650662	L-153_2 T-020-12 MP 25.11 TO MP 27.88	IIH		$ 2,761,354	$ (481,398)
41650674	L-153_1 TEST 2.80MI MP 20.06-22.87 PH1	KE1		$ 1,635,431	$ 33,289
41650741	L-153_2 T-019-12 MP 22.87 TO MP 25.110	IIH		$ 1,496,627	$ (133,226)
41656115	TIM-166-12 DFM-1301-01 MP 4.18TO MP 4.63	IIH		$ 2,339,159	$ 97,356
41656201	TIM-168-12 DFM-1614-08 MP 0.56 TO MP 1.0	IIH		$ 824,281	$ 8,155
41656204	TIM-169-12 L-197B MP 0.00 TO MP 4.40	IIH		$ 104,187	$ 15,716
41660676	L_153 C-047C MP 20.07-22.870	KE1		$ (38,134)	$ 502
41663877	L-300A_1 TEST 0.58MI MP 187.84-188.41 PH	KE1		$ 2,257,846	$ 2,316
41665948	DFM 7222-01 TIM-160B-12 MP11.16 TO MP13.	IIH		$ 2,030,053	$ 14,342
41699027	DFM-1816-05 TEST 0.36MI MP 0.00-1.20 PH1	JTC		$ 244,270	$ (315,666)
41699030	DFM-7219-01 T-173-12 MP 0.00-3.73	JTC		$ 1,839,887	$ (1,839,887)
41709445	L-132_1 TEST 0.63MI MP 4.29-4.92 PH1	KE1		$ 1,948,945	$ 807,127
41710903	T-285-13 X6526 TEST MP 0.00-0.26	KE1		$ 408	$ 1,375,244
41712455	L-301F T-176-12 MP 7.23-7.63	JTC		$ 1,248,140	$ 5,938
41736391	L-119A TIM-177-12 MP 16.2225-16.4109	IIH		$ 1,057,266	$ (13,852)
41737020	L-109 TIM-175-12 MP 16.93 TO MP 17.01	IIH		$ 318,312	$ 265,185
41743422	DFM-1004-01 TEST 4.79MI MP 0.00-4.75 PH1	KE1		$ 11,970	$ 2,240,659
41743424	DFM-1813-02 TEST 1.12MI MP 8.76-9.71 PH1	KE1		$ 67,805	$ 1,329,270
41743426	DFM-1813-02 TEST 3.88MI MP 12.52-12.95 P	KE1		$ 26,617	$ 2,665,982
41743428	DFM-7223-01 TEST 1.69MI MP 8.40-9.48 PH1	KE1		$ 13,299	$ 3,460,354
41743429	DFM-7226-01 TEST 4.75MI MP 0.00-4.59 PH1	KE1		$ 35,762	$ 2,247,644
41743430	GCUST5900 TIM-274-13 MP 0.07-0.49	IIH		$ 40,503	$ 651,521
41744012	DFM-0201-01 T-216A-13 MP 0.00-2.95	KE1		$ 6,649	$ 2,137
41744014	DFM-0201-01 T-216B-13 MP 2.95-6.62	KE1		$ 3,292	$ 4,294
41744015	DFM-0215-01 TEST 0.70MI MP 0.02-0.78 PH1	KE1		$ 9,183	$ 1,941,184
41744017	L-021B TEST 3.31MI MP 0.01-2.31 PH1	KE1		$ 55,971	$ 2,281,951
41744221	L-021B TEST 5.01MI MP 10.64-14.80 PH1	KE1		$ 32,726	$ 1,795,710
41744226	L-050A-1 TEST 1.26MI MP 1.56-2.87 PH1	KE1		$ 34,664	$ 2,402,614
41744230	DFM-0604-01 TEST 0.77MI MP 0.00-0.30 PH1	KE1		$ 39,485	$ 1,844,720
41744231	DFM-0604-01 T-224B-13 MP 0.00-0.30	KE1		$ 6,457	$ 1,781
41744232	DFM-0604-07 TEST 5.29MI MP 0.00-6.41 PH1	KE1		$ 29,193	$ 3,625,565
41744236	DFM-0817-01 TEST 0.48MI MP 0.00-0.47 PH1	KE1		$ 67,244	$ 1,508,712
41744498	DFM-1816-15 TEST 6.04MI MP 0.00-6.01 PH1	KE1		$ 2,378	$ 5,964
41744765	L-331A T-252-13 MP 8.06-8.40	KE1		$ 1,048	$ 2,168
41744766	DFM-7218-01 T-253-13 MP 0.00-1.32	KE1		$ 3,256	$ 4,193
41744767	DFM-1813-02 TEST 0.41MI MP 11.75-12.05 P	KE1		$ 23,411	$ 1,364,553
41744771	L-108 TIM-257-13 MP 48.50-49.04	KE1		$ 2,073	$ 1,573
41744772	L-109 TIM-258-13 MP 50.04-50.65	KE1		$ 2,518	$ 2,311
41746698	L-153_2 TIM-179-12 MP 0.00 - 0.31	IIH		$ 814,659	$ 17,056
41748703	L-118B TEST 4.22MI MP 1.04-7.72 PH1	KE1		$ 57,096	$ 3,458,221

41748704	L-118B TEST 2.44MI MP 8.46-8.72 PH1	KE1		$ 20,314	$ 2,336,754
41748705	L-118B TEST 9.30MI MP 10.87-20.07 PH1	KE1		$ 19,408	$ 2,777,286
41748961	DFM-1202-02 T-232-13 MP 2.00-2.39	KE1		$ 520	$ 2,017
41748970	DFM-1603-01 TEST 1.23MI MP 0.50-0.59 PH1	KE1		$ 40,223	$ 3,749
41748974	L-162A TEST 0.35MI MP 4.41-4.76 PH1	KE1		$ 1,880	$ 1,470,517
41748975	L-162A TEST 1.32MI MP 7.72-9.03 PH1	KE1		$ 3,184	$ 1,169,362
41748976	L-177B TEST 6.66MI MP 0.86-7.51 PH1	KE1		$ 10,531	$ 3,496,242
41748985	L-191-1 TIM-180-12 MP 34.70-35.28	IIH		$ 1,305,972	$ 14,340
41748986	L-109 TEST 0.72MI MP 0.44-1.16 PH1	KE1		$ 722,896	$ 176,423
41749020	DFM-1815-02 T-242-13 MP 6.50-10.03	KE1		$ 25,627	$ 9,697
41749033	DFM-1815-02 TEST 10.02MI MP 6.50-16.85 P	KE1		$ 20,202	$ 6,325
41756005	L-187 TEST 9.77MI MP 22.82-33.04 PH1	KE1		$ 41,975	$ 2,746,337
41756006	L-187 TEST 8.13MI MP 33.04-41.08 PH1	KE1		$ 32,176	$ 1,849,505
41756007	L-187 TEST 5.72MI MP 41.08-42.64 PH1	KE1		$ 33,577	$ 3,186,027
41756008	L-187 TEST 4.39MI MP 46.63-50.67 PH1	KE1		$ 18,564	$ 1,224,420
41756009	L-187 TEST 5.20MI MP 50.67-56.55 PH1	KE1		$ 14,263	$ 1,182,414
41756012	L-187 TEST 9.31MI MP 56.55-60.03 PH1	KE1		$ 26,843	$ 2,558,819
41756013	DFM-0141-01 TEST 0.42MI MP 0.00-0.42 PH1	KE1		$ 10,800	$ 807,776
41801018	L-210B T-091B-12 MP 20.22 TO MP 20.3285	JTC		$ 6,440	$ 2,229,893
41801221	L-132_1 TEST 0.01MI MP 46.60-46.61 PH1	KE1		$ 23,774	$ 296,351
41801222	L-191 TEST 1.20MI MP 2.76-6.48 PH1	KE1		$ 47,657	$ 2,067,624
41802284	DFM-1023-01 TEST 1.13MI MP 0.82-1.97 PH1	KE1		$ 5,074	$ 1,650,910
41821631	L-109 TIM-013A-12 PSEP FUND	KE1		$ 2,541,277	$ 5,828
41896934	L-148 PRESSURE RESTORATION REPAIRS	JTC			$ 23,113
41935324	DFM 1813-02 TIM-269B-13 MP16.39-16.40	IIH			$ 58,944
2032287	ATS 2012 Hydrotest Pipe Testing	KE1		$ 106,686	$ 55,752
2032545	2012 Hydrotest Pipe Destructive Testing	KE1			$ 11,475
2032985	2013 HYDROTEST PIPE DESTRUCTIVE TEST	KE1			$ 232,793
2032986	PSEP Hydrotesting IIC Expense	KE1			$ (86,871,198)
2032987	PSEP Hydrotesting Non-IIC Expense	KE1			$ 86,871,198
2033046	Lathrop Yard Hydrotest Used Pipe Storage	KE1			$ 215,254
2033710	TIMP Dig PMO	IIH			$ 5,300
8119984	Hydrotest PMO	KE1		$ 822,868	$ 4,349,497
8120278	Hydrotesting Engineering	KE1		$ 85,854	$ 266,611
40755080	DFM 2403-01 UPRATE 3 MILES, NILES	JTC	$ 5,098	$ 172,778	$ 105,336
40965738	L-167 - HYDROTEST FOR CLASS CHANGE	JTC		$ 214	
40966131	BEALE AFB DFM UPRATE - EXPENSE	JTC		$ 475	
41463579	STRENGTH TEST-PROGRAM	KE1	$ 60,023,736	$ (26,529,940)	$ 6,008,815
41471993	0804-03 UPRATE LAFAYETTE DFM	JTC			$ 1,041
41473886	DFM-0115-01 TEST 0.40MI MP 0.00-0.41 PH1	KE1		$ 8	
41473887	DFM-0126-01 TEST 0.07MI MP 1.76-1.84 PH1	KE1	$ 328	$ (328)	
41473888	DFM-0141-01 TEST 0.43MI MP 0.00-0.42 PH1	KE1		$ 402	$ 3,269
41473891	DFM-0211-01 TEST 0.68MI MP 0.00-0.68 PH1	KE1		$ 1	
41473893	DFM-0215-01 TEST 0.95MI MP 0.00-0.98 PH1	KE1		$ 3	
41473895	DFM-0401-01 TEST 5.44MI MP 0.03-5.48 PH1	KE1	$ 8,077	$ (8,077)	
41473896	DFM 0401-10 MP 0-0.01 TEST 1 MI PH1	KE1		$ 856	
41473897	DFM-0402-01 TEST 0.69MI MP 0.27-2.36 PH1	KE1		$ (0)	
41473920	DFM-0405-01 TEST 6.23MI MP 3.89-11.09 PH	KE1		$ (0)	
41473922	DFM-0406-03 TEST 0.76MI MP 0.08-0.81 PH1	KE1		$ 78	
41473923	DFM-0407-01 TEST 4.36MI MP 0.00-4.34 PH1	KE1	$ 1,607	$ (1,607)	
41473924	DFM-0601-01 TEST 0.36MI MP 0.09-0.46 PH1	KE1		$ 14	
41473925	DFM-0604-01 TEST 1.08MI MP 0.00-4.71 PH1	KE1		$ 14	
41473926	DFM-0604-06 TEST 2.29MI MP 0.00-2.28 PH1	KE1		$ 4	
41473927	DFM-0604-07 TEST 6.25MI MP 0.01-6.41 PH1	KE1		$ 109	
41473930	DFM-0611-01 TEST 1.07MI MP 0.00-1.07 PH1	KE1	$ 876	$ (876)	
41473932	DFM-1502-11 TEST 1.98MI MP 0.00-2.96 PH1	KE1	$ 144	$ (144)	
41473933	DFM-1502-06 TEST 0.32MI MP 0.00-0.32 PH1	KE1		$ 11	
41473934	L-153_2 TEST 10.86MI MP 3.58-27.88PH	KE1	$ 438	$ (438)	$ 1,403
41473936	DFM-0630-01 TEST 0.07MI MP 1.33-1.40 PH1	KE1		$ 14	
41473939	DFM-7221-10 TEST 6.10MI MP 7.45-15.99 PH	KE1	$ 704	$ (706)	
41473941	*CANC* DFM-7222-01 TEST 13.55MI MP 0.	KE1		$ 363	
41473942	DFM-7223-01 TEST 9.90MI MP 0.15-10.05 PH	KE1		$ (0)	

41473943	DFM-7224-09 TEST 1.35MI MP 0.00-1.35 PH1	KE1		$ 3	
41473944	DFM-7224-12 TEST 0.48MI MP 0.25-0.73 PH1	KE1		$ 3	
41473945	DFM-7226-01 TEST 5.59MI MP 0.00-5.59 PH1	KE1		$ 2	
41473947	DFM-7226-13 TEST 0.25MI MP 0.00-0.25 PH1	KE1		$ 2	
41473961	DFM-1306-01 TEST 0.72MI MP 0.01-0.72 PH1	KE1		$ 25	
41473962	DFM-0621-01 TEST 0.68MI MP 0.02-0.70 PH1	KE1		$ 309	
41473965	DFM-0638-02 TEST 1.24MI MP 1.69-2.93 PH1	KE1		$ 11	
41473969	DFM-0813-01 TEST 1.30MI MP 0.00-1.29PH1	KE1		$ 0	
41473970	DFM-0813-02 TEST 0.50MI MP 0.00-0.50PH1	KE1		$ 2	
41473971	DFM-0814-05 TEST 0.31MI MP 0.00-0.31 PH1	KE1		$ 2	
41473972	DFM-0817-01 TEST 1.31MI MP 0.00-1.30 PH1	KE1		$ 1	
41473974	DFM-1004-01 TEST 0.35MI MP 4.40-4.75 PH1	KE1		$ 27	
41473975	DFM-1023-01 TEST 2.83MI MP 0.00-2.83 PH1	KE1		$ 296	
41473976	DFM-1027-01 TEST 1.21MI MP 3.46-6.58 PH1	KE1		$ 15	
41473979	DFM-1202-16 TEST 2.50MI MP 0.08-2.58 PH1	KE1		$ 2	
41473982	DFM-1301-01 TEST 4.40MI MP 0.00-4.63 PH1	KE1		$ 25	
41473985	DFM-0213-02 TEST 0.90MI MP 0.00-0.94 PH1	KE1		$ 2	
41473986	DFM-1816-01_2 TEST 9.17MI MP 8.44-18.25	KE1	$ 805	$ (805)	
41473987	DFM-1310-01 TEST 1.28MI MP 0.00-1.29 PH1	KE1		$ 14	
41473988	DFM-1401-01 TEST 0.80MI MP 0.00-0.79 PH1	KE1	$ 328	$ (328)	
41473990	DFM-1501-01 TEST 5.55MI MP 0.00-6.88 PH1	KE1		$ 29	
41473991	DFM-1501-02 TEST 0.80MI MP 0.62-2.44 PH1	KE1		$ 25	
41473992	DFM-1502-02 TEST 1.60MI MP 0.00-1.60 PH1	KE1	$ 144	$ (144)	
41473994	DFM-1502-08 MP -0.01 TEST 1MI PH1	KE1		$ 1,857	
41473999	DFM-1601-09 TEST 0.86MI MP 0.00-0.86 PH1	KE1		$ 2	
41474000	DFM-1603-03 TEST 0.46MI MP 0.48-0.49 PH1	KE1		$ 2	
41474001	DFM-1640-01 TEST MP 0.00-0.70 PH1	KE1		$ (0)	
41474002	DFM-1614-01 TEST 3.97MI MP 0.00-3.97 PH1	KE1		$ 3	
41474005	DFM-1615-01 TEST 8.03MI MP 6.72-14.74 PH	KE1	$ 1,773	$ (1,773)	
41474007	DFM-1615-07 TEST 0.25MI MP 0.01-0.25 PH1	KE1		$ 2	
41474008	DFM-1622-01 TEST 0.99MI MP 0.00-1.00 PH1	KE1		$ 2	
41474011	DFM-1813-02 TEST 5.17MI MP 8.93-16.39 PH	KE1		$ -	
41474012	DFM-1815-02 TEST 9.80MI MP 6.50-16.85 PH	KE1		$ 3	
41474013	DFM-1815-15 TEST 1.98MI MP 0.18-2.13 PH1	KE1		$ 4	
41474015	DFM-1816-02 TEST 0.12MI MP 0.00-0.12 PH1	KE1		$ 0	
41474016	DFM-1816-05 TEST 0.80MI MP 0.00-0.80 PH1	KE1		$ 2	
41474017	DFM-1816-15 TEST 6.04MI MP 0.00-6.01 PH1	KE1		$ 4	
41474018	L-131_2 TEST 3.14MI MP 8.44-45.90 PH1	KE1	$ 1,063	$ (1,063)	
41474019	DFM-1819-01 TEST 0.64MI MP 0.42-1.07 PH1	KE1		$ 3	
41474020	DFM-1869-01 TEST 0.16MI MP 0.00-0.16 PH1	KE1		$ 2	
41474021	DFM-1870-01 TEST 3.33MI MP 0.00-3.33 PH1	KE1		$ 1	
41474024	DFM-2408-01 TEST 0.99MI MP 2.32-2.72 PH1	KE1		$ 3	
41474028	DFM-3010-01 TEST 1.27MI MP 0.00-1.27 PH1	KE1		$ 3	
41474029	DFM-3017-01 TEST 6.68MI MP 0.02-6.95 PH1	KE1		$ 31	
41474030	DFM-6603-01 TEST 2.18MI MP 3.96-6.14 PH1	KE1		$ 3	
41474031	L-401 TEST 0.80MI MP 323.44-326.76 PH1	KE1		$ -	
41474033	L-131Z TEST 0.54MI MP 0.00-0.54 PH1	KE1		$ 82	$ 824
41474035	L-134A TEST 5.94MI MP 4.00-25.55 PH1	KE1		$ 126	
41474036	L-137B TEST 5.29MI MP 0.00-7.37 PH1	KE1		$ 41	
41474037	L-142N TEST 11.67MI MP 0.00-14.05 PH1	KE1	$ 3,232	$ (3,232)	
41474038	L-142S TEST 2.28MI MP 0.02-11.48 PH1	KE1	$ 4,067	$ (4,067)	
41474040	L-158-1 TEST 2.58MI MP 11.07-13.65 PH1	KE1		$ 27	
41474041	L-162A TEST 1.69MI MP 4.41-9.03 PH1	KE1		$ 9	
41474042	L-172A TEST 2.11MI MP 35.51-67.50 PH1	KE1	$ 2,386	$ (2,386)	
41474043	L-177A TEST 0.33MI MP 88.50-88.83 PH1	KE1	$ 201	$ 7	
41474044	L-177B TEST 6.65MI MP 0.86-7.51 PH1	KE1		$ 11	
41474045	L-181A MP 15.31-15.32 TEST 1 MI PH 1	KE1		$ -	
41474046	L-181B TEST 1.55MI MP 0.64-2.17 PH1	KE1		$ 3	
41474047	L-191-1 TEST 10.07MI MP 9.59-35.83 PH1	KE1	$ 2,435	$ (2,435)	
41474048	L-191A TEST 4.89MI MP 0.00-4.84 PH1	KE1	$ 648	$ (648)	
41474049	L-191B MP 1.63-1.64 TEST 1 MI PH1	KE1	$ 3,522		
41474051	L-197B TEST 5.18MI MP 0.00-5.49 PH1	KE1		$ 168	

41474052	L-197C-1 TEST 2.34MI MP 14.73-17.05 PH1	KE1	$ 68	$ 168	
41474057	L-400_1 TEST 17MI MP 80.04-298.84 PH1	KE1		$ 41	
41474060	L-196A TEST 0.46MI MP 11.49-11.93 PH1	KE1		$ 62	
41474061	L-100 TEST 10.36MI MP 138.43-150.13 PH1	KE1	$ 4,618	$ (4,618)	
41474063	L-103 TEST 2.45MI MP 25.31-27.77PH1	KE1		$ 4	
41474065	L-105N-3 MP 0.0 TEST 1 MI PH1	KE1	$ 120,097		
41474067	L-108 MP 6.0-73.58 TEST 1.1 MI PH1	KE1	$ 3,227		
41474068	L-109 TEST 3.40MI MP 7.57-48.84 PH	KE1		$ -	
41474069	L-111-A MP 27.53 TEST 1 MI PH1	KE1	$ 94	$ 59	
41474070	L-118A TEST 1.30MI MP 0.00-58.74 PH1	KE1		$ 124	
41474071	L-118B TEST 16.44MI MP 1.04-20.07 PH1	KE1		$ 10	
41474072	L-119A TEST 3.68MI MP 0.00-14.02 PH1	KE1	$ 1,271	$ (1,271)	
41474073	L-119B TEST 6.91MI MP 0.00-10.02 PH1	KE1		$ 0	
41474075	L-126A TEST 9.84MI MP 0.00-10.89 PH1	KE1	$ 71	$ 384	
41474076	L-126B TEST 10.14MI MP 0.00-10.57 PH1	KE1		$ 152	
41474077	L-131Y MP 0.53-0.54 TEST 1 MI PH1	KE1		$ 4,507	
41474080	L-138 TEST 17.09MI MP 22.04-45.39 PH1	KE1	$ 1,811	$ (2,439)	
41474083	L-150 TEST 6.63MI MP 6.15-18.09 PH1	KE1		$ 61	
41474084	L-151 TEST 0.42MI MP 10.81-11.23 PH1	KE1		$ 247	
41474086	L-186 TEST 2.08MI MP 9.20-26.13 PH1	KE1		$ 138	
41474087	L-187 TEST 39.21MI MP 22.58-65.70 PH1	KE1	$ 3,556	$ (3,556)	
41474089	L-195A3-1 TEST 0.48MI MP 0.00-0.48 PH1	KE1		$ 7	
41474090	L-021B TEST 18.93MI MP 0.00-18.64 PH1	KE1		$ 34	
41474091	L-021C TEST 7.10MI MP 35.05-51.41 PH1	KE1	$ 755	$ (755)	
41474092	L-021F TEST 5.18MI MP 2.70-19.93 PH1	KE1	$ 1,781	$ (1,781)	
41474094	L-021G TEST 2.54MI MP 0.00-2.54 PH1	KE1	$ 402	$ (402)	
41474095	L-220 TEST 4.58MI MP 23.14-27.68 PH1	KE1		$ 296	
41474096	L-306 TEST 7.24MI MP 0.00-70.02 PH1	KE1	$ 7,681	$ (7,681)	
41474097	L-314 TEST 4.34MI MP 20.91-24.92 PH1	KE1		$ 92	
41474099	L-050A TEST 1.36MI MP 32.33-38.63 PH1	KE1		$ 14	
41474101	L-210B TEST 13.54MI MP 7.57-25.98 PH1	KE1	$ 503	$ (503)	
41482848	DFM-2403-12 TEST 2.88MI MP 0.00-2.88 PH1	KE1			$ 325
41482859	L-197C-2 TEST 2.88MI MP 0.55-3.43 PH1	KE1	$ (3)		
41496073	STRENGTH TEST-FACILITIES	KE1	$ 829,339	$ (491)	
41496075	STRENGTH TEST-PMO	KE1	$ 9,699,267	$ 2,432,818	$ 1,286,605
41497343	L-101 T-004-11 MP 9.76 TO MP 10.00	KE1	$ 30,552	$ 2,566	
41497368	L-105N T-012-11 MP 18.92 TO MP 19.14	KE1	$ 15,343	$ 1,551	
41513705	UG WELDING CONTRACTORS	KE1	$ 36,264	$ 941,122	$ (968,658)
41540051	T-13 L-105N MP 21.24 TO MP 21.3	KE1	$ 50,067		
41540052	T-14 L-105N MP 21.3 TO MP 21.7	KE1		$ 301	
41544921	T-96 L-SP5 MP 0.0000 TO MP 3.8700	KE1	$ 1,734,321		$ 48
41599870	DFM-0401-01 TEST 0.27MI MP 2.47-2.48 PH1	KE1		$ 10,398	$ 13,074
41599871	DFM-0401-01 TEST 2.25MI MP 2.48-4.49 PH1	KE1		$ 10,256	$ 43,855
41599872	DFM-0401-01 TEST 0.99MI MP 4.49-5.48 PH1	KE1	$ 605	$ 11,937	$ 40,475
41599873	DFM-0402-01 T-007-12 MP 2.35 TO MP 2.35	KE1		$ 28,759	$ 2,802
41599875	DFM-0407-01 TEST 3.67MI MP 0.44-4.34 PH1	KE1		$ 68,576	$ 62,335
41599877	L-131_2 TEST 1.51MI MP 42.42-45.90 PH1	KE1		$ 51,047	$ 140,778
41600044	L-300A_2 T-030-12MP 468.19 TO MP 472.13	KE1	$ 683	$ 94,235	$ 2,107
41600045	T-12031 L-300A MP 488.7782 TO MP 490.59	KE1		$ 2,602	
41600061	T-12058 L-300A MP 268.1191 TO MP 269.718	KE1		$ 998	
41600063	L-021C TEST 8.48MI MP 43.328-44.8985 PH1	KE1		$ 167,453	$ 37,244
41600064	L-021E T-069-12 MP 137.36 TO MP 137.38	KE1		$ 16,943	
41600068	L-119A T-080-12 MP 13.12 TO MP 14.02	KE1		$ 857	
41600076	DFM-1816-01_2 TEST 3.45MI MP 12.78-16.32	KE1		$ 21,308	$ 86,594
41600078	L-148 T-098-12 MP 3.12 TO MP 7.54	KE1	$ 1,996	$ 21,170	
41605311	ATS WORK_2011 HYDROTESTS	KE1	$ (256)	$ 314,788	$ (3,344)
41613028	2012 STRENGTH TEST - GENERAL	KE1	$ 3,567	$ 1,692,314	$ 578,883
41613031	L-132 T-017-12 MP 40.04 TO MP 40.08	KE1	$ 4,693	$ 11,045	
41617904	DFM-0126-01 TEST 0.03MI MP 1.78-1.84 PH1	KE1	$ 505	$ 28,601	$ 818
41617905	DFM-0401-01 TEST 2.44MI MP 0.03-2.47 PH1	KE1		$ 41,715	$ 58,832
41617906	DFM-0402-01 T-006-12 MP 0.27 TO MP 2.35	KE1		$ 17,803	$ 3,453
41617907	DFM-0407-01 T-008-12 MP 0.00 TO MP 0.44	KE1		$ 24,916	$ 2,469

41617910	L-109 TEST 1.92MI MP 41.90-43.47 PH1	IIH		$ 295,335	$ 52,238
41617912	L-132_1 T-120-12 MP 38.390 TO MP 38.400	KE1		$ 67,952	$ 20,063
41617914	L-300A_1 T-121-12 MP502.23 TO MP502.240	KE1		$ 582	$ 3,229
41617918	L-300A_2 T-029-12 MP 463.91 TO MP 468.19	KE1		$ 97,413	$ 2,309
41617919	T-12032 L-303 MP 19.21 TO MP 20.43	KE1			$ 1,462
41617924	*CANC* L-057A-MD1 T-042-12 MP 0.00 TO MP	KE1		$ -	
41617934	L-021F T-070-12 MP 2.70 TO MP 5.26	KE1		$ 22,702	$ 1,605
41617936	DFM-0611-01 TEST 1.09MI MP 0.00-1.07 PH1	KE1		$ 15,255	$ 34,853
41617938	DFM-0611-05 TEST 0.06MI MP 0.00-0.12 PH1	KE1		$ 12,158	$ 18,983
41617943	L-177A T-087-12 MP 88.50 TO MP 88.83	KE1		$ 6,658	$ 2,423
41617947	DFM-1816-01_2 TEST 3.21MI MP 8.44-11.48	KE1		$ 45,170	$ 96,683
41622645	L-118A T-102B-12 MP 0.76 TO MP 0.83	KE1		$ 511,849	$ 5,871
41622648	L-118A T-102E-12 MP 42.5 TO MP 42.54	KE1		$ 9,748	
41622653	L-153_1 T-106-12 MP 3.51 TO MP 3.58	KE1		$ 367	$ 828
41622654	L-153_1 TEST 0.02MI MP 18.01-18.03 PH1	KE1		$ 1,083	$ 483
41622657	L-300A_1 T-111-12 MP 490.64 TO MP 490.66	KE1		$ 385	$ 16
41622658	L-300A_1 T-112-12 MP 182.34 TO MP 187.85	KE1		$ 532	$ 486
41622659	L-300B_1 TEST MP 152.46-152.73 PH1	KE1		$ 3,001	
41622680	L-300B_1 T-114-12 MP 156.05 TO MP 160.71	KE1		$ 84,990	$ 950
41622681	L-300B_1 T-115-12 MP 218.67 TO MP 219.49	KE1		$ 6,278	
41622683	L-300B_1 TEST MP 353.82-354.02 PH1	KE1		$ 858	
41622684	L-300B_1 T-118-12 MP 450.93 TO MP 451.72	KE1		$ 780	
41622685	L-300B_1 T-119-12 MP 484.73 TO MP 488.12	KE1		$ 652	
41634469	ATOMIC ABSORPTION UNITS-EXP-HYDRO T	KE1		$ 41,842	$ 739
41640538	L-109 T-124-12 MP 28.21 TO MP 28.539	IIH		$ 124,069	$ (11)
41640625	L-103 TIM-141-12 MP 19.36 TO MP 20.54	KE1		$ 19,087	
41640630	DFM-0638-02 TIM-147-12 MP 0.0 TO MP2.926	KE1		$ 14,209	$ 825
41640633	DFM-1607-01 TIM-157-12 MP 0.00TO MP0.405	IIH		$ 29,648	$ 1
41640638	DFM-1819-01 TEST 2.14MI MP 0.00-2.33 PH1	KE1		$ 106,636	$ 1,297
41641197	L-107 TIM-134B-12 MP 24.36 TO MP 24.42	KE1		$ 24,994	
41641281	L-142S-1 TIM-139-12 MP 0.00 TO MP 0.22	IIH		$ 3,752	
41641282	L-108 TIM-145-12 MP 38.17 TO MP 39.472	IIH		$ 7,938	
41641283	L-101 TIM-153-12 MP 40.82 TO MP 42.17	IIH		$ 8,168	$ 482
41656119	TIM-167-12 DFM-1614-02 MP 0.0 TO MP 2.64	IIH		$ 6,946	
41656205	TIM-170-12 DFM-7225-02 MP 0.0 TO MP 2.42	IIH		$ 275,233	$ 2,659
41666887	153 MP 25.54 DENT EVALUATION	IIH		$ 5,694	$ 2,057
41676466	PR-002 DFM2405-01 P-RESTORE MP.6-.62	JTC		$ 7,594	
41679586	*CANC*M-052-12 MP 0.00 TO MP 4.30	IIH		$ 187	
41679587	*CANC* L-142S TIM-053-12 MP 4.30 TO MP	IIH		$ 187	
41679588	*CANC* DFM-7224-01 TIM-133-12 MP 1.90	IIH		$ 233	
41679589	*CANC* L-107 TIM-134A-12 MP 23.204 TO	IIH		$ 47	
41679617	*CANC* RIM-190: DREG4921 MP 0.071 TO 0.0	IIH		$ 93	
41679618	RIM-192: GCUST5779 MP 0.00 TO 0.02 (T)	IIH		$ 140	
41682163	RIM-073R: DCUST2512 MP 0.0 TO 0.01 (REP)	IIH		$ 2,005	
41716958	*CANC* L-109 T-175-12 MP 16.927 TO MP 1	KE1		$ 93	
41719450	L-300B T-353-14 MP 197.97 TO MP 201.2225	KE1		$ 4,214	$ 689
41743278	L-150 TIM-262-13 MP 6.15-13.28	KE1		$ 6,717	$ 1,863
41743279	*CANC* L-150 TEST 6.63MI MP 15.17-18.09	KE1		$ 1,867	$ 1,704
41743421	DFM-0611-07 TIM-264-13 MP 0.12-0.22	IIH		$ 4,533	$ 1,954
41743423	DFM-1601-09 TEST 0.86MI MP 0.00-0.86 PH1	KE1		$ 4,675	$ 2,680
41743427	L-197A TIM-270-13 MP 39.77-39.99	IIH		$ 1,504	$ 8,135
41744019	L-021B T-219-13 MP 4.94-12.65	KE1		$ 32,461	$ 7,283
41744224	DFM-0405-01 TEST 2.08MI MP 0.00-2.15 PH1	KE1		$ 6,913	$ 107,236
41744769	L-123 TIM-201-13 MP 3.48-4.01	KE1		$ 4,509	$ 2,202
41744770	L-108 TIM-256-13 MP 42.33-42.72	KE1		$ 778	$ 1,455
41744773	L-123 TIM-259-13 MP 5.41-5.74	KE1		$ 620	$ 1,810
41744774	L-123 TIM-260-13 MP 9.52-9.74	KE1		$ 703	$ 1,542
41744775	L-131 TIM-261-13 MP 46.87-49.36	KE1		$ 1,752	$ 1,411
41745177	L-195A3-1 T-248-13 MP 0.00-0.476	KE1		$ 74,477	$ 14,095
41745179	GCUST7854 TIM-200-13 MP 0.00-0.22	IIH			$ 1,538
41747709	L-153 T-047C-11 SPILL MP 20.06	KE1		$ 102,823	$ (187,376)
41748966	L-137B TEST 7.38MI MP 0.00-7.37 PH1	KE1		$ 18,774	$ 86,766

41749034	DFM-1815-15 TEST 2.35MI MP 0.18-2.13 PH1	KE1		$ 5,771	$ 47,876
41749035	DFM-1816-02 TEST 0.13MI MP 0.00-0.12 PH1	KE1		$ 2,315	$ 19,003
41756014	DFM-0406-03 T-312-14 MP 0.08 TO MP 0.73	KE1		$ 2,861	$ 2,820
41756747	LK 3612200061-ELK RIVER RD #(AG), EUREK	JTC		$ 285	
41756748	LK 3612200071-ELK RIVER RD #(AG), EUREK	JTC		$ 285	
41756750	LK 0712704581-SANITARY FILL, FORT ORD	JTC		$ 328	
41756755	LK 0912540481-FRANKLIN RD, MERIDIAN	JTC		$ 713	
41756757	LK 0912540471-FRANKLIN RD, MERIDIAN	JTC		$ 713	
41757217	LK 4412034591-26888 ASTI RD, CLOVERDALE	JTC		$ 428	
41757219	LK 4412034561-N JEFFERSON ST, CLOVERD	JTC		$ 499	
41757284	LK 4412034571-27620 ASTI RD, CLOVERDALE	JTC		$ 1,568	
41757734	LK 9112305441-5412 FAITH HOME RD, CERES	JTC		$ 570	
41802282	DFM-0405-01 T-222-13 MP 14.97-17.71	KE1		$ 2,662	$ 16,453
41821633	DFM-3017-01 TEST 3.10MI MP 0.81-3.92 PH1	KE1		$ 1,677,478	$ 33,720
41821639	DFM-3017-01 TIM-131-12 IM FUND	IIH		$ 477,376	$ 22,697
41822275	DFM-1614-01 TIM-136-12 IM FUND	IIH		$ 183,531	$ 18,672
41822364	DFM-0115-01 TIM-146-12 IM FUND	IIH		$ 684,201	$ 97,324
41822367	L-138D MP45.10 TIM-155-12 PSEP FUND	KE1		$ 440,667	$ 39,109
41822375	DFM-7224-09 TIM-162-12 IM FUND	IIH		$ 951,422	$ 107,670
41822376	L-197B TEST 4.50MI MP 0.00-4.47 PH1	KE1		$ 1,299,038	$ 557
41822507	DFM-0813-01 TEST 1.00MI MP 0.02-1.29 PH1	KE1		$ 1,393,103	$ 33,010
41849199	HYDROTEST - TEST HEADS (EXPENSE)	KE1			$ 150,868
41912559	L-191-1 TIM-022-12 MP 20.46 TO 25.29 IM	IIH			$ 1,023,354
41917256	L105B M-9.92 RETEST BAYER TAP	JTC			$ 88,960
41640372	L-131 PR-003-12 MP 0.00-0.18 CT X6428	KF1		$ 1,663,434	$ (13,684)
41644891	DFM-2405-01 PR-002-12 MP 0.55-0.62	KF1		$ 334,532	$ 361
41717164	L-300B PR-004-12 MP 0.1294 TO MP 0.1549	KF1		$ 55,718	$ 340
41719452	L-148 PR-005-12 MP 0.93-1.43	KF1		$ 1,615,535	$ 3,022
41758523	L-300B T-183-12 MP 151.5762 TO MP 152.66	KF1		$ 1,762	
41758570	L-300B T-183-12 MP 151.5762 TO MP 152.66	KF1		$ 1,866,282	$ 684,055
8103940	GIS SYST. DATA ASSESSMENT/RECORDS R	KF4	$ 3,238		
8107136	MAOP PROJECT PHASE II # MAOP VALIDATI	KF4	$ 808,007		
8107137	MAOP PROJECT PHASE II - PMO	KF4	$ 1,157,484	$ 76	
8107141	MAOP PROJECT PHASE II - RECORDS VERI	KF4	$ 3,444,802		
8119963	2012 RIM Eng. Research/Program Develop.	HPM		$ 89,728	
8120016	MAOP Pre-1970 Compass	KF4		$ 72,491	
8120017	MAOP Post 1970 Compass	KF4		$ 32,627	
8122186	MORGAN HILL FACILITY - CONST MANAGEM	KEX		$ 106,068	$ 2,366
8125197	MAOP 2013 PFL PREP	KF4			$ 916,864
8125198	MAOP PRE-1970 PFL BUILD 2013	KF4			$ 7,833,338
8125199	MAOP PRE 1970 ENGINEERING	KF4			$ 2,132,033
8125200	MAOP PRE-1970 GAS OPS INTEG	KF4			$ 1,182,326
8125201	MAOP PRE 1961 VALID EXCA/NDE	KF4			$ 52,179
8125202	MAOP 1961-70 VALID EXCA/NDE	KF4			$ 15,411
8125205	MAOP PRE 1970 PMO	KF4			$ 1,186,117
8125206	MAOP PRE 1970 ISTS APPS	KF4			$ 421,621
8125207	MAOP PRE 1970 PROJECT OVERHEAD	KF4			$ 14,050
8137675	MAOP IMAGERY & CHANGE DETECTION PR	KF4			$ 0
8139936	MAOP PFL MAINTENANCE & CORRECTIONS	KF4			$ 775,495
8140113	MAOP GIS PRODUCTION	KF4			$ 608,005
8140114	MAOP GOI - SPECIAL PROJECTS	KF4			$ 518,768
8140115	MAOP GOI - SAP DEVELOPMENT	KF4			$ 1,164,740
8140137	MAOP LINE PIPE TESTING & JEF ANALYSIS	KF4			$ 197,378
8140156	MAOP GOI - ASSET MANAGEMENT	KF4			$ 28,015
8141885	MAOP QUANTITATIVE ANALYSIS	KF4			$ 2,495,864
8142712	MAOP PFL DESIGN	KF4			$ 50,195
40137949	SPM-3CCBM DFM MAINT CORRECT REG	BXM		$ 285	
41457902	PHASE 1 DATA & MAOP VALIDATION-DV-PR	KF4	$ 14,638,927	$ 27	$ 154
41457903	PHASE 1 DATA & MAOP VALIDATION - DV - N	KF4	$ 2,054,089		
41457904	PHASE 1 DATA & MAOP VALIDATION - ISTS I	KF4	$ 229,463		
41457905	PHASE 1 DATA & MAOP VALIDATION - ISTS A	KF4	$ 1,765,395		
41457906	PHASE 1 DATA & MAOP VALIDATION - DV O T	KF4	$ 144,652		

41463067	MAOP PROJECT PHASE II PFL BUILD	KF4	$ 38,082,116	$ 1,583,083	$ 118,031
41463068	MAOP PROJECT PHASE II – PMO	KF4	$ 8,412,409	$ (38,194)	$ 114
41463069	MAOP PROJECT PHASE II – ISTS INFRASTRU	KF4	$ 1,008,103	$ 6,695	$ 320
41463070	MAOP PROJECT PHASE II – ISTS APPLICATI	KF4	$ 5,265,553	$ 304,547	$ 1,410
41463071	MAOP PROJECT PHASE II – PROJECT OVER	KF4	$ 2,375,781	$ 182,802	$ 46,953
41464520	MAOP PROJECT PHASE II – RECORDS VERI	KF4	$ 25,212,123	$ 142,105	$ 92
41466462	RECORDS PROJECT UPDATE	KF4	$ 3,711,641		
41489483	MAOP VALIDATION EXCAVATIONS / NDE	KF4	$ 4,647,686	$ 4,571,094	$ 15,526
41502220	CPUC REVIEW OF MAOP WORK	KF4	$ 50,146		
41613038	MAOP PRE 1970 PFL PREP	KF4		$ 13,764,526	
41613039	MAOP PRE 1970 PFL BUILD	KF4		$ 40,690,240	
41613060	MAOP PRE 1970 VALIDATION EXCAVATIONS	KF4		$ 623,863	$ 35,868
41613061	MAOP PRE 1970 PMO	KF4		$ 5,473,519	
41613062	MAOP PRE 1970 ISTS INFRASTRUCTURE	KF4		$ 338,979	$ 3,583
41613063	MAOP PRE 1970 ISTS APPLICATIONS	KF4		$ 3,711,330	
41613065	MAOP PRE 1970 PROJECT OVERHEAD	KF4		$ 880,256	
41613067	MAOP POST 1970 PFL PREP	KF4		$ 6,184,062	$ 410,486
41613070	MAOP POST 1970 PFL BUILD	KF4		$ 18,281,122	$ 3,380,494
41613073	MAOP POST 1970 VALIDATION/EXCAVATION	KF4		$ 1,071,077	$ 340,100
41613074	MAOP POST 1970 PMO	KF4		$ 2,459,117	$ 520,401
41613075	MAOP POST 1970 ISTS INFRASTRUCTURE	KF4		$ 152,295	$ 1,610
41613076	MAOP POST 1970 ISTS APPLICATIONS	KF4		$ 1,667,409	$ 189,424
41613077	MAOP POST 1970 PROJECT OVERHEAD	KF4		$ 395,477	$ 6,312
41626607	MAOP PRE 1970 ENGINEERING	KF4		$ 6,459,610	
41626608	MAOP POST 1970 ENGINEERING	KF4		$ 2,902,143	$ 932,447
41626609	MAOP PRE 1970 GAS OPS INTEGRATION	KF4		$ 2,360,564	$ 317,643
41626610	MAOP POST 1970 GAS OPS INTEGRATION	KF4		$ 1,060,543	$ 673,899
41629963	ANNUAL MATERIALS PROCUREMENT	KEX		$ (0)	
41641187	*CANC* L-142S TIM-052-12 MP 0.00 TO MP 4	HPF		$ 84	
41641189	*CANC* L-142S TIM-053-12 MP 4.30 TO MP 8	HPF		$ 84	
41641280	*CANC* DFM-1501-02 TIM-138-12 MP 0.97 TO	HPF		$ 3,617	
41645779	PUBLIC SAFETY BOARDS-COMMUNITY REL	KEX		$ 196,720	$ 39,594
41651987	MAOP PRE 1961 VALIDATION EXCAVATIONS	KF4		$ 3,815,248	$ 2,279,361
41651989	MAOP 1961-1970 EXCAVATIONS / NDE	KF4		$ 1,170,174	$ 200,185
41664672	BD 272 & DF 33 MP 8.54 TO 8.54	HPM		$ 1,027	
41679156	*CANC* RIM-004: 0611-08 MP 0.00 TO 0.06	HPM		$ 74	
41679157	*CANC* RIM-013: 1503-01 MP 0.00 TO 0.04	HPM		$ 74	
41679613	RIM-128: GCUST5917 MP 0.004 TO 0.068 (T)	HPM		$ 122,742	$ 1,764
41682261	*CANC* DREG4921 MP 0.071 TO 0.084 (REPL	HPM		$ 5,949	$ 78
41689270	DFM 7224-01 MP 2.44 REMOVE 8" LINE	HPM		$ 713	$ 5,310
41691992	RIM 073-R DCUST2512 MP 0.0 TO 0.01 (REP)	HPM		$ 1,160	
41691993	*CANC* RIM-111R DRIP7975 MP 0.0 - 0.01	HPM		$ 33,386	$ (33,386)
41716449	*CANC* DFDS3614 MP 0.00 TO 0.01 (REPLA	HPM		$ 1,992	
41720867	BD8547 MP16.66 & X6338/X6342 MP16.09 (T)	HPM		$ 7,445	
41736918	*CANC*RIM-177T: 1310-01 MP 1.27 TO 1.29	HPM		$ (2,829)	
41755233	*CANC* REL-057B MP4.576 DIG-IN BACON IS	HPM		$ 1,982	$ 2,569
41759303	L-057A KINK IN PIPE AT INDIAN SLOUGH	HPM		$ 258,761	$ 65,417
41986939	L303 MP-42.44 MAOP VALIDATION DIG	KF4			$ 1,857
41987158	STUB6041 MP0.00 (VERIFICATION DIG)	KF4			$ 102,246
97001461	SP4Z T-279-13 MP 8.43 to 8.93	34A		$ 99,361	$ 1,366,965
Grand Total			$ 341,190,919	$ 298,424,483	$ 153,706,175

EXHIBIT JAL-26

SoCalGas PSEP Workpapers

Summary of VEP Major Valve Work Locations

The following pages provide two lists of valves and associated costs which have been developed for SDG&E and SoCalGas for the valve enhancement plan implementation. The first list contains the transmission valves modifications for both SoCalGas and SDG&E which have been identified. The second list contains SDG&E distribution valves which will be modified as discussed in Testimony Chapter V. These valves lists are subject to continued refinement as the utilities perform additional assessments and engineering review in advance of Plan implementation.

PSEP MAJOR TRANSMISSION VALVE UPGRADES

Line	Mile	Valve #	Valve Size	Installation Type	Modification Cost ($000)

Shaded Italicized valves = SDGE

INSTALLATION TYPE KEY

C/P = Control and Power only (ASV to RCV Conversions)

A/AG= New Actuator Above Ground

A/VT = New Actuator in Vault

NV/AG = New Valve and Actuator Above Ground

NV/VT = New Valve and Actuator in Vault

NV/NP = New Valve and Actuator in Replaced Pipe

BLANK = Existing RCV

Table x1

Valve Unit Cost Estimate All units are in thousand dollars						
Pipe Diameter	**Config 1**: Install a new buried valve and above ground actuator with power, controls and telemetry on existingpipeline	**Config 2**: Install a new vaulted valve and actuator with power, controls and telemetry on existingpipeline in the street	Install power, control and telemetry	**Config. 3**: Install an existing valve with an actuator, power, control and telemetry	**Config. 4**: Install a new vaulted valve with an actuator, power, control and telemetry	Install a new vaulted valve and actuator with power, control and telemetry on new pipeline in the street (subtract $120k from Config. 2 for work being planned and valve installedas part of new pipeline)
	Avg (SCG and 3PC) estimate	Avg (SCG and 3PC) Estimate	SCG Estimate	Avg (SCG and 3PC) Estimate	3PC Estimate	Avg (SCG and 3PC) Estimate
12"	762.1	810.8	217.0	281.5	543.8	690.8
14"	762.1	810.8	217.0	281.5	543.8	690.8
16"	836.7	922.8	217.0	292.2	647.3	802.8
18"	836.7	922.8	217.0	292.2	647.3	802.8
20"	**936.8**	**1,007.8**	**217.0**	**300.9**	**710.3**	887.8
22"	936.8	1,007.8	217.0	300.9	710.3	887.8
24"	1,017.3	1,119.2	217.0	311.3	806.7	999.2
26"	1,096.7	1,177.0	217.0	317.4	842.7	1,057.0
30"	1,171.6	1,288.1	217.0	342.9	957.4	1,168.1
34"	1,171.6	1,288.1	217.0	342.9	957.4	1,168.1
36"	1,300.5	1,453.8	217.0	360.7	1,075.6	1,333.8

Note: SCG is SoCalGas and 3PC is a third-party consulting engineering and construction company.

Table x5

Config. 4: Example for a 20-inch diameter pipeline to install a new vaulted valve and actuator with power, controls and telemetry on existing pipeline in the street.

All units are in thousand dollars	**3rd-Party**
Actuator & Valve (1)	123.6
Pipe (Materials)(2)	74.9
Pipe (Contractor Labor) (3)	157.8
Subtract Spec Services actuator cost	-13.1
Subtract Spec Services contract labor	-130.4
Add upfit an existing valve with actuator, power, control and telemetry (Config. 3)	300.9
Pipe (Company Labor) (4)	144.0
Subtotal	657.7
+ 8% Contingency	52.6
Total Cost	$710.3

Notes:

(1) Unit cost to purchase actuator and valve plus tax and delivery.

(2) New materials is used for each valve construction type, including FBE coated pipe and bends. Vault pricing also includes vault and delivery.

(3) Construction labor rates includes activities associated with pipe installation, including but not limited to, trench excavation (or pit excavation), pipe stringing/welding, pipe lowering/fitting, purging, tie-in, backfill/compaction, surface restoration (paving), radiographic inspection, mobilization/demobilization pipeline removal, and pipeline cleaning. Vault pricing also includes setting of vault and slurry backfill.

(4) SoCalGas' cost estimate to design and permit the placement and installation at each location, plus supervision, inspection, and project management.

EXHIBIT JAL-27

GTS-RateCase2015_DR_IP_002-Q87

PACIFIC GAS AND ELECTRIC COMPANY
GTS RATE CASE 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedProducers_002-087		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedProducers_002-Q087		
Request Date:	March 14, 2014	Requester DR No.:	002
Date Sent:	March 27, 2014	Requesting Party:	Indicated Producers
PG&E Witness:	William Edward Mojica	Requester:	Evelyn Kahl/ John McIntyre/ Kenneth Sosnick

SUBJECT: CHAPTER 4B – TRANSMISSION PIPE ENGINEERING PROGRAMS

QUESTION 87

Table 4B-12 on Page 4B-36 shows capital expenditures for the Work Required by Others program to go from $5,850 in 2014 to $24,610, $26,328, and $28,150 in 2015, 2016, and 2017 respectively.

a. Please provide in electronic format all documents, models, methodologies, or any other related source that will verify the increase in capital expenditures from year to year for 2014 to 2017.

b. Please provide in electronic format all documents, models, methodologies, or any other related source, including all expenses and capital expenditures, that demonstrates the work to be done for each and every individual project within the Work Required by Others program.

ANSWER 87

a. As discussed in the Chapter 4B testimony on page 4B-35, Work Required by Others (WRO) follows a cyclical pattern. When the economy is strong and there is an abundance of federal, state and private investor funds available, the number of these WRO projects increase and when economic times falter the number of projects decrease. As discussed in Chapter 14 on pages 14-4 to 14-5, according to Moody's Analytics[1], PG&E's service area is in economic recovery and Moody's projects economic growth in the service area to be above average compared with the rest of the United States. The projection is for the recovery to continue expanding during the rate case period due to a rebound in housing prices, new construction activity, and continued growth in the tech sector and personal incomes across the service area. In line with a growing economy, an increase in the number

1 Moody's Analytics is an internationally recognized economic and demographic forecasting firm.

of high-speed and light rail projects is forecasted for 2015-2017, and a significant number of highway and freeway projects remain in the forecast. Where possible, PG&E makes its best effort to coordinate with external agencies to discuss future WRO projects to accommodate work schedules and outline preliminary plans, but often these efforts extend only one to two years into the future. As a result, there is a high likelihood that PG&E will be involved in a greater number of WRO projects during the 2015 rate case period than is currently outlined in the workpapers supporting Chapter 4B on page WP 4B-38.

As discussed in the workpapers supporting the Chapter 4B testimony on page WP 4B-36 through WP 4B-40, the costs incurred by PG&E for performing this work, with the exception of relocating facilities installed in public streets pursuant to its city and county franchises, are reimbursed as detailed in the various master agreements, or in accordance with PG&E's easement rights. Based on average historical data, PG&E is reimbursed approximately 65 percent of such project costs, leaving PG&E responsible for the remaining 35 percent, derived from historical PG&E net costs. It is from these net costs that PG&E has developed its 2015-2017 WRO capital forecast.

Additional details associated with the historical projects utilized in developing the 35 percent PG&E contribution and the average footage per such mitigation project are available in workpapers, pages WP 4B-38 through WP 4B-40.

b. The individual planning orders, planning order descriptions, and costs associated with WRO forecasts during the rate case period are detailed in the Chapter 4B workpapers:

- Detail of Expenses – beginning on page WP 4B-2, lines 51 through 56,
- Expense Cost Summary – page WP 4B-9,
- Detail of Capital Expenditures – beginning on page WP 4B-17, lines 121 through 206, and
- Capital Cost Summary – beginning on page WP 4B-36.

EXHIBIT JAL-28

GTS-RateCase2015_DR_TURN_006-Q002

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	TURN_006-02		
PG&E File Name:	GTS-RateCase2015_DR_TURN_006-Q02		
Request Date:	February 18, 2014	Requester DR No.:	006
Date Sent:	March 3, 2014	Requesting Party:	The Utility Reform Network
PG&E Witness:	Bennie Barnes	Requester:	Tom Long

QUESTION 2

Regarding Direct Examination and Repair digs presented in Testimony on p. 4A-14, and in WP 4A-70, Please

a. Explain PG&E's criteria for considering a dig to be "Primarily Urban", "Mixture of Rural and Urban" and "Primarily Rural".

b. Please provide the historic data on p. 4A-77, separately for Urban or "primarily urban" digs and for Rural or "Primarily Rural" digs.

c. Please provide the characteristics of each of the forecast DE&R projects shown on pages WP 4A-73 through 4A-75, that qualify them as either "Primarily Urban" or "Primarily Rural".

ANSWER 2

PG&E would like to explain how to use the information in the context of the Direct Examination and Repair (DE&R) Digs program. When PG&E plans for direct examination and repair digs, it does not yet know where it may have to dig within the segment of pipe that is being inspected by In-Line Inspection (ILI) tools. Therefore, a method was developed to estimate the cost of Direct Examination and Repair Digs before having data from ILI to scope specific projects. The use of the terms "Primarily Urban", "Mixture of Rural and Urban" and "Primarily Rural" were used to apply historical costs for the average digs per mile for similar lengths of ILI inspections to future ILI runs, considering that some lines have circumstances that make the average cost per dig go up or down because of the level of complexity associated with an ILI segment. For example, for ILI segments that are "Primarily Rural", the average cost per dig is decreased by 10%. For lines that are "Primarily Urban", the average cost per dig is increased by 25%. These are described in more detail in the Assumptions shown in the Chapter 4A workpapers on page WP 4A-72.

a. For determining whether an ILI segment is considered to be "Primarily Urban", "Mixture of Rural and Urban" or "Primarily Rural", PG&E considered the degree of population density, types of land use, accessibility restrictions, and additional permitting requirements, all of which have historically influenced the cost of a Direct

Examination and Repair dig as explained above. In general, “Primarily Urban” projects represent excavations in areas with a relatively high degree of difficulty to perform. “Primarily Rural” projects represent excavations in areas with a relatively lower degree of difficulty for performing the work. “Mixture of Urban and Rural” projects represent a combination of the first two classifications, resulting in a moderate degree of difficulty for performing excavations. The primary factor used in making this determination was population density in the form of percentage of the inspection segment that has inspection mileage in a High Consequence Area (HCA). Sites located in congested urban areas typically impose restrictions and requirements that extend the direct examination and repair process. These restrictions and requirements potentially include: restricted work hours, traffic control, pavement restoration and local moratoriums, minimizing impact to local communities and businesses, existing infrastructure and utilities, and an increased likelihood of contaminated soil mitigation, all of which place upward pressure on costs.

In addition to percentage of HCA, PG&E added considerations that increased or decreased further the historical cost influence. These additional considerations included current land use (e.g. agriculture, commercial, residential, etc.), segment accessibility, and additional permitting requirements, all of which have the potential to also place upward pressure on costs. For example, segments with heightened community sensitivity, such as in the Peninsula region, typically require additional permitting, are more difficult to access, and require longer lead times before construction can commence, also increasing project costs. Segments located near bodies of water or in areas with environmental sensitivities require additional permitting and project coordination, resulting in additional project costs.

PG&E evaluated each direct examination and repair project based on these considerations and assigned the appropriate category to the project. These three categories are directly tied to the unit cost ILI DE&R project estimates.

b. Historic data from workpapers on page WP 4A-77 is attached in GTS-RateCase2015_DR_TURN_006-Q02Atch01 Sheet 2b, showing alignment with each of the cost driver categories of “Primarily Urban”, “Mixture of Rural and Urban” and “Primarily Rural”.

c. Each of the forecast DE&R projects shown on pages WP 4A-73 through 4A-75 are shown in the attached spreadsheet GTS-RateCase2015_DR_TURN_006-Q02Atch01 Sheet 2c with their associated categories of “Primarily Urban”, “Mixture of Rural and Urban” and “Primarily Rural” and the characteristics that support those classifications.

EXHIBIT JAL-29

GTS-RateCase2015_DR_IS_011-Q03(a)

PACIFIC GAS AND ELECTRIC COMPANY
Gas Transmission and Storage Rate Case 2015
Application 13-12-012
Data Response

PG&E Data Request No.:	IndicatedShippers_011-03		
PG&E File Name:	GTS-RateCase2015_DR_IndicatedShippers_011-Q03		
Request Date:	July 24, 2014	Requester DR No.:	011
Date Sent:	August 5, 2014	Requesting Party:	Indicated Shippers
PG&E Witness:	Bennie Barnes	Requester:	Evelyn Kahl/ John McIntyre/ Dr. Jonathan Lesser

QUESTION 3

In Workpapers WP 4A-73 to WP 4A-75 there are charts with information about "Traditional ILI Direct Examination & Repair." Within these charts is a row labeled "First Time or ILI Re-Inspection." Within that row are several cells with the word "First" or the word "Second."

(a) For cells with the word "First," does this signify that the identified line has never had ILI inspection and that the first ILI inspection will occur at some point within the rate case period? If no, please explain in detail the meaning of "First."

(i) If PG&E knows of the dates when these "First" ILI inspections will occur, please provide the dates.

(b) For cells with the word "Second," does this signify that the identified line has had ILI inspection at some time in the past and that this "second" inspection will occur at some point in the rate case period? If no, please explain in detail the meaning of "Second."

(i) Please provide the dates for when the first ILI inspection occurred on the identified lines and the results of the ILI inspections.

(ii) If PG&E knows of the dates when these "Second" ILI inspections will occur, please provide the dates.

(c) What does the word "Re-Inspection" signify for L-101(N) on WP 4A-74? Please explain in detail.

(i) Please provide the dates for when the first ILI inspection occurred on the identified line and the results of the ILI inspections.

(ii) If PG&E knows of the date when this "Re-Inspection" ILI inspections will occur, please provide the date.

ANSWER 3

(a) Yes, cells with the word "First" on pages WP 4A-73 to WP 4A-75 indicate that the identified line has never been inspected via In-Line Inspection (ILI) methods in the past. For these projects, the first ILI inspection is scheduled to be performed in 2014 or later.

 (i) Please see GTS-RateCase2015_DR_IndicatedShippers_011-Q03Atch01 for a table showing when the first ILI inspection is to be performed on these lines.

(b) Yes, cells with the word "Second" on pages WP 4A-73 to WP 4A-75 indicate that the identified line has been inspected via ILI in the past, and that the next inspection will occur within the 2015 Gas Transmission and Storage (GT&S) Rate Case period.

 (i) Please see GTS-RateCase2015_DR_IndicatedShippers_011-Q03Atch01 for a table showing when the first ILI inspection was performed on these lines.

 (ii) Please see GTS-RateCase2015_DR_IndicatedShippers_011-Q03Atch01 for a table that shows when the second ILI inspection will be performed for these lines. Note that those ILI inspections scheduled to be performed in 2014 or during the 2015 GT&S Rate Case period (2015 to 2017) are in a preliminary planning phase, and PG&E has not yet determined the specific dates of inspection for these(therefore only the year is shown.

(c) L-101N is to be re-inspected following the completion of additional retrofits and installation of a permanent launcher-receiver at this location. Re-inspection is to be performed during the 2015 GT&S Rate Case period, and will cover the segment identified on WP 4A-74.

The baseline ILI assessment of this line segment is scheduled to be performed in October 2014. The purpose of re-assessment is to inspect the last three quarter mile of pipe just south of Lomita Park Station. This project is currently in a preliminary phase of planning, so PG&E has not yet determined a specific date for re-inspection.