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Introduction to Workpapers Supporting the Prepared Direct Testimony of Bill Kostelnik

I. INTRODUCTION

In D.14-06-007, the California Public Utility Commission (CPUC) approved SoCalGas and SDG&E's plan to execute hundreds of unique and discrete in-service pressure test, replacement, abandonment, and valve enhancement projects as soon as practicable as part of the Pipeline Safety Enhancement Plan (PSEP)[1]. This Decision also adopted a process for reviewing and approving PSEP implementation costs after-the-fact and established balancing accounts to record PSEP expenditures[2]. To recover PSEP costs, SoCalGas was ordered to "file an application with testimony and work papers to demonstrate the reasonableness of the costs incurred which would justify rate recovery."[3] In D.16-08-003, the CPUC modified this decision and directed SoCalGas to submit two standalone reasonableness review applications for PSEP[4] and, among other things, stated that future GRC applications should include additional PSEP costs until implementation of the plan is complete[5].

The workpapers that follow describe SoCalGas' approach to completed pipeline and valve enhancement projects which are managed according to the following objectives:

1) Enhance public safety.
2) Comply with the directives of the Commission as set forth in Decision (D.)11-06-017.
3) Minimize customer and community impacts; and
4) Maximize the cost effectiveness of safety enhancement investments for the benefit of our customers.

As described in testimony, SoCalGas PSEP Projects are managed according to the Stage Gate Review Process[6] which sequences and schedules PSEP project workflow deliverables. Key design, management and execution actions and activities occur within and across the various stages. Depending on the timing of the project, the Stage Gate Review Process for PSEP projects included in this Application

[1] D.14-06-007 at 2-3
[2] *Id.*, Ordering Paragraph 2 at 59. The balancing accounts that were subsequently created for capital and O&M are known as the Safety Enhancement Capital Cost Balancing Account (SECCBA) and Safety Enhancement Expense Balancing Account (SEEBA), respectively.
[3] *Id.* at 39.
[4] SoCalGas has previously submitted A.16-09-005 (approved in D.19-02-004), and A.18-11-010 (approved in D.20-08-034).
[5] D.16-08-003, OP 5 at 16.
[6] Refer to SoCalGas Direct Testimony of Bill Kostelnik Pipeline Safety Enhancement Plan, Section III.B.2

consisted of either five or seven stages[7] with specific objectives for each stage, and an evaluation gate at the end of each stage to verify that those objectives have been met prior to proceeding to the next stage.

These workpapers are presented in the five sections that follow:

- Section II comprises SoCalGas's **Reasonableness Review Pipeline Project Workpaper Structure.** This section provides a description of the workpaper format followed by the workpapers for the 21 PSEP Pipeline Projects subject to reasonableness review.
- Section III comprises SoCalGas's **Reasonableness Review Valve Enhancement Project Workpaper Structure.** This section provides a description of the workpaper format followed by the workpapers for the 66 PSEP Valve Project bundles subject to reasonableness review.
- Appendix A contains a **Summary of Standard Planning and Construction Practices for Replacement, Hydrotest, Valve and Abandonment Projects**. This provides a synopsis of typical pre-construction and construction activities that occurred during SoCalGas's PSEP pipeline and valve enhancement projects.
- Appendix B contains the **PSEP Glossary of Terms and Acronyms** that will assist in defining specific construction and financial terminology used throughout the workpapers.

[7] SoCalGas recently modified the Stage Gate process from Seven to Five Stages. The activities and documentation requirements remain largely the same but have been consolidated into fewer stages.

II. SOCALGAS REASONSONABLENESS REVIEW PIPELINE PROJECT WORKPAPER STRUCTURE

The project workpapers that follow provide detailed components of the workpapers for the 21 PSEP Pipeline pressure test, replacement and abandonment projects subject to reasonableness review. The workpapers that follow support SoCalGas' first reasonableness review of its PSEP pipeline projects being submitted in a GRC. These projects were primarily placed in operation (NOP-ed) prior to February 11, 2020 and the costs have been reconciled as of December 31, 2020. Trailing costs or adjustments posted after December 31, 2020 are not reflected in the totals shown in Table 2 below nor in the workpapers.

Table 2 – Pipeline Hydrotest, Replacement and Abandonment Projects for the 2024 Reasonableness Review

Pipeline Workpaper Title	Project Scope (miles, rounded)				Workpaper Page
	Hydrotest	Replace	Abandon	Derate	
30-18 Section 2 Replacement Project		0.619			WP-23
33-120 Section 1 Replacement Project		0.24			WP-45
36-1032 Section 4 Replacement Project		0.307			WP-65
36-9-09 North Section 5B-02 and 5C Replacement		0.894			WP-82
36-9-09 North Section 6B Replacement Project		1.732			WP-104
36-9-21 Replacement Project		0.464			WP-125
37-18-K Replacement Project		1.928			WP-144
38-101 Replacement Project		4.525			WP-163
41-6001-2 Replacement Project		0.005			WP-183
43-121 North Sections 2, 3, and 4 Replacement Project		1.054			WP-201
45-120 Section 2 Replacement Project		3.588			WP-231
404 Section 4A Replacement Project		0.831			WP-269
404-406 Somis Station Replacement Project		0.136			WP-292
2006 Replacement Project		0.094			WP-315
Storage - Goleta Project	0.286				WP-332
33-121 Hydrotest Project	0.478				WP-350
2000-D Hydrotest Project	3.184				WP-366
2001 West-C Desert Hydrotest Project	16.803				WP-388
2001 West-D Whitewater Hydrotest	4.36				WP-410
41-6000-2 Abandonment Project	0.189	0.239	24.033	3.652	WP-432
103 Derate and Replacement Project		0.001		9.303	WP-456

Each workpaper is divided into five sections: A) Project Introduction; B) Engineering, Design and Planning; C) Construction; D) Project Costs; and V) Conclusion.

A general explanation is provided for each section's objective is as follows:

A. PROJECT INTRODUCTION

1. Background and Summary

This section includes a high-level summary of the project scope which is also summarized in *Table 1: General Project Information*, providing overall project details such as mileage, pipe diameter (confidential), construction start/stop, project costs, etc. The pipe vintage listed reflects the vintage of the Category 4 Criteria mileage[8].

In addition, maps and satellite images are included to provide a perspective of the project in relation to the community it impacts and demonstrate the reasonable inclusion of accelerated and incidental pipe when remediating the Category 4 Criteria pipe segments and, when applicable, the rerouted pipeline alignment. Schematic drawings are sometimes included to illustrate and magnify pipeline interconnections and features that are not discernable from the map images.

B. ENGINEERING, DESIGN, AND PLANNING

1. Project Scope:

This section consists of *Table 2: Mileage Information* depicted by mileage type: Criteria, Accelerated, Incidental, New, and Total (both miles and feet). In some instances, an alignment offset, or rerouted pipeline results in "New" mileage that is greater than or less than the original route. The terms are defined as follows:

- Criteria Mileage is Phase 1A mileage. These are pipeline segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP and are located in Class 3 & 4 locations and Class 1 & 2 High Consequence Areas (HCA).
- Accelerated Mileage is pipeline that would otherwise be addressed in a later phase of PSEP under the approved prioritization process but has been advanced to Phase 1A or Phase 1B to realize operating and cost efficiencies. Accelerated miles may be Phase 1B or Phase 2 mileage.

[8] Category 4: Pipelines segments that lack sufficient documentation of a post-construction strength test to at least 1.25 times the MAOP.

- Incidental Mileage is pipeline that does not fall within the scope of the Commission's directives in D.11-06-017 or California Public Utilities Code section 958, but is addressed as part of a PSEP project, where its inclusion is determined to improve cost and program efficiency, address constructability, or facilitate continuity of testing.
- New Mileage is an alignment offset or rerouted pipeline segment that resulted in mileage that is greater than the original route.

A high-level summary of the progression of the project chronicles the project evolution is typically organized as follows:

- 2011 PSEP Filing indicates the type of project (replacement or hydrotest) and the Phase 1A mileage type as submitted in A.11-11-002.
- Scope Validation summarizes the outcome of scope validation that included evaluation of existing pipeline documentation to confirm the project scope. Criteria mileage originally included for remediation may be increased or decreased due to the scope validation efforts. Criteria mileage may have been removed if a reduction in Maximum Allowable Operating Pressure (MAOP) is determined to be appropriate from a gas operating system perspective.
- Engineering, Design and Constructability summarizes the constructability factors that influenced the project design, mileage, route and construction methods.
- Final Project Scope summarizes the final project scope including mileage, construction method and other project activity, such as engineered crossings or new mainline valves (MLV) that contributed to the project complexity and/or cost.

2. Decision Tree Analysis

This section describes the Decision Tree Analysis that confirmed or modified the 2011 PSEP filing project's designation as either a pressure test or replacement project. In some instances, and after careful analysis, a third option (abandonment) is recommended, which determined that the pipeline is no longer needed for reliability from a gas operating system perspective. Typically, for pipeline projects greater than 1,000 feet in length, a Test-versus-Replace Analysis was conducted to compare costs of at least two scenarios (test or replace), and in some cases route alternatives were also considered. Project execution options are then presented to PSEP leadership at a stage gate review and approval is given to move forward with more detailed engineering and design

efforts for the recommended project type. The workpapers summarize the relevant data points that were known at that time which influenced leadership's approval of the Decision Tree outcome. These data points are listed in the workpapers. Included are only the data points that influenced the Decision Tree outcome.

1. Shut In Analysis – describes the conditions, if any, when this pipeline can be shut in and if alternate service is available.
2. Customer Impacts – describes the impact, if any, to customers should a shut in be necessary.
3. Community Impacts – describes the construction activity impact on the neighboring community, typically traffic and noise impacts. The project alignment and route were influenced by the desire to minimize the impact on the community.
4. Permitting Conditions – lists the known jurisdictional agencies in the construction area.
5. Piggability – states if the existing pipeline was/is piggable.
6. Pipe Vintage – reflects the predominate vintage of the preexisting Category 4 Criteria mileage pipeline segments.
7. Existing Pipe Attributes – lists the known pipeline features that could prevent the pipeline from being pigged or features that would need to be addressed prior to a hydrotest.
8. Longseam Type – states the longseam type, if known.
9. Longseam Repair History – provides a summary of recorded history of repair to the pipeline section.
10. Condition of Coating – provides a description of the coating, if known.
11. History of Leaks - provides a summary of recorded history of leaks on the pipeline section.
12. Constructability – describes the known factors that influenced the preliminary project design such as geographic constraints, existing substructures, adjacent highways, railroads, waterways, etc.
13. Other – describes other factors that influenced the Decision Tree outcome.

3. Engineering, Design, and Planning Factors

This section summarizes the notable engineering, design and planning activities. Planning is initiated by the analysis of pipeline attribute records, survey and mapping activities and site visits. During the initial planning and design process, information is updated, and new information is

acquired regarding the permit conditions, existence of substructures, land rights, environmental issues, etc. that may differ from the original assumptions. These data points serve to influence the routing and design of the project, and the project schedule.

Once the detailed design is finished and construction documents are completed, necessary permits and authorizations are attained, pipeline materials are purchased, received, inspected, and prepared for turnover to the construction contractors. Material procurement is identified in two main phases, long-lead items and short-lead items. Long-lead material is identified and purchased at the 30% design stage while short-lead material is identified and purchased at the 60% design stage. When possible, SoCalGas acquires materials by aggregating anticipated material needs (bulk purchasing) from many projects thereby making periodic purchases for larger quantities of material at a lower unit cost.

The information that influenced the preliminary pre-construction design described in this section of the workpaper and will include a summary of the conditions that influenced the preliminary pre-construction design and was the basis for the preliminary cost estimate. Only the relevant factors that impacted the project design are listed in the workpaper.

4. Scope Changes

This section describes any major scope or redesign changes made after the preliminary design and estimate was authorized. Changes are initiated to accommodate constructability or scheduling challenges[9] and can occur at any stage of the project lifecycle. Scope changes are authorized and documented using a scope change form. The revised project scope and design, given all the unique conditions and constraints of each project, considers cost effectiveness, system operation efficiencies, mitigation of customer and community impacts, and system capacity. The incremental costs associated with scope changes are *not* reflected in the estimated costs in Tables 4 and 5.

[9] Examples of the challenges frequently encountered are permit or land use restrictions, environmental constraints, customer impacts, traffic and other community impacts, system constraints, or pipe conditions identified once the pipe is exposed through potholing efforts.

It is important to note that in some instances, when there are obstacles that apply to only a portion of the project, a project scope change involves the sectionalizing of the project so that the unimpeded sections can be remediated as soon as practicable. The remaining sections are postponed until the obstacles have been addressed.

C. Construction[10]

1. Construction Contractor Selection

This section details the estimated (confidential) Construction Contractor Costs and the final negotiated (confidential) Construction Contractor costs. Construction activity begins with the selection of the Construction Contractor. For PSEP projects, the Construction Contractors are predominately selected through the Performance Partner Program process which is assigned to a geographical area. 15 of the 21 pipeline projects in this Reasonableness Review were assigned to the Performance Partner selected for that region. The Performance Partner Program allows for competitive pricing of projects and provides incentives associated with the program to encourage the Construction Contractors to further reduce costs. Occasionally, Performance Partners work outside their assigned regions to maintain a balance of work across all Performance Partners. When it was not practical to use a Performance Partner, the Construction Contractor was chosen through a competitive solicitation process.

In either instance, based on the Issue-for-Bid design (90% design drawing), a final scope of work (SOW) is prepared and provided to the Construction Contractor which is used to prepare a Target Price Estimate (TPE). Each Project executed by a Performance Partner required negotiation to reach an agreed-upon TPE. In a competitive bidding process, SoCalGas awarded the construction contract to the bidder that best met the selection criteria for the Project. For each Project, the workpaper will state if the project was executed through the Performance Partnership or through Competitive Bid with further details:

- SoCalGas preliminary, confidential cost estimate for Construction Contractor costs is sometimes referred to as the Total Installed Cost (TIC).

[10] Construction Activities further detailed in Appendix A to these workpapers, which provides a description of the large variety of field activities that may take place on a PSEP pipeline or valve project.

- The Construction Contractor's confidential Target Price Estimate (TPE) or bid and the variance between the final bid and SoCalGas preliminary estimate/TIC.

2. Construction Schedule

This section consists of *Table 3: Construction Timeline* depicting the construction start date, completion date and Notice of Operation (NOP) date for each project. For projects with more than one section, Table 3 will reflect the construction start date for the first section and the construction completion and NOP dates for the last section, if completed under different timelines.

3. Changes During Construction

This section summarizes the notable change orders that were initiated after the Project went to construction. Most of the pipeline replacement, hydrotest and abandonment projects presented for review are located in dense urban environments, which greatly adds to the complexity of the construction activities. Many of the construction challenges were mitigated and planned for; however, others were unanticipated and were addressed as they arose in the field. These unforeseen conditions may have required activities that were outside of the original scope of work upon which the TPE was established. As unexpected conditions were encountered during construction, the Construction Contractor described the conditions and proposed a solution to SoCalGas via a Request for Information (RFI) form. If authorized by the PSEP Project Manager, the solution was executed, and any incremental costs were documented via a change order. The workpapers for each project describe notable construction change orders (i.e. when the total construction change order costs are more than 10% of the TPE). Change orders are summarized in the workpapers and are categorized generally by cause.

4. Commissioning and Site Restoration

This section describes site restoration activities that are typically completed several weeks or even a month or more after the pipeline is returned to service. The site is demobilized, test water is disposed of or stored and removed for use on an adjacent project and the area is returned to its previous condition, which may include repaving and restoration of landscaping. Closeout activities are executed within the final months of the project lifecycle and include finalization of as-built

drawings and uploading of updated information into the company's documentation and recordkeeping systems to reflect the final scope of work.

D. PROJECT COSTS

1. Cost Avoidance Actions

This section describes the notable cost avoidance decisions and actions that are described in the project workpapers. Because PSEP projects are thoughtfully and prudently designed with safety and cost efficiency at top of mind, not all cost avoidance actions are specifically noted, and it would be impractical to list all the costlier design options that were briefly considered and rejected. Some typical areas of cost avoidance and cost savings are derived from planning and design choices that include reduction of project scope, choice of materials or bulk purchasing of materials, project designs that eliminate or reduce features that would complicate routine maintenance activities to reduce future maintenance costs, and planning and coordination of the PSEP project schedule to incorporate other projects to share resources or avoid duplicative or wasted effort. Prudent negotiation of terms with landowners and permit terms, as well as shared land use, are additional means of avoiding costs. Finally, costs are avoided through prudent engineering and design decisions made in the field to address and mitigate unanticipated conditions revealed once the pipe was exposed or otherwise identified during the latter stages of project execution.

2. Cost Estimate

Estimating activities are initiated with the approval of the Phase 1 Work Order Authorization (WOA) reflecting the estimated costs for preliminary design, mapping, and survey activities. Subsequently, based on 30% design drawings, a Total Installed Cost (TIC) estimate was prepared using the most current version of the PSEP Estimating Tool. The TIC is presented to PSEP leadership and approval is required to move forward.

The TIC costs reflect Direct Costs only, which are typically used to prepare the Phase 2 WOA. The Phase 2 WOA includes Indirect Costs, and therefore, reflects the Total Loaded Project Cost estimate.

The approval of the Phase 2 WOA was required to proceed with execution of the project. Any significant project activities and costs subsequently added to the project scope after execution of the TIC would not be reflected in the estimated costs presented in Tables 4 and 5. These additional costs and activities are authorized and documented through the scope change process.

3. Actual Direct and Indirect Costs

The Estimated and Actual Costs shown in *Table 4: Estimated and Actual Direct Costs and Variances* in workpapers are defined as follows:

- Company Labor: Labor costs for SoCalGas employees charging directly to the project, such as project managers, engineers, land services personnel, environmental services personnel, communication and outreach managers, construction managers, and field support personnel.
- Materials: Costs for materials that SoCalGas purchased to complete the project, such as piping, valves, fittings, and other miscellaneous materials. Materials planned to be purchased by the construction contractor may be included in the construction contractor costs.
- Construction Contractor: Costs for Construction Contractor activity and materials or equipment acquired by the contractor. The actual Construction Contractor costs also include authorized change order costs and risk reward payments, minus construction credits, when applicable.
- Construction Management and Support: Costs for construction inspection, contamination mitigation, environmental monitoring, hydrotesting services, and other miscellaneous activities that occur in the field.
- Environmental: Costs for environmental assessments, monitoring, asbestos abatement, water and waste management, and miscellaneous environmental permits and fees not reflected in other cost categories.
- Engineering and Design: Costs for planning and design services, engineering, environmental services, land use and permitting fees not included in other categories, and project support, such as survey, mapping and miscellaneous expenses.
- Project Management Services: Contracted costs for project management services and general PSEP program support.

- ROW & Permits: Costs associated with permitting fees and land easement, or acquisition expenses not reflected in other cost categories.
- General Management and Administration (GMA) Costs: PSEP project support costs not directly tied to a specific project and incurred to support the overall implementation of PSEP that are not included in Company Overheads. GMA costs were applied to projects prior to the 2019 GRC Decision directing PSEP to transition and utilize the GRC overhead framework.

Indirect Costs are listed in *Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances*. These costs are incremental overheads applied to PSEP projects. Indirect costs are for those activities and services that are associated with indirect costs – such as payroll taxes, pension, and benefits. Also included is interest that SoCalGas earns for funds used during construction for capital projects (AFUDC) and Property Tax for construction work in progress (CWIP) for capital projects.

The Actual Full-Time equivalents (FTEs) are included to provide context for the Company labor hours to support each pipeline project.

4. Cost Impacts

There are several factors that may cause a variance between actual and estimated costs. Most of the differences are attributed to one or more factors: 1) estimates are based on preliminary design, 2) reasonable changes in project scope are required to address conditions identified after the preliminary estimate is prepared, 3) Unforeseen and unplanned field conditions also contribute to variances between the preliminary estimate and actual costs. The purpose of this section is to describe some of those factors and how they influenced each of the project's overall cost variance.

5. Disallowances

Of the 21 PSEP pipeline projects presented for review in this Application, 5 projects addressed footages of post-1955 pipe that lacked pressure test records, making portions of those projects subject to disallowance. In the project workpapers for these 5 projects, the disallowed scope is described, and the calculation of disallowed costs is provided. The disallowed project costs are

provided in the final workpapers for completeness, but the disallowed costs were previously recognized by SoCalGas, are not recorded in the PSEP balancing accounts, and are not included in the revenue requirement presented for review in this Application, as described in testimony.

III. SOCALGAS REASONABLENESS REVIEW VALVE ENHANCEMENT PROJECT WORKPAPER STRUCTURE

The workpapers that follow consist of final reports that describe the actions taken in each of SoCalGas 66 Pipeline Safety Enhancement Plan (PSEP) valve enhancement project bundles included in the 2024 Reasonableness Review. The workpapers support SoCalGas' first reasonableness review of its PSEP valve enhancement projects being submitted in a GRC. These projects were primarily placed in operation (NOP-ed) prior to October 22, 2019 and the costs have been reconciled as of December 31, 2020. Trailing costs or adjustments posted after December 31, 2020 are not reflected in the totals shown in Table 3 below nor in the workpapers.

Table 3 – Valve Project Bundles submitted in the 2024 Reasonableness Review

Valve Workpaper Title	Project Scope (valves, sites)	Workpaper Page
29 Palms Valve Enhancement Project - Indian Canyon	1 valve, 1 site	WP-474
29 Palms Valve Enhancement Project - Mohawk Trail	1 valve, 1 site	WP-491
29 Palms Valve Enhancement Project - Sunburst Street	1 valve, 1 site	WP-506
29 Palms Valve Enhancement Project - Utah Trail	1 valve, 1 site	WP-523
45-120 Valve Enhancement Project	1 valve, 1 site	WP-540
225 Valve Enhancement Project - Beartrap	1 valve, 1 site	WP-558
225 Valve Enhancement Project - Quail Canal	1 valve, 1 site	WP-575
404-406 Valley Bundle Valve Enhancement Project	8 valves, 4 sites	WP-592
404-406 Ventura Valve Enhancement Project - Somis Yard	1 valve, 1 site	WP-624
1014 Olympic Valve Enhancement Project	6 valves, 2 sites	WP-641
1018 Valve Enhancement Project - Alipaz Street	1 valve, 1 site	WP-667
1018 Valve Enhancement Project - Avery Parkway	1 valve, 1 site	WP-684
1018 Valve Enhancement Project - Burt Road	2 valves, 1 site	WP-702
1018 Valve Enhancement Project - Camino Capistrano	1 valve, 1 site	WP-720
1018 Valve Enhancement Project - El Toro Road	1 valve, 1 site	WP-740
1018 Valve Enhancement Project - Harvard & Alton	3 valves, 1 site	WP-759
2000 Beaumont Riverside 2016 Valve Enhancement Project Bundle	4 valves, 4 sites	WP-778
4000 Valve Enhancement Project - Camp Rock Road	1 valve, 1 site	WP-807
4000 Valve Enhancement Project - Desert View Road	1 valve, 1 site	WP-824
4000 Valve Enhancement Project - Devore Station	2 valves, 1 site	WP-841
4000 Valve Enhancement Project - Powerline Road	1 valve, 1 site	WP-858
4002 Fontana Valve Enhancement Project - Etiwanda & 4th	1 valve, 1 site	WP-875
7000 Valve Enhancement Project - Beech & Highway 46	1 valve, 1 site	WP-894
7000 Valve Enhancement Project - Melcher & Elmo	3 valves, 1 site	WP-912

7000 Valve Enhancement Project - Road 68 & Avenue 232	1 valve, 1 site	WP-931
7000 Valve Enhancement Project - Road 96 & Avenue 198	1 valve, 1 site	WP-949
7000 Valve Enhancement Project - Visalia Station	2 valves, 1 site	WP-968
Adelanto Valve Enhancement Project - MLV 4	1 valve, 1 site	WP-987
Apple Valley Valve Enhancement Project - MLV 2	1 valve, 1 site	WP-1003
Apple Valley Valve Enhancement Project - MLV 13	1 valve, 1 site	WP-1020
Aviation & 104th Valve Enhancement Project	5 valves, 1 site	WP-1038
Banning 2001 Valve Enhancement Project - MLV 14.3A	3 valves, 1 site	WP-1063
Banning 2001 Valve Enhancement Project - MLV 14A	1 valve, 1 site	WP-1081
Banning 2001 Valve Enhancement Project - MLV 16A	1 valve, 1 site	WP-1098
Banning 2001 Valve Enhancement Project - MLV 17A	1 valve, 1 site	WP-1116
Banning Airport Valve Enhancement Project	2 valves, 1 site	WP-1133
Blythe Valve Enhancement Project - Cactus City	1 valve, 1 site	WP-1151
Brea Valve Enhancement Project - Atwood Station	3 valves, 1 site	WP-1169
Brea Valve Enhancement Project - Carbon Canyon	1 valve, 1 site	WP-1186
Brea Valve Enhancement Project - Gale & Azusa	1 valve, 1 site	WP-1203
Brea Valve Enhancement Project - Brea Canyon	3 valves, 1 site	WP-1220
Burbank Valve Enhancement Project - Riverside & Agnes	1 valve, 1 site	WP-1238
Carpinteria Valve Enhancement Project - Oxy & Rincon	1 valve, 1 site	WP-1254
Del Amo Station Valve Enhancement Project	3 valves, 1 site	WP-1271
Fontana 4000-4002 Valve Enhancement Project - Benson & Chino	1 valve, 1 site	WP-1288
Glendale Valve Enhancement Project - Geneva & Monterey	1 valve, 1 site	WP-1309
Indio Valve Enhancement Project - MLVs 8, 8A, & 8B	3 valves, 2 sites	WP-1326
Indio Valve Enhancement Project - MLV 9A & 9B	2 valves, 1 site	WP-1347
Indio Valve Enhancement Project - MLVs 10, 10A, & 10B	3 valves, 1 site	WP-1366
Palowalla Valve Enhancement Project	3 valves, 1 site	WP-1385
Rainbow 2017 Valve Enhancement Project - Martin & Ramona	2 valves, 1 site	WP-1402
Rainbow Check Valve Enhancement Project - Newport & Briggs	1 valve, 1 site	WP-1418
Rainbow Check Valve Enhancement Project - Scott & El Centro	2 valves, 1 site	WP-1434
Rainbow Check Valve Enhancement Project - Rainbow Valley & Pechanga	2 valves, 1 site	WP-1450
Rainbow CV Valve Enhancement Project - Ramona & Lakeview	2 valves, 1 site	WP-1467
Rainbow Valve Enhancement Project - MLV 5	3 valves, 1 site	WP-1483
Santa Barbara County Valve Enhancement Project - Lions	1 valve, 1 site	WP-1500
Spence Station Valve Enhancement Project	1 valve, 1 site	WP-1520
Taft Valve Enhancement Project - 7th Standard	1 valve, 1 site	WP-1536
Taft Valve Enhancement Project - Buttonwillow	1 valve, 1 site	WP-1553
Taft Valve Enhancement Project - Hageman & Renfro	2 valves, 1 site	WP-1571
Taft Valve Enhancement Project – Sycamore Road	1 valve, 1 site	WP-1592
Victorville COMMS Valve Enhancement Project - MLV 11	1 valve, 1 site	WP-1609
Victorville COMMS Valve Enhancement Project - MLV 12	1 valve, 1 site	WP-1626

Western Del Rey Valve Enhancement Project - Mississippi & Armacost	1 valve, 1 site	WP-1643
Wilmington Valve Enhancement Project - Eubank Station	2 valves, 1 site	WP-1660

Each workpaper is divided into five sections: A) Project Introduction; B) Engineering, Design and Planning C) Construction; D) Project Costs; and E) Conclusion.

An explanation describing each section's objective is as follows:

A. Project Introduction

1. Background and Summary

When practical and anticipated to provide project management and cost efficiencies, SoCalGas bundled multiple valve enhancement project sites for project management and execution. Included in this background and summary section is *Table 1: General Project Information*, which provides overall valve project details by site such as location, valve type(s), and valve and site enhancements.

In addition, maps and satellite images are included for the entire bundle (when applicable) and for each site to provide a perspective of the project in relation to the community it impacts, and the other project sites. Schematic drawings are sometimes included to illustrate and magnify pipeline interconnections and features that are not discernable from the map images.

B. Engineering, Design, and Planning

As described in testimony, the SoCalGas Engineering group guides execution of the Valve Enhancement Plan and designates which valves require remote automation capability to enable optimal system isolation in the event of an emergency.

1. Project Scope

Included in this section is *Table 2: Final Project Scope* which details valve number, valve size (confidential), installation type and function. Project scoping activities include review of existing documentation and a detailed system flow analysis to confirm the scope of the project. As appropriate, modifications are made to the plan to update the scope to include or remove valves as necessary to achieve planned isolation.

- 2011 PSEP Filing indicates valves identified as a candidate for automation as submitted in A. 11-11-002.
- Updated Scope summarizes the outcome of scope validation and documentation to confirm the project scope.
- Engineering, Design and Constructability summarizes the constructability factors that influenced the project design and route.
- Final Project Scope summarizes the final project scope including the installation of any new automated valves, actuators, vaults, power equipment, communications equipment, or the necessary automation equipment that contributed to the project complexity and/or cost.

2. Site Evaluation and Planning

Once a PSEP valve project is initiated and preliminary scope is identified, a site visit is conducted to inspect the valve, confirm the normal valve position (open or closed), location of the valve (above-grade or below-grade), valve type and identify other field and site conditions that could impact the successful automation of the valve. Upon receipt of these data points, project engineering and design commences. In cases where it is warranted, the PSEP project team recommends modifications to the project scope and selects an alternate valve for automation or recommends that the valve be moved to a location out of a roadway that is safer and less impactful to customers when routine maintenance is being conducted. A schematic drawing is included in this section to depict the existing valves and valves that were enhanced with remote isolation capability to enable system isolation.

Once the detailed design is prepared and construction documents are completed, necessary permits and authorizations are attained, and required valve materials are purchased, received, and prepared for turnover to contractors.

3. Scope Changes

Throughout the Engineering, Design and Planning process, constructability or scheduling hurdles are sometimes revealed that require design changes, such as the addition or removal of valves from the project scope, a change in which valves were being enhanced, or a change in the type of enhancement. Scope changes are reviewed and authorized. The incremental costs associated with a subsequent scope change would *not* be reflected in the estimated costs in *Tables 4 and 5*.

C. CONSTRUCTION

1. Construction Contractor Selection

SoCalGas utilize electrical contractors to execute PSEP valve automation work (installation of controls, wiring, communication and electrical work) and requires additional services of a mechanical construction contractor when a valve is relocated, or other pipeline work is required. Valve mechanical work is included within the Performance Partner's anticipated activities within each geographic region. When a Performance Partner is not used, the project is competitively bid. Similar to the Performance Partner Program, SoCalGas created an Alliance Contractor Program for PSEP electrical contractors. Unlike the Performance Partner Program however, the Alliance Partnership does not include a risk reward provision. Three electrical contractors were selected as Alliance Contractors, following receipt of competitive bids from eight qualified electrical contractors through a competitive solicitation process. Alliance Contractors are assigned projects based on workload and geographic considerations.

Once the Issue-for-Bid design (90% design drawing) is completed, a final scope of work is prepared and provided to the Electrical and Mechanical Contractors, which is used by the Electrical and Mechanical Contractors to prepare their construction cost estimates. Each project executed by an Alliance Contractor or Performance Partner requires negotiation of an agreed-upon estimated cost. The Contractor selection process for each project is described in the project workpapers.

2. Construction Schedule

Valve projects typically require less mobilization efforts than a pipeline project because the scope of work is much more contained and less invasive to the project site. Demobilization requires less effort therefore, contractors frequently work on and manage multiple adjacent projects at the same time, moving from site to site to execute work when materials and other conditions are available. This creates efficiencies and reduces downtime or standby charges as the project team can remain active but extends the duration of the construction.

Table 3: Construction Timeline lists the Construction Start and Completion Dates and includes the days on site which is a better indicator of the complexity of the project execution. It also lists the Commissioning Date which is the date that point-to-point contact verification was achieved indicating that the valve was remotely operable.

3. Changes During Construction

Once the project proceeds to construction, site conditions may have changed, or other unanticipated factors may be identified. The Construction Contractor describes the unanticipated conditions encountered during construction and the proposed solution to SoCalGas via an RFI form. If authorized by the PSEP Project Manager, the solution is executed, and the incremental costs are documented via a change order. The workpapers for each project describe notable construction change orders (i.e., when the total construction change order costs are more than 10% of the TPE).

4. Commissioning and Site Restoration

Commissioning activities include site restoration, a site Acceptance Test, which is necessary to obtain agreement from SoCalGas Gas Operations that the valve project is complete before turnover. The site is demobilized, and the area is returned to its previous condition. This may include repaving and restoration of landscaping. Closeout activities are executed within the final months of the project lifecycle and include finalization of as-built drawings and uploading of updated information into the company's documentation and recordkeeping systems to reflect the final scope of work.

D. PROJECT COSTS

1. Cost Avoidance Actions

This section describes the notable cost avoidance decisions and actions that are described in the project workpapers. Because PSEP projects are thoughtfully and prudently designed with safety and cost efficiency at top of mind, not all cost avoidance actions are specifically noted, and it would be impractical to list all the costlier design options that were briefly considered and rejected. Some typical areas of cost avoidance and cost savings are derived from planning and design choices that include reduction of project scope, choice of materials or bulk purchasing of materials, project designs that eliminate or reduce features that would complicate routine maintenance activities to reduce future maintenance costs, and planning and coordination of the PSEP project schedule to incorporate other projects to share resources or avoid duplicative or wasted effort. Prudent negotiation of terms with landowners and permit terms, as well as shared land use, are additional means of avoiding costs. Finally, costs are avoided through prudent

engineering and design decisions made in the field to address and mitigate unanticipated conditions identified during construction.

2. Cost Estimate

Estimation activity is initiated in Stage 1 with approval of the Phase 1 WOA reflecting the estimated costs for preliminary design, mapping and survey activities. Subsequently, based on 60% design drawings, a TIC estimate is prepared using the most current version of the PSEP Estimating Tool available. The TIC is presented to PSEP leadership at a Stage 3 gate review and approval is required to move forward. The TIC costs reflect direct costs only, which are typically used to prepare the Phase 2 WOA. The Phase 2 WOA includes indirect costs, and therefore, provides a total loaded project cost estimate. Approval of the Phase 2 WOA is required to proceed with execution of the project. Any significant project activity and costs subsequently added to the project scope after execution of the TIC would not be reflected in the estimated costs presented in Tables 4 and 5 in the project workpapers. These additional costs and activities are authorized and documented through the scope change process discussed above.

3. Actual Direct and Indirect Costs

The Estimated and Actual Costs shown in *Table 4: Estimated and Actual Direct Costs and Variances* in workpapers are defined as follows:

- Company Labor: Labor costs for SoCalGas employees charge directly to the project, such as project managers, engineers, land services personnel, environmental services personnel, communication and outreach managers, construction managers, and field support personnel.
- Materials: Costs for materials that SoCalGas purchased to complete the project, such as valves, fittings, and other miscellaneous materials. Materials planned to be purchased by the construction contractor may be included in the construction contractor's costs.
- Mechanical Construction Contractor: Costs for mechanical construction activities performed by the Mechanical Contractor and materials or equipment acquired by the contractor. The actual Mechanical construction contractor costs also include authorized change order costs and risk reward payments, minus construction credits, when applicable.

- Electrical Contractor: Costs for electrical construction activity and materials or equipment acquired by the Electrical Contractor. The actual Electrical construction contractor costs also include authorized change order costs, when applicable.
- Construction Management and Support: Costs for construction inspection, contamination mitigation, environmental monitoring, hydrotesting services, and other miscellaneous activities that occur in the field.
- Environmental: Costs for environmental assessments, monitoring, asbestos abatement, water and waste management, and miscellaneous environmental permits and fees not reflected in other cost categories.
- Engineering and Design: Costs for planning and design services, engineering, environmental services, land use and permitting fees not included in other categories, and project support, such as survey, mapping, and miscellaneous expenses.
- Project Management Services: Contracted costs for project management services and general PSEP program support.
- ROW & Permits: Costs associated with permitting fees and land easement, or acquisition expenses not reflected in other cost categories.
- General Management and Administration (GMA) Costs: PSEP project support costs not directly tied to a specific project and incurred to support the overall implementation of PSEP that are not included in Company Overheads. GMA costs were applied to projects prior to the 2019 GRC Decision directing PSEP to transition and utilize the GRC overhead framework.

Indirect Costs are listed in *Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances*. These costs are incremental overheads applied to PSEP projects. Indirect costs are for those activities and services that are associated with indirect costs – such as payroll taxes, pension, and benefits. Also included is interest that SoCalGas earns for funds used during construction for capital projects (AFUDC) and Property Tax for construction work in progress (CWIP) for capital projects.

The Actual Full-Time equivalents (FTEs) are included to provide context for the Company labor hours to support each pipeline project.

4. Cost Impacts

There are several factors that may cause a variance between actual and estimated costs. Most of the differences are attributed to one or more factors: 1) estimates are based on preliminary design, 2) reasonable changes in project scope are required to address conditions identified after the preliminary estimate is prepared, 3) Unforeseen and unplanned field conditions also contribute to variances between the preliminary estimate and actual costs. The purpose of this section is to describe some of those factors and how they influenced each of the project's overall cost variance.

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SCG Reasonableness Review Pipeline Project Workpapers

REASONABLENESS REVIEW PIPELINE PROJECTS

Table 2 – Pipeline Hydrotest, Replacement and Abandonment Projects for the 2024 Reasonableness Review

Pipeline Workpaper Title	Project Scope (miles, rounded)				Workpaper Page
	Hydrotest	Replace	Abandon	Derate	
30-18 Section 2 Replacement Project		0.619			WP-23
33-120 Section 1 Replacement Project		0.24			WP-45
36-1032 Section 4 Replacement Project		0.307			WP-65
36-9-09 North Section 5B-02 and 5C Replacement		0.894			WP-82
36-9-09 North Section 6B Replacement Project		1.732			WP-104
36-9-21 Replacement Project		0.464			WP-125
37-18-K Replacement Project		1.928			WP-144
38-101 Replacement Project		4.525			WP-163
41-6001-2 Replacement Project		0.005			WP-183
43-121 North Sections 2, 3, and 4 Replacement Project		1.054			WP-201
45-120 Section 2 Replacement Project		3.588			WP-231
404 Section 4A Replacement Project		0.831			WP-269
404-406 Somis Station Replacement Project		0.136			WP-292
2006 Replacement Project		0.094			WP-315
Storage - Goleta Project	0.286				WP-332
33-121 Hydrotest Project	0.478				WP-350
2000-D Hydrotest Project	3.184				WP-366
2001 West-C Desert Hydrotest Project	16.803				WP-388
2001 West-D Whitewater Hydrotest	4.36				WP-410
41-6000-2 Abandonment Project	0.189	0.239	24.033	3.652	WP-432
103 Derate and Replacement Project		0.001		9.303	WP-456

I. SUPPLY LINE 30-18 SECTION 2 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 30-18 Section 2 is a predominantly [redacted] diameter transmission line that runs approximately 0.6 miles along the heavily trafficked 190th Street from Vermont to Victoria Street and South Avalon Boulevard, through residential neighborhoods and commercial areas within the City of Carson to the City of Torrance. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Supply Line 30-18 Section 2 Replacement Project that consists of the replacement of 0.619 miles of pipeline with approximately 0.250 miles of horizontal directional drill (HDD). The specific attributes of this Project are detailed in Table1 below. The total loaded cost of the Project is $10,905,874.

SoCalGas separated the Supply Line 30-18 Project into three separate projects: Supply Line 30-18[1] Sections 1, 2, and 3 for constructability, coordination, and permitting requirements for certain portions along the replacement route.

[1] Supply Line 30-18 Sections 1 and 3 was filed for recovery in A.18-11-010 and authorized in D.20-08-034.

Table 1: General Project Information

Project Name	Supply Line 30-18 Section 2		
Project Type	Replacement		
Length	0.619 miles		
Location	Carson		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1943		
Construction Start	01/16/2018		
Construction Finish	05/14/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	10,905,874	-	10,905,874
Disallowed Costs	130,758	-	130,758

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview Map of the Supply Line 30-18 Sections 1, 2, and 3 Replacement Projects

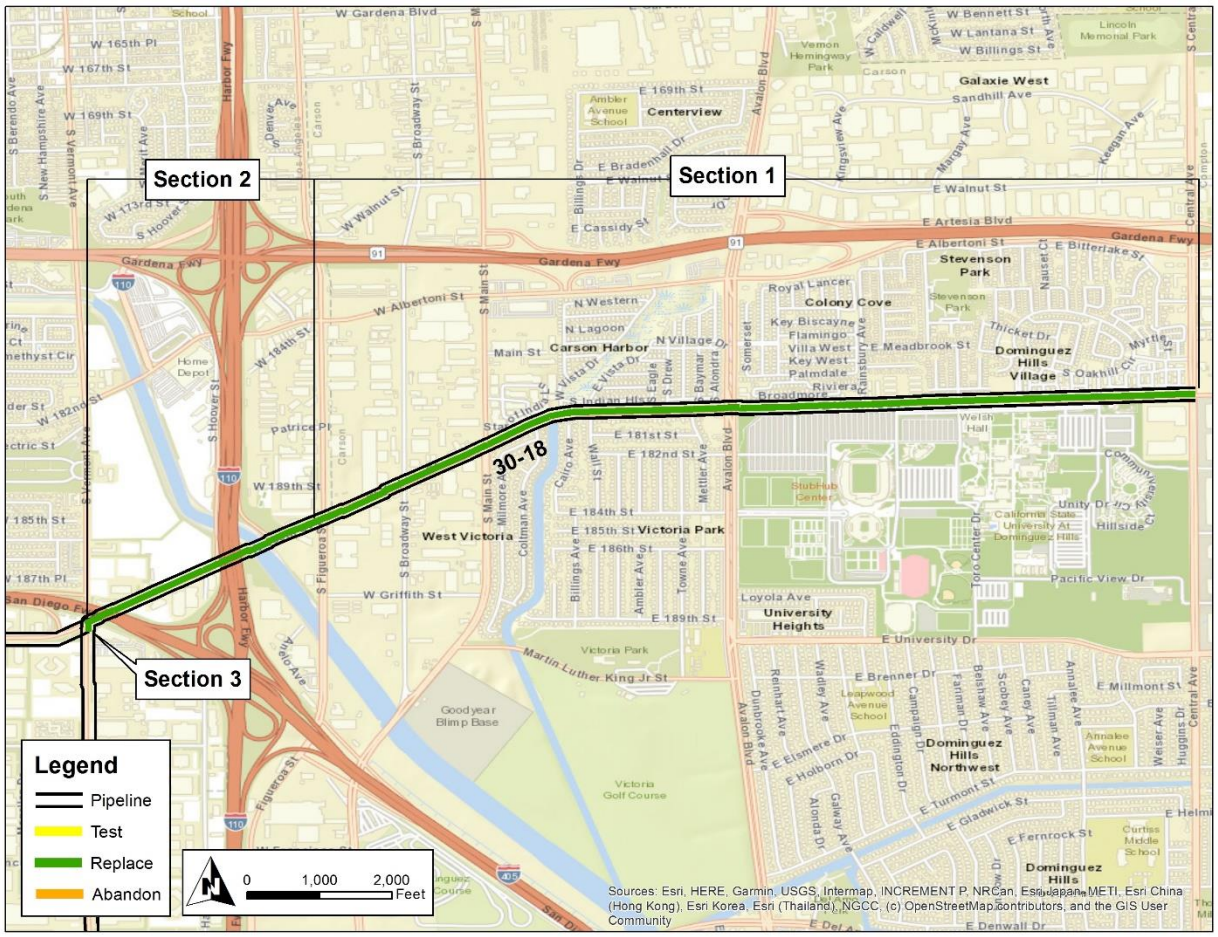
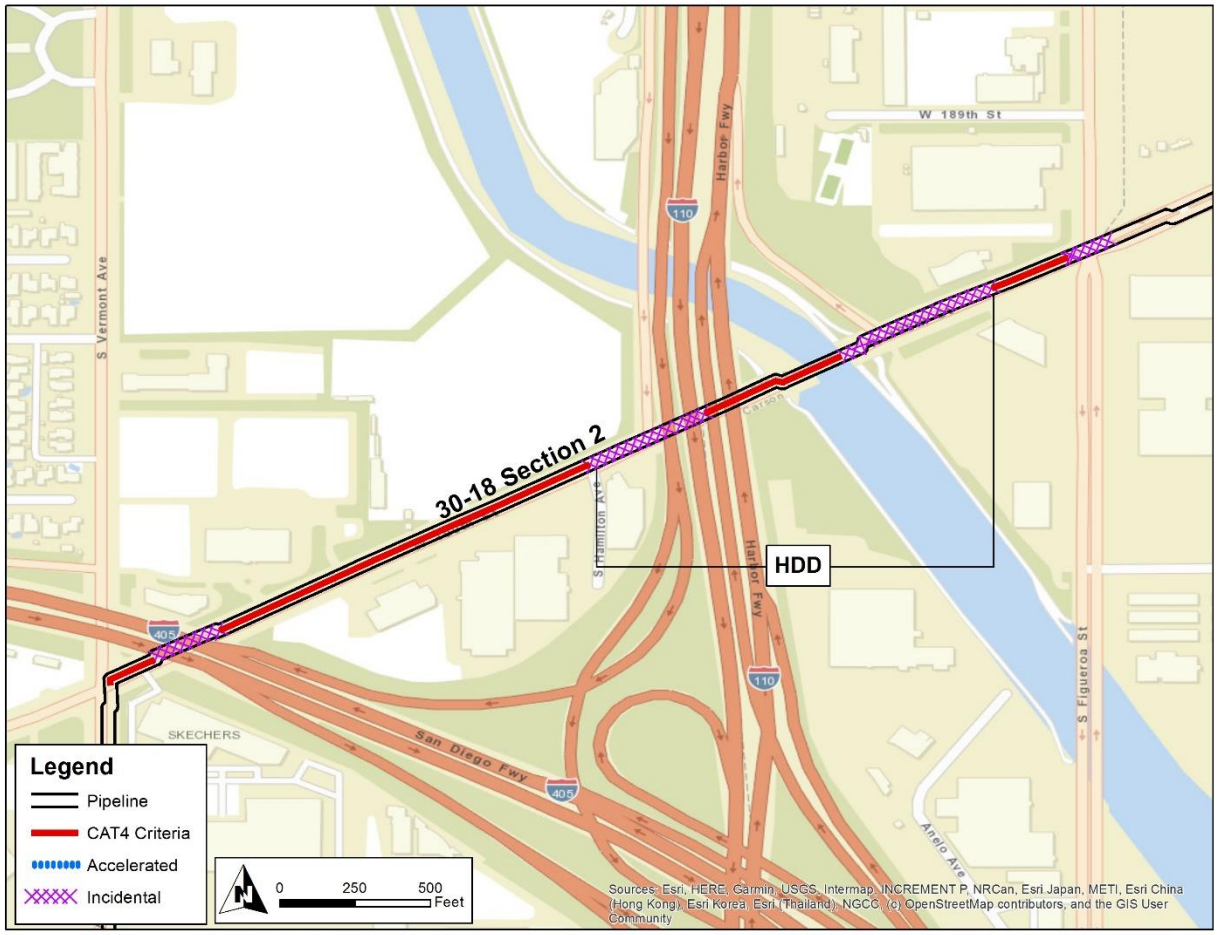


Figure 2: Satellite Image of Supply Line 30-18 Section 2 Replacement Project

Figure 3: Overview Map of Supply Line 30-18 Section 2 Replacement Project



II. Engineering, Design, and Planning

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated	Incidental	New	Total[3]
Final Mileage	0.370 mi.	0 mi.	0.226 mi.	0.023 mi.	0.619 mi.
	1,951 ft.	0 ft.	1,192 ft.	123 ft.	3,266 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2018, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 30-18 as a Phase 1A Replacement Project comprised of 2.139 miles of Category 4 Criteria pipe and 0.445 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 0.077 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team planned Section 2 to occur last due to the more detailed permitting and approval process required for crossing the Dominguez Channel and Caltrans Interstate 110.

[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. The Project Team utilized HDD to cross under the Dominguez Channel and Interstate 110. This crossing required extensive Caltrans permit reviews and two geotechnical investigations.
c. Incidental mileage was included for constructability purposes related to the HDD Dominguez Channel crossing and associated Caltrans permitting requirements.

4. Final Project Scope: The final project scope consists of a 0.619 mile Replacement that included 0.250 miles of HDD.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 30-18 Section 2 and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas have already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for in-line inspection, likely have non-state-of-the-art welds, and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in with no system impact.
2. Customer Impacts: The Project Team identified one customer that would need to be transferred to an adjacent medium pressure system prior to construction.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1943.
5. Existing Pipe Attributes: Multiple diameters, non-piggable taps, and pressure control fittings (PCFs).
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the line could be shut-in without impact to service.
2. Customer Impact: The Project Team identified one customer that would be transferred to an adjacent medium pressure system prior to construction.
3. Community Impact:

a. In order to improve efficiency and safety, the pipeline was constructed within a k-rail island. Temporary full street closures were coordinated with the city in order to install and remove the k-rails.
b. A full street closure of 190th Street was also required for the HDD pullback.

4. Diameter Changes: The Project Team replaced the existing [redacted] line with a [redacted] line to standardize the pipeline for future piggability purposes.
5. Substructures:
   a. A bore pit was relocated due to overhead electrical wires near the proposed drill location.
   b. Bore depth was increased to maintain the structural integrity of a pillar within the freeway.
   c. The bore length was extended to avoid interference during the pull back due to overhead electrical lines.
6. Permit Conditions:
   a. Caltrans required a permit to install pipe inside Caltrans ROW and to alternate traffic flow for the highway on-ramp and off-ramp.
   b. City of Carson Encroachment required a permit to excavate within City of Carson roads.
   c. City of Los Angeles required a noise variance for potential non-peak hour work that included extended hours and HDD activities and a peak hour exemption to extend work hours in order to reduce project duration.
   d. Los Angeles Bureau of Engineering Utility required a permit for the approval of the HDD and encroachment into the public ROW.
   e. Los Angeles Board of Public Works required approval for the street closure permit.
   f. Los Angeles Department of Transportation required a permit to close traffic lanes during construction.
   g. Los Angeles County Flood Control required a permit to HDD under the Dominguez Channel.

h. Los Angeles County Traffic and Lighting Division required a permit to alter traffic signals during construction.

7. Land Use: Laydown yard was shared with the PSEP Supply Line 37-07 and Supply Line 37-18 Projects.
8. Environmental: The Project Team planned for typical abatement activities when removing existing pipe for tie-ins.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. Construction

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	01/16/2018
Construction Completion Date	05/14/2018
NOP Date	03/29/2018

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Cranes Positioning Pipe for Horizontal Directional Drill Pullback

Figure 5: Preparing for Horizontal Directional Drill Pullback

Figure 6: Installing Offset at the Intersection of Figueroa Street and Victoria Street

Figure 7: Lowering New [redacted] Pipe into Trench

Figure 8: Hoses and Connections for Seasoning of New Pipeline

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. Project Costs

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $13,306,535. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $10,905,874.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals[6]	Delta Over/(Under)
Company Labor	593,620	340,405	(253,215)
Materials	411,724	325,769	(85,955)
Construction Contractor	6,554,264	4,368,706	(2,185,558)
Construction Management & Support	534,107	420,997	(113,110)
Environmental	261,146	142,186	(118,960)
Engineering & Design	678,339	2,046,159	1,367,820
Project Management & Services	2,218,435	562,348	(1,656,087)
ROW & Permits	302,992	85,707	(217,285)
GMA	1,751,908	945,894	(806,014)
Total Direct Costs	**13,306,535**	**9,238,171**	**(4,068,364)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[7]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	881,013	866,640	(14,373)
AFUDC	2,891,877	708,304	(2,183,573)
Property Taxes	631,075	92,759	(538,316)
Total Indirect Costs	**4,403,965**	**1,667,703**	**(2,736,262)**
Total Direct Costs	**13,306,535**	**9,238,171**	**(4,068,364)**
Total Loaded Costs	**17,710,500**	**10,905,874**	**(6,804,626)**

The Actual Full-Time Equivalents[8] (FTEs) for this Project are 1.35.

[5] Values may not add to total due to rounding.
[6] Actual Material and Construction Contractor costs exclude the cost of upsizing the pipe.
[7] Values may not add to total due to rounding.
[8] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 30-18 Section 2 Replacement Project, Actual Direct Costs were less than the preliminary estimate by $4,068,364. This variance is attributable to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; increased productivity during the HDD and Hydrotest allowed for construction to be completed in less time than originally expected; the engineering and design firm was able to utilize previously completed work for Line 30-18 Projects which were combined with this Project; schedule coordination with another SoCalGas Project allowed for enhanced efficiency through shared mobilization costs, sequencing, and site facility usage; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

For this replacement project, SoCalGas identified 404 feet of pipe as being installed after 1955 and lacking records that provide the minimum information necessary to demonstrate compliance with then-applicable industry standards or regulatory strength testing and recordkeeping requirements. Of the pipeline that was replaced, 404 feet of Phase 1A pipe is disallowed. Therefore, a $130,758 reduction to ratebase was calculated by multiplying 0.0765 miles of pipe by $1,709,257 per mile, which was SoCalGas and SDG&E's system average cost of pressure testing at the time the pipeline was returned to service.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 30-18 Section 2 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.619 miles of pipeline and utilized HDD for approximately 0.250 miles along 190th Street, from Vermont to Victoria Street and South Avalon Boulevard in the City of Carson. The total loaded cost of the Project is $10,905,874.

SoCalGas executed this project prudently through the use of a HDD and open trench construction methods.

SoCalGas engaged in prudent cost avoidance efforts by sharing a laydown yard and sequencing with adjacent PSEP Projects to reduce mobilization cost, and descoping additional landscaping.

End of Supply Line 30-18 Section 2 Replacement Project Final Report

I. SUPPLY LINE 33-120 SECTION 1 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 33-120 is a predominantly [redacted] diameter transmission line that runs approximately 13 miles from Sylmar to Encino. The pipeline is primarily routed across a Class 3 location and traverses some Class 1 and Class 2 locations. This report describes the activities associated with Supply Line 33-120 Section 1 Replacement Project that consists of the replacement and reroute of 0.240 miles of pipeline and one mainline valve (MLV) near San Fernando Road, through commercial areas west of Interstate 5 and adjacent to the Metropolitan Water District (MWD) facility in the City of Los Angeles. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $12,484,119.

SoCalGas separated the Supply Line 33-120 Project into three separate projects: Supply Line 33-120 Sections 1, 2[1], and 3[2] for project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline. Supply Line 33-120 Section 1 was coordinated with the PSEP Supply Line 45-120 Section 2 Replacement Project as an overall reroute since they are geographically and operationally connected sections that were designed in conjunction with one another in order to avoid conflicts in construction and system interruptions.

[1] Supply Line 33-120 Section 2 Replacement Project was filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004.
[2] Supply Line 33-120 Section 3 Replacement Project was filed for reasonableness review in A.18-11-010 and authorized in D.20-08-034.

Table 1: General Project Information

Project Name	Supply Line 33-120 Section 1		
Project Type	Replacement		
Length	0.240 miles		
Location	Los Angeles		
Class	2		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1930		
Construction Start	09/18/2017		
Construction Finish	07/19/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[3] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	12,484,119	-	12,484,119
Disallowed Costs	-	-	-

[3] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 45-120 Sections 1, Supply Line 45-120 Sections 2, and Supply Line 33-120 Section 1 Replacement Projects

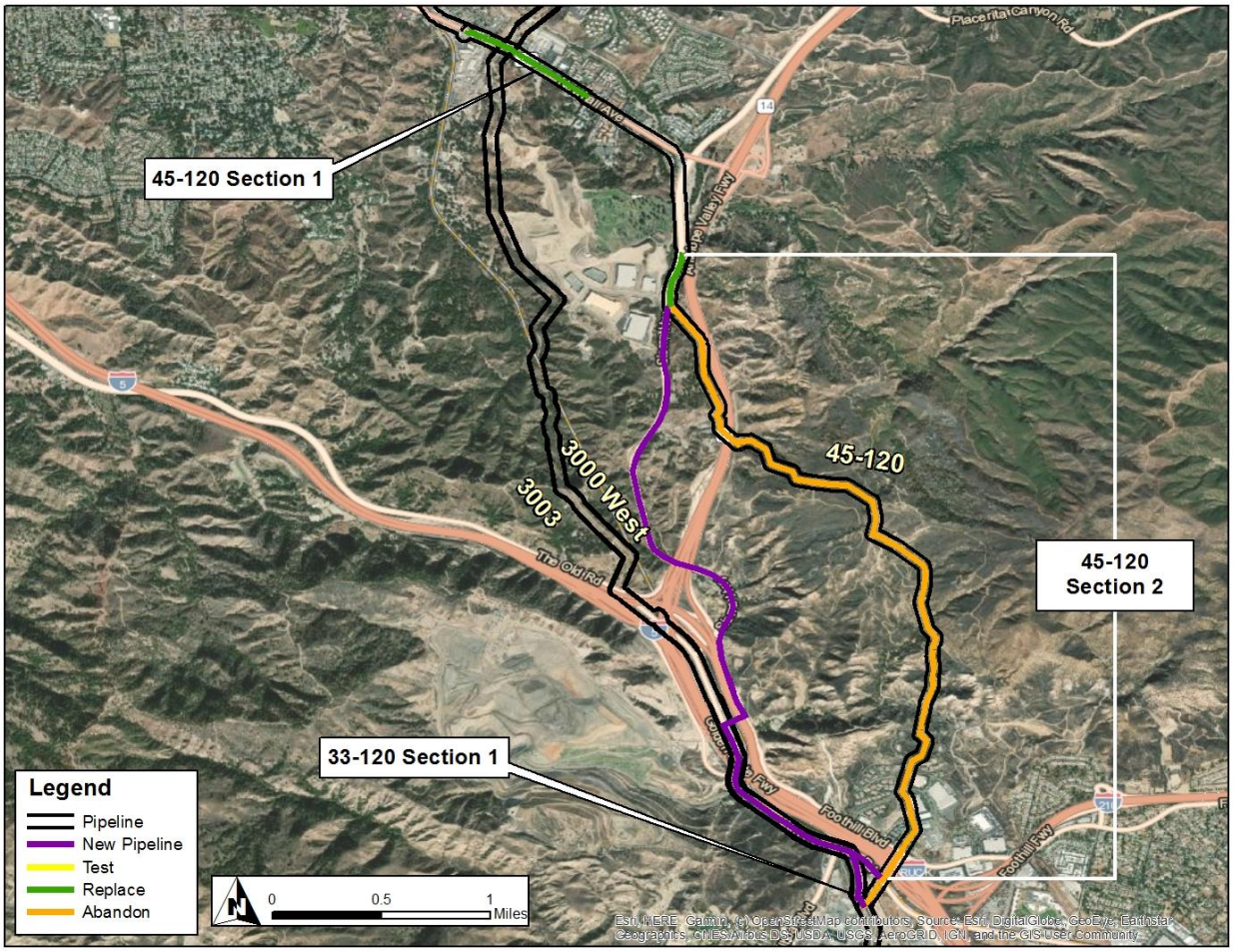


Figure 2: Satellite Image of Supply Line 33-120 Section 1 Replacement Project

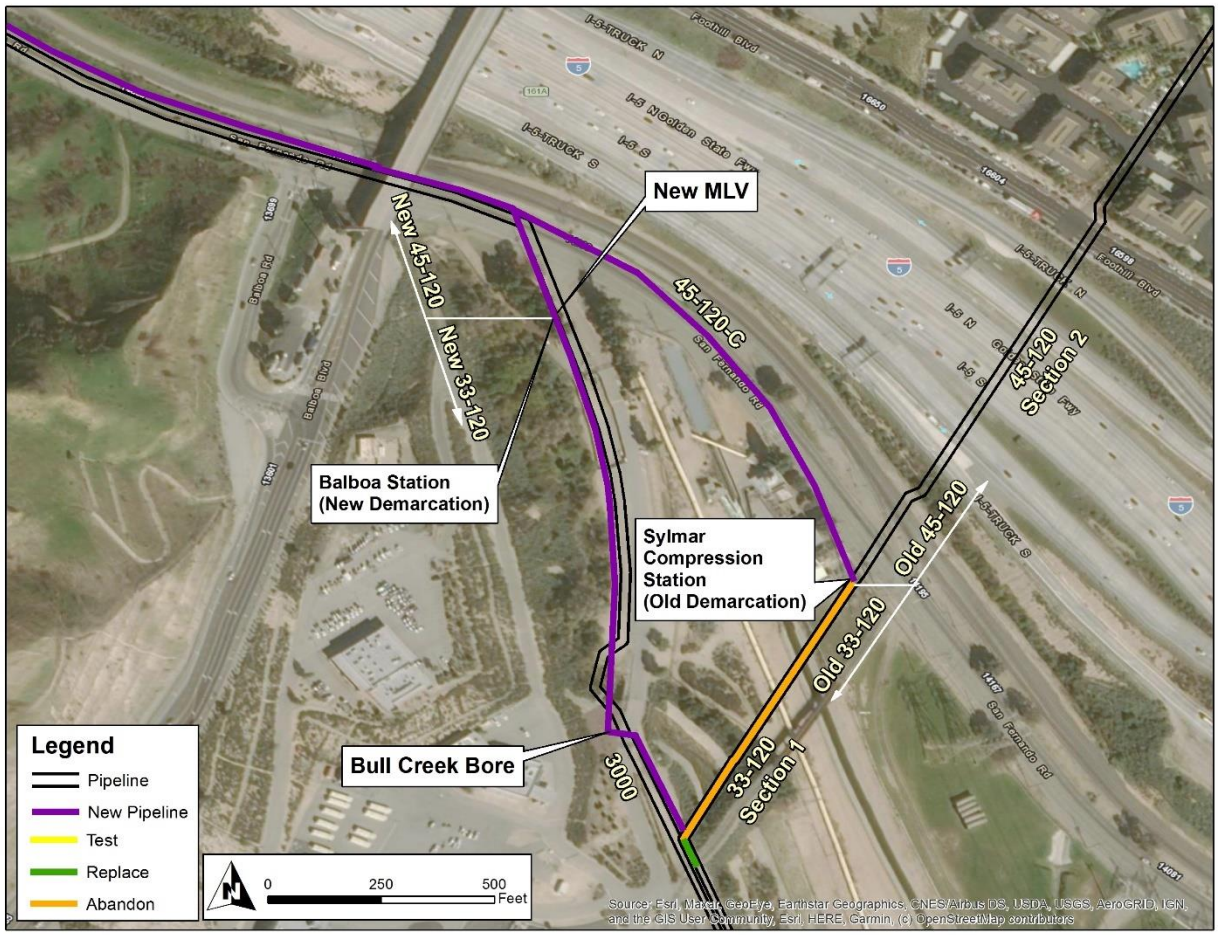
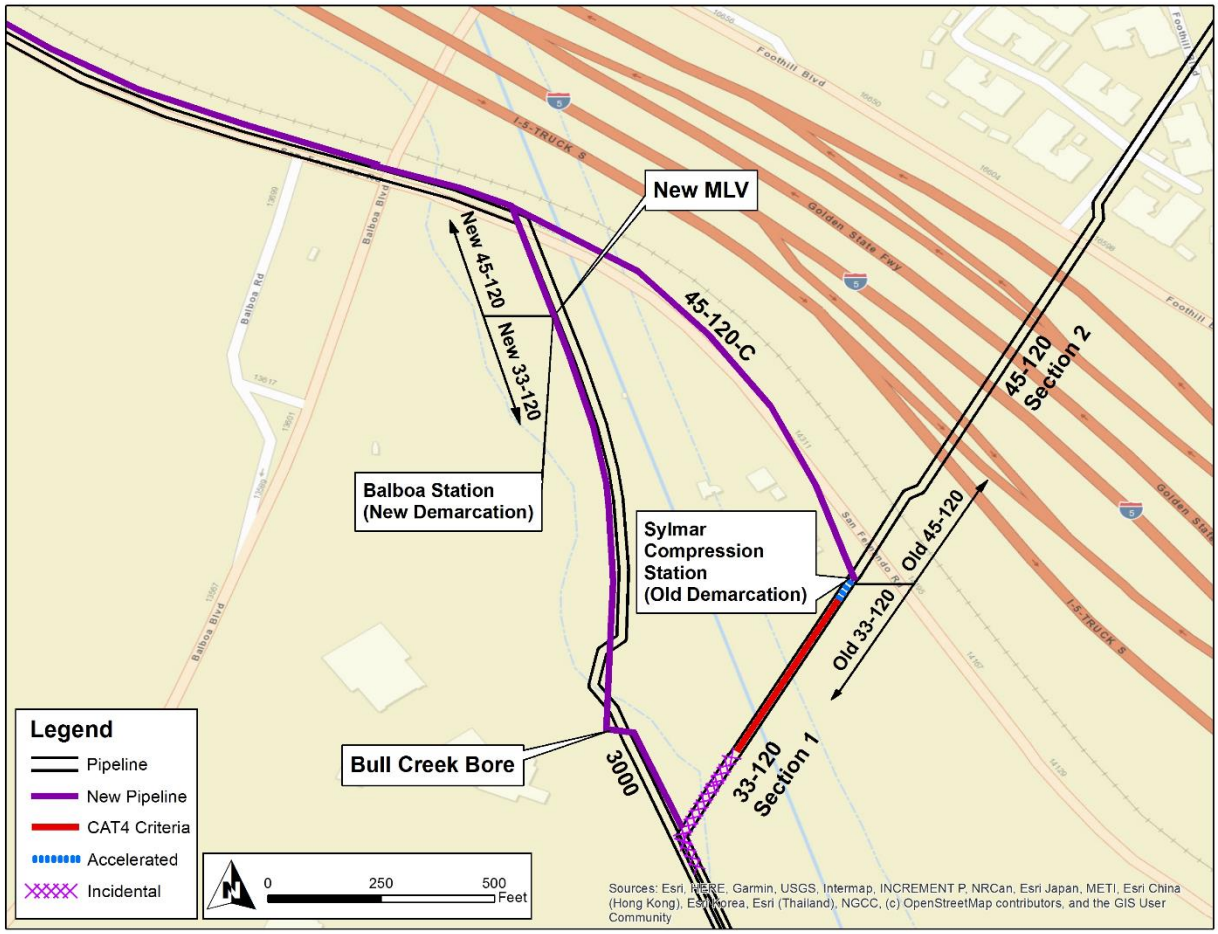


Figure 3: Overview Map of Supply Line 33-120 Section 1 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[4]	Incidental	New	Total[5]
Final Mileage	0.071 mi.	0.008 mi.	0.044 mi.	0.117 mi.	0.240 mi.
	374 ft.	41 ft.	232 ft.	620 ft.	1,267 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[6] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 33-120 as a Phase 1A Replacement Project comprised of 0.387 miles of Category 4 Criteria pipe and 0.865 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 0.316 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project starts near San Fernando Road and ties into the existing Supply Line 33-120 within a MWD facility.
   b. The rerouted pipeline design utilized a jack and bore to cross under Bull Creek within a MWD facility.

[4] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[5] Values may not add to total due to rounding.
[6] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

c. Supply Line 33-120 Section 1 was designed with the PSEP Supply Line 45-120 Section 2 Replacement Project as an overall reroute since they are geographically and operationally connected sections.
d. The Project Team included Accelerated and Incidental mileage to accommodate the rerouted alignment.

4. Final Project Scope: The final project scope consists of a 0.240 mile Replacement and one mainline valve. The Accelerated mileage consists of 41 feet of Phase 1B pipe and 232 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 33-120 Section 1 and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas has already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for in-line inspection, likely have non-state-of-the-art welds, and would require significant investment for retrofitting to accommodate in-line inspection tools.

Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost

effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut in.
2. Customer Impacts: Customer service was maintained utilizing a stopple fitting and compressed natural gas (CNG).
3. Community Impacts: Project work completed within the Metropolitan Water District property required additional security review prior to entrance. The Project Team coordinated with the MWD during construction to maintain uninterrupted access for shipments of chemicals critical for MWD operations.
4. Piggability: Non-piggable.
5. Pipe Vintage: 1930.
6. Existing Pipe Attributes: Multiple diameters and an unbarred tee.
7. Longseam Type: Unknown.
8. Longseam Repair History: No identified issues.
9. Condition of Coating: No identified issues.
10. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the line could be shut in.
2. Customer Impact: Per the RER, customer service was maintained utilizing a stopple fitting and CNG.
3. Community Impact: Project work completed within MWD property required additional security review prior to entrance. The Project Team coordinated with the MWD during construction to maintain uninterrupted access for shipments of chemicals critical for MWD operations.
4. Diameter Changes: The Project Team replaced the existing [redacted] line with a [redacted] line to standardize the pipeline for future piggability purposes.
5. Constructability: The rerouted pipeline design utilized a jack and bore to cross under Bull Creek within a MWD facility.
6. Schedule Coordination: The Project Team coordinated design and construction with the adjacent PSEP Supply Line 45-120 Section 2 Replacement Project since Supply Line 33-120 and Supply Line 45-120 are geographically and operationally connected sections.
7. Known Substructures: Potholing information during design did not identify any unknown substructures.
8. Permit Conditions: The Project Team identified multiple jurisdictional agencies that included:
   a. MWD.
   b. City of Los Angeles Department of Water and Power.
   c. Regional Water Quality Control Board.
   d. Los Angeles County Fire Department.
   e. California Department of Fish and Wildlife (CDFW).
   f. Los Angeles Bureau of Engineering (LA BOE).
9. Land Use: A laydown yard was shared with the Supply Line 45-120 Section 2 Replacement Project.

10. Environmental: The Project is located near an environmentally sensitive area and the Project Team identified multiple environmental requirements.
    a. CDFW permit for debris, waste, or any other material that could pass into Bull Creek.
    b. Storm Water Pollution Prevention Plan (SWPPP).
    c. Typical abatement activities for tie-in pipe removal.
11. Valves: One [redacted] MLV and bridle assembly was replaced.
12. Tie-In: The Project Team relocated the demarcation of Supply Line 45-120 and Supply Line 33-120 from Sylmar Compressor Station to Balboa Station in order to abandon an existing span over a creek.

D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. As part of the piggablity enhancements for this Project, the Project Team added a new [redacted] valve to accommodate future In-Line Inspection.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	09/18/2017
Construction Completion Date	07/19/2018
NOP Date	12/21/2017

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Driving Sheet Piling

Figure 5: Welding Support Beams for Entry Bore Pit

Figure 6: New Pipe Lowered into Trench

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Land Use: A laydown yard was shared with the Supply Line 45-120 Section 2 Project.
2. Construction Execution:
   a. The Project Team changed the excavation plan to remove the use of shoring in some locations.
   b. The Project Team combined tie-in and post completion Hydrotest activities with the adjacent Supply Line 45-120 Section 2 Replacement Project. This reduced the inspection and Project Field Team personnel, provided shared logistics, and consolidated communication with the local jurisdiction inspection representatives.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $12,513,922. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $12,484,119.

Table 4: Estimated and Actual Direct Costs and Variances[7]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	910,226	470,566	(439,660)
Materials	519,727	505,555	(14,172)
Construction Contractor	5,580,533	4,527,327	(1,053,206)
Construction Management & Support	513,894	705,195	191,301
Environmental	781,238	424,602	(356,636)
Engineering & Design	1,555,303	1,894,136	338,833
Project Management & Services	816,047	569,964	(246,083)
ROW & Permits	146,739	181,529	34,790
GMA	1,690,215	1,175,790	(514,425)
Total Direct Costs	**12,513,922**	**10,454,665**	**(2,059,257)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[8]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,309,104	1,133,632	(175,473)
AFUDC	741,259	791,575	50,316
Property Taxes	16,795	104,248	87,453
Total Indirect Costs	**2,067,158**	**2,029,454**	**(37,704)**
Total Direct Costs	**12,513,922**	**10,454,665**	**(2,059,257)**
Total Loaded Costs	**14,581,080**	**12,484,119**	**(2,096,961)**

[7] Values may not add to total due to rounding.
[8] Ibid.

The Actual Full-Time Equivalent[9] (FTE) for this Project is 0.94.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 33-120 Section 1 Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $2,059,257. This variance can be attributed to several factors including: the Project Team combined tie-in and post-completion hydrotest activities with the adjacent Supply Line 45-120 Section 2 Replacement Project. This reduced inspection and Project Field Team personnel, provided shared logistics, and consolidated communication with local jurisdiction inspection representatives; after discussions with the Metropolitan Water District, it was determined the project would likely require a review pursuant to the California Environmental Quality Act (CEQA). To account for this extensive effort, the

[9] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

Project Team initially estimated an environmental cost increase. However, after continued review and discussions with MWD, it was later determined to not be as significant of an endeavor, resulting in lower environmental costs; it was initially assumed Company labor would handle project management duties, however multiple activities were performed by third-party contractors; finally, the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

The scope of the Line 33-120 Section 1 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 33-120 Section 1 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.240 miles of pipeline and one mainline valve in the City of Los Angeles. The total loaded cost of the Project is $12,484,119.

SoCalGas executed this project prudently by completing the design with the PSEP Supply Line 45-120 Section 2 Replacement Project as an overall reroute since they are geographically and operationally connected sections.

SoCalGas engaged in prudent cost avoidance efforts by coordinating with a customer outage to avoid the need of providing CNG support, and sharing a laydown yard with the PSEP Supply Line 45-120 Section 2 Replacement Project.

End of Supply Line 33-120 Section 1 Replacement Project Final Report

I. SUPPLY LINE 36-1032 SECTION 4 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 36-1032 Section 4 is a [redacted] diameter pipeline that runs approximately 0.3 miles along Highway 1 near the Lompoc Airport and across the Santa Ynez River. The pipeline is primarily routed across a Class 3 location and traverses some Class 1 locations. This report describes the activities associated with Supply Line 36-1032 Section 4 Replacement Project which consists of the replacement of 0.307 miles of pipeline using horizonal directional drill (HDD) across the Santa Ynez River. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $6,105,956.

SoCalGas separated the Supply Line 36-1032 Project into four separate projects: Supply Line 36-1032[1] Sections 1, 2, 3, and 4 for project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline.

[1] Supply Line 36-1032 Replacement Project was submitted for reasonableness review in A.16-09-005 and were approved in D.19-02-004.

Table 1: General Project Information

Project Name	**Supply Line 36-1032 Section 4**		
Project Type	Replacement		
Length	0.307 miles		
Location	Lompoc		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1953		
Construction Start	07/10/2017		
Construction Finish	09/28/2017		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	6,105,956	-	6,105,956
Disallowed Costs	-	-	-

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 36-1032 Section 4 Replacement Project

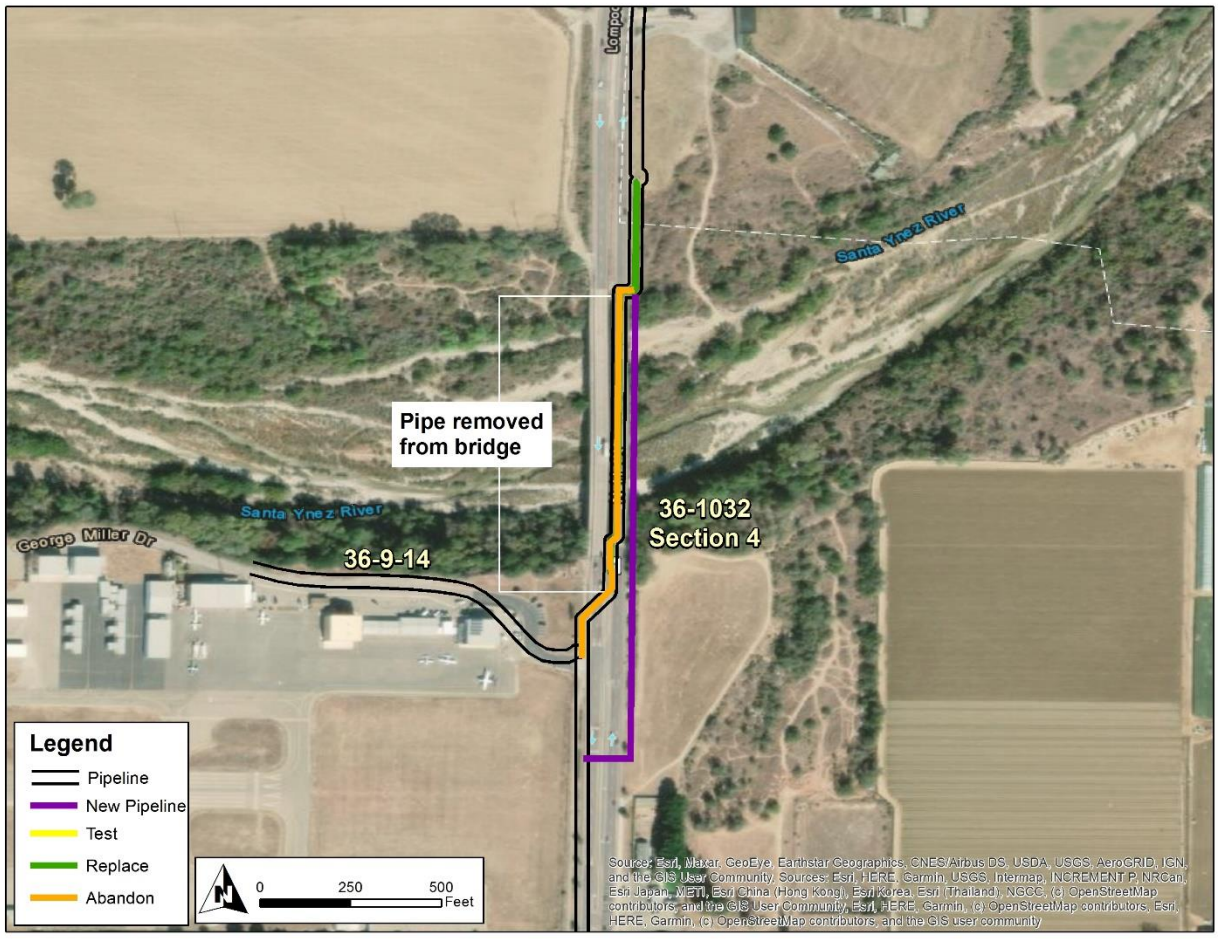
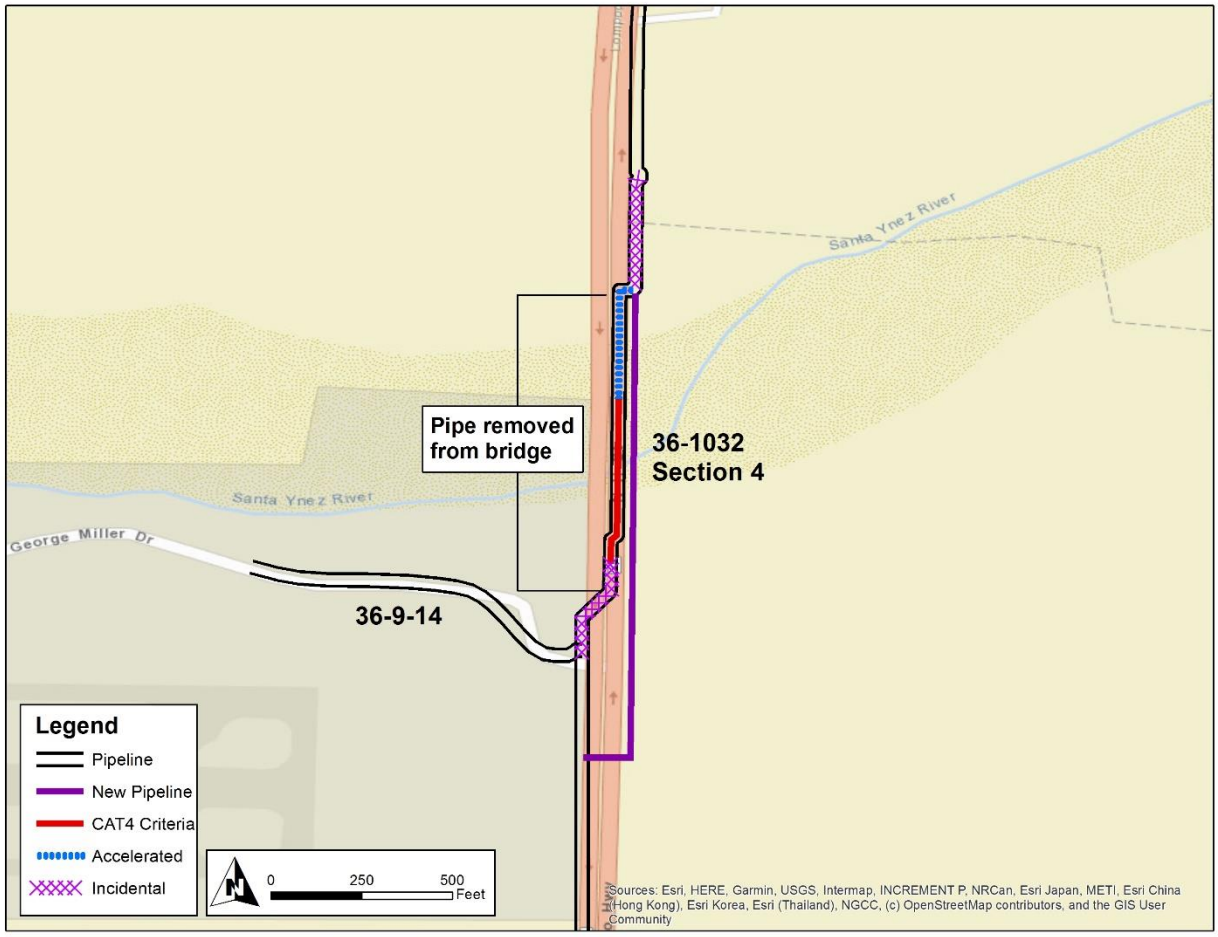


Figure 2: Overview Map of Supply Line 36-1032 Section 4 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Final Mileage	0.093 mi.	0.057 mi.	0.094 mi.	0.064 mi.	0.307 mi.
	489 ft.	299 ft.	495 ft.	337 ft.	1,620 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[5] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 36-1032 as a Phase 1A Hydrotest Project comprised of 1.165 miles of Category 4 Criteria pipe and 0.390 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 1.072 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team utilized HDD to cross the Santa Ynez River.
   b. The Project Team utilized a slick bore to cross Highway 1 adjacent to the Lompoc Airport.

[3] Accelerated mileage includes Phase 2A. Phase 2A includes pipelines without sufficient record of a pressure test in less populated areas. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

c. Caltrans required the removal of approximately 778 feet of existing pipeline hanging under the Highway 1 bridge crossing the Santa Ynez River.
d. Accelerated mileage and Incidental mileage was included for constructability purposes related to the HDD to cross the Santa Ynez River.

4. Final Project Scope: The final project scope consists of a 0.307 mile Replacement. The Accelerated mileage consists of 299 feet of Phase 2A pipe and 495 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 36-1032 Section 4 and confirmed the project design should commence as a Replacement Project.

Segments of less than 1,000 feet are identified for replacement under the approved PSEP Decision Tree because, for short segments of pipe, the logistical costs associated with pressure testing (for example, permitting, construction, water handling, and service disruptions for a non-looped system) can approach or exceed the cost of replacement. In such circumstances, replacement affords a more cost-effective approach to achieving compliance with D.11-06-017 while providing equal safety enhancement benefits. Moreover, installation of the new segment can usually be performed while the existing service is maintained to customers, thereby avoiding service disruptions that may otherwise occur during pressure testing.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis that concluded the line could not be shut in and that customer service would need to be maintained utilizing CNG and pressure control fittings (PCFs).

2. Customer Impact: Pressure control fittings were utilized to maintain uninterrupted service on Supply Line 36-1032. CNG was utilized to maintain service on Supply Line 36-9-14 for the airport customer tap.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1953.
5. Existing Pipe Attributes: Multiple diameters.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.
10. Constructability: Caltrans required the removal of approximately 778 feet of existing pipeline hanging under the Highway 1 bridge crossing the Santa Ynez River.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review analysis that concluded the line could not be shut in and that customer service would need to be maintained utilizing CNG and PCFs.
2. Customer Impact: Pressure control fittings were utilized to maintain uninterrupted service on Supply Line 36-1032. CNG was utilized to maintain service on Supply Line 36-9-14 for the airport customer tap.
3. Community Impact: Lane closures along Highway 1 were required to complete the HDD across the Santa Ynez River, slick bore across Highway 1, and tie-in.
4. Substructures: No substructures were identified within the excavation areas.
5. Permit Conditions:

a. The Project Team obtained permits from multiple agencies along the proposed alignment that included Caltrans, County of Santa Barbara, and the City of Lompoc.
b. Caltrans required the removal of approximately 778 feet of existing pipeline hanging under the Highway 1 bridge crossing the Santa Ynez River.

6. Land Use:
   a. Two laydown yards were utilized for HDD equipment and general fabrication and staging.
   b. One work space agreement and one permanent easement was also required.
7. Environmental:
   a. The Project Team identified permits for U.S. Army Corps of Engineers, Central Coast Regional Water Quality Control Board, and California Department of Fish and Wildlife.
   b. Removal of the existing pipeline across the Santa Ynez River had to occur between September 1 and November 1 to avoid bird nesting season and rainy season.
   c. The Project Team planned for typical abatement activities when removing existing pipe for tie-ins.
8. Reroute: The City of Lompoc's Engineer informed the Project Team that they would not grant a private easement for the realignment and HDD due to concerns regarding interference with a waterway. The Project Team shifted the proposed route and HDD from the City of Lompoc right of way (ROW) to the adjacent Caltrans ROW.
9. Valves: One valve was installed to replace an existing valve.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a construction contractor. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Bid (*confidential*): The Construction Contractor's bid was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	07/10/2017
Construction Completion Date	09/28/2017
NOP Date	08/23/2017

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Setting Shoring Box

Figure 4: Checking for Leaks Before Start of Line Odorizing.

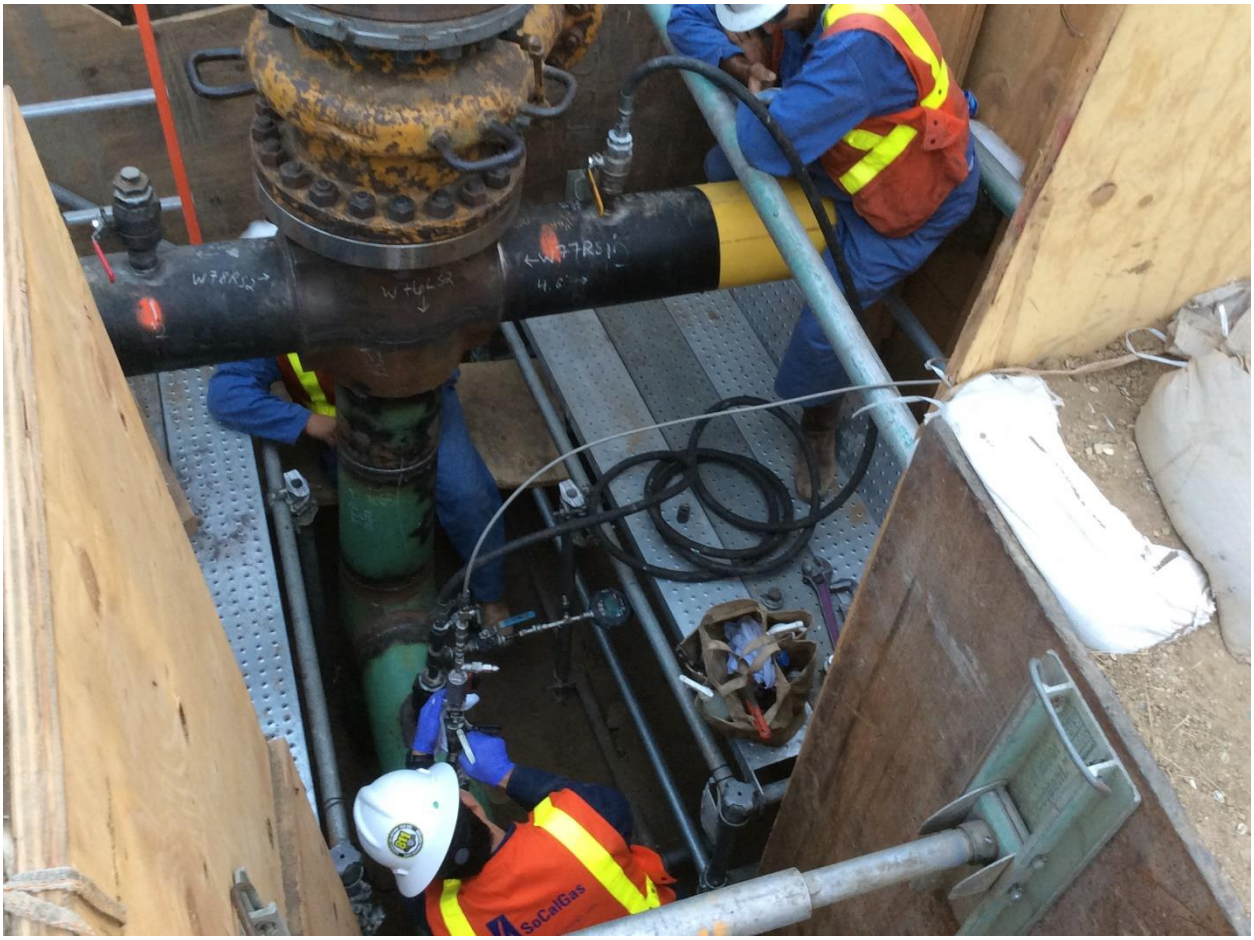


Figure 5: Abatement for Pipe Removal of Santa Ynez River Bridge.

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Scope Change: During gas handling, the Project Team removed the planned installation of a bypass to reduce the number of PCF installations without impacting service to customers.
2. Water Management: Utilized water for dust control.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $6,482,482. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $6,105,956.

Table 4: Estimated and Actual Direct Costs and Variances[6]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	285,554	182,204	(103,350)
Materials	357,308	140,288	(217,020)
Construction Contractor	2,489,529	2,376,403	(113,126)
Construction Management & Support	645,695	238,494	(407,201)
Environmental	489,694	268,922	(220,772)
Engineering & Design	996,722	1,084,724	88,002
Project Management & Services	206,354	387,289	180,935
ROW & Permits	378,000	99,368	(278,633)
GMA	633,626	620,244	(13,382)
Total Direct Costs	**6,482,482**	**5,397,935**	**(1,084,547)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[7]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	497,804	494,581	(3,223)
AFUDC	851,407	187,219	(664,188)
Property Taxes	189,186	26,220	(162,966)
Total Indirect Costs	**1,538,397**	**708,020**	**(830,377)**
Total Direct Costs	**6,482,482**	**5,397,935**	**(1,084,547)**
Total Loaded Costs	**8,020,879**	**6,105,956**	**(1,914,923)**

The Actual Full-Time Equivalent[8] (FTE) for this Project is 0.52.

[6] Values may not add to total due to rounding.
[7] Ibid.
[8] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 36-1032 Section 4 Replacement Project, Actual Direct Costs were less than the preliminary estimate by $1,084,547. This variance can be attributed to a variety of factors including: During detailed design the Project Team successfully eliminated the need for PCF installations and the [redacted] bypass, resulting in reduced construction and construction management costs; the project initially included easement costs associated with the realignment and HDD taking place on private property, but these were refined due to concerns with the potential interference of a waterway. The Project Team shifted the proposed route and HDD to an adjacent Caltrans ROW and the easement was no longer required; Environmental activities to address any potential endangered species encounters and contaminated soil were anticipated but neither issue occurred; preliminary design included two [redacted] bridle valves and a blowdown valve, but as the project continued through detailed design it was determined to no longer be required and removed from scope.

E. Disallowance

The scope of the Line 36-1032 Section 4 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 36-1032 Section 4 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.307 miles of pipeline in the City of Lompoc. The total loaded cost of the Project is $6,105,956.

SoCalGas executed this project prudently through the replacement of pipeline using HDD across the Santa Ynez River.

SoCalGas engaged in prudent cost avoidance efforts by efficiently managing the number of PCF installations without impacting service to customers, and utilizing water for dust control.

End of Supply Line 36-1032 Section 4 Replacement Project Final Report

I. SUPPLY LINE 36-9-09 NORTH SECTIONS 5B-02 AND 5C REPLACEMENT PROJECT

A. Background and Summary

The Supply Line 36-9-09 North Section 5B-02 and 5C Replacement Project is a rerouted alignment of a [redacted] diameter supply line that runs approximately 0.9 miles parallel to Highway 101, adjacent to a public sports complex owned by the City of Pismo Beach, and crossing a railroad right of way (ROW). The pipeline runs through both commercial and residential neighborhoods in the City of Pismo Beach. This report describes the activity associated with the Supply Line 36-9-09 North Section 5B-02 and 5C Replacement Project that consists of a replacement and reroute of 0.894 miles of pipeline within the city franchise to improve accessibility for routine maintenance and emergency response, two horizontal directional drills (HDDs), the installation of a regulator station, and removal of an existing span. The total loaded cost of the Project is $13,741,772.

The Supply Line 36-9-09 North 5B-02 and 5C Replacement Project is a component of Supply Line 36-9-09 North, which was identified in the 2011 PSEP filing[1] as a 16.016 mile replacement project. The pipeline is located in the cities of Atascadero, San Luis Obispo, Pismo Beach, and Arroyo Grande. For project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline, SoCalGas divided Supply Line-36-9-09 North into several project sections to be managed individually (see Figure 1). Two key reasons drove the decision to manage the work on Supply Line 36-9-09 North in this manner; the sections were in different locations and physically separated from each other by non-PSEP segments of pipeline, and the project scopes (hydrotesting, replacement, or abandonment) differed among the sections and had differing permit acquisition timelines. Additionally, the entire length of Supply Line 36-9-09 North was made up of varying pipe diameters. SoCalGas standardized the pipeline diameter to make the pipeline piggable.

[1]See Amended December 2, 2011 Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E.

Table 1: General Project Information

Project Name	**Supply Line 36-9-09 North Section 5B-02**		
Project Type	Replacement		
Length	0.278 miles		
Location	Pismo Beach		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1932		
Construction Start	11/13/2018		
Construction Finish	03/20/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Name	**Supply Line 36-9-09 North Section 5C**		
Project Type	Replacement		
Length	0.617 miles		
Location	Pismo Beach		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1932		
Construction Start	12/12/2016		
Construction Finish	03/24/2016		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[3] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	13,741,772	-	13,741,772
Disallowed Costs	-	-	-

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[3] Ibid.

B. Maps and Images

Figure 1: Map of Supply Line 36-9-09 North PSEP Projects

Figure 2: Satellite Image of Supply Line 36-9-09 North Sections 5B-02 and 5C Replacement Project

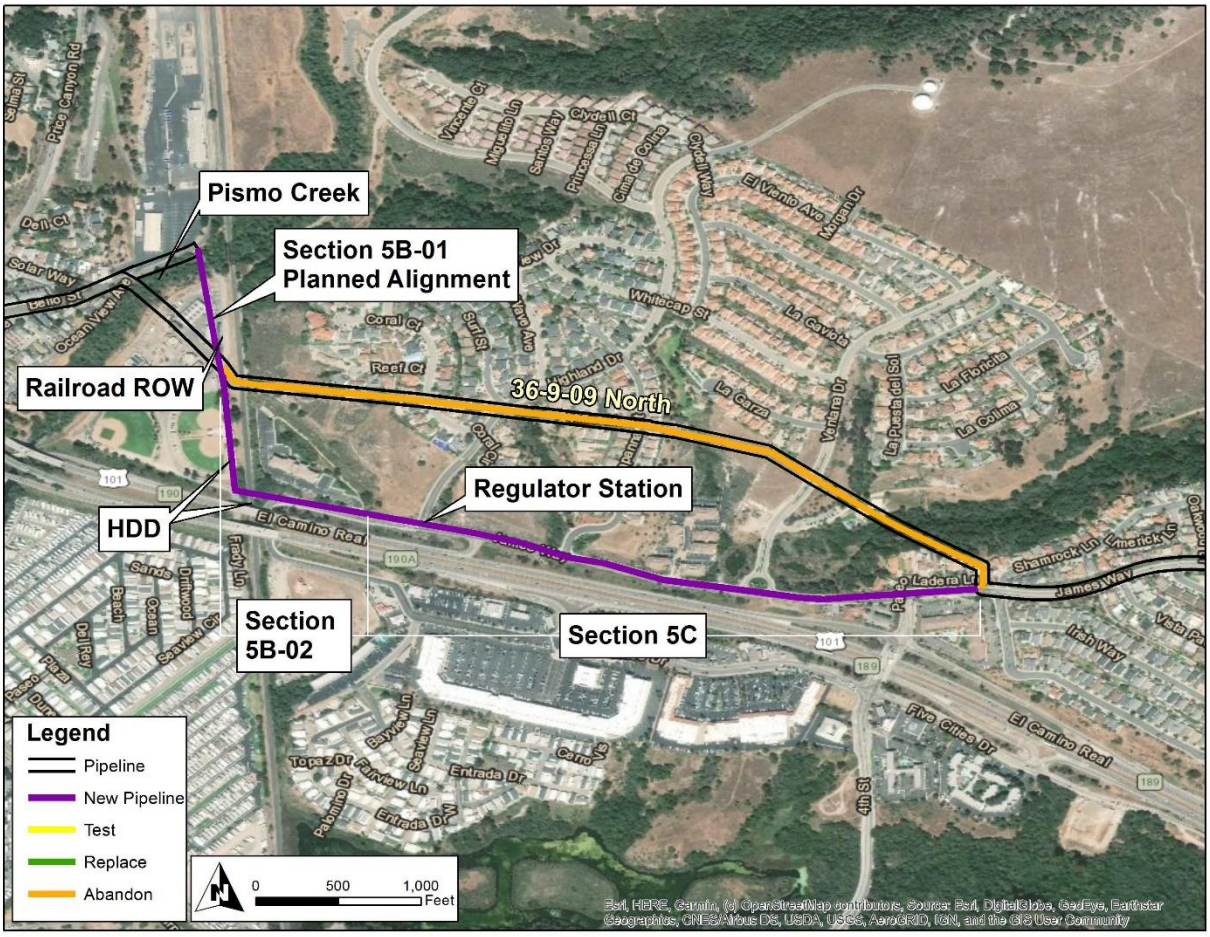
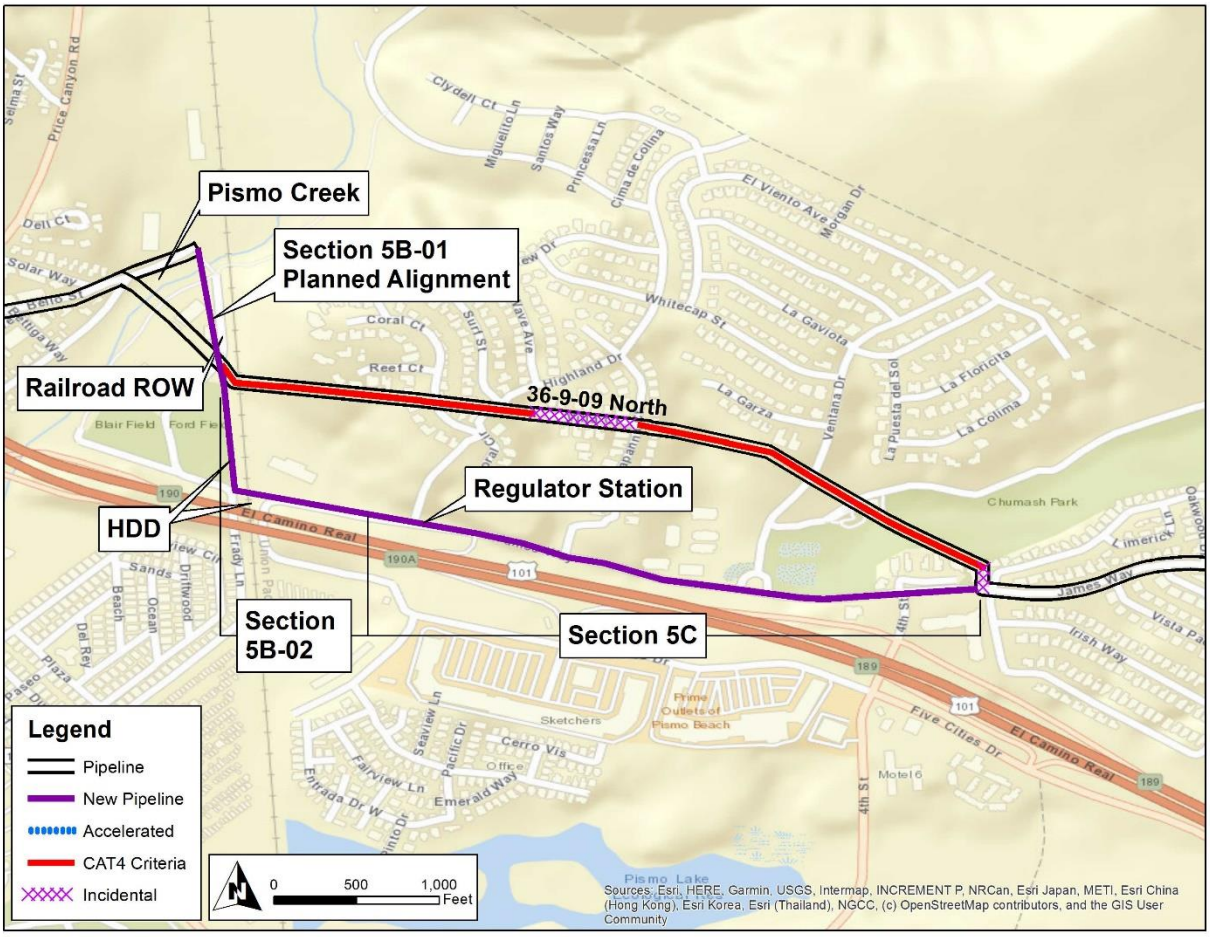


Figure 3: Overview Map of Line 36-9-09 North Sections 5B-02 and 5C Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information[4]

	Criteria	Accelerated	Incidental	New	Total[5]
Section 5B-02	0.670 mi.	0 mi.	0.161 mi.	0 mi.	0.278 mi.
	3,536 ft.	0 ft.	848 ft.	0 ft.	1,466 ft.
Section 5C	0 mi.	0 mi.	0.617 mi.	0 mi.	0.617 mi.
	0 ft.	0 ft.	3,257 ft.	0 ft.	3,257 ft.
Total Final Mileage	0.670 mi.	0 mi.	0.777 mi.	0 mi.	0.894 mi.
	3,536 ft.	0 ft.	4,105 ft.	0 ft.	4,723 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing. Prior to initiating execution of the Project in 2016, SoCalGas and SDG&E reviewed existing pipeline records to validate the scope of the project. During the Engineering, Design and Planning phase, SoCalGas and SDG&E further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: Supply Line 36-9-09 North was identified as a Phase 1A replacement project comprised of 9.662 miles of Category 4 Criteria pipe and 6.354 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 8.802 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. SoCalGas initially scoped Supply Line 36-9-09 North Section 5 as a single project; however, due to long lead permitting delays and constructability issues, the Project

[4] Total mileage of the completed project differs from the mileage of the pipe addressed due to realignment of the pipeline route.
[5] Values may not add to total due to rounding.

Team decided that Supply Line 36-9-09 North Section 5 should be sectioned into 5A[6], 5B, and 5C.

b. Subsequently, the Project Team determined that Section 5B should be further split into two sections, 5B-01[7] and 5B-02, due to delays in the City of Pismo Beach's own construction plans along the proposed alignment for Section 5B.

c. The Project Team designed the Supply Line 36-9-09 North Section 5B-02 and 5C Projects as one continuous rerouted replacement in the City of Pismo Beach utilizing open trench and two HDD crossings.

4. Final Project Scope: The final project scope for Sections 5B-02 and 5C consists of a 0.894 mile rerouted replacement, replacement of one regulator station, and the abandonment of 0.855 miles of pipeline. The Incidental mileage consists of 0.779 miles of pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line Section 5B-02 and 5C and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation of federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas has already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for

[6] Supply Line 36-9-09 North Section 5A Replacement Projects was submitted for Reasonableness Review in the 2018 proceeding.

[7] Supply Line 36-9-09 North Section 5B-01 will be submitted for reasonableness review in a future proceeding.

in-line inspection, likely have non-state-of-the-art welds and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and with the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in.
2. Customer Impacts: The Project Team determined that service could be maintained to customers by utilizing pressure control fittings (PCFs) during the tie-in.
3. Community Impacts: The rerouted alignment of the pipeline along Frady Lane would impact traffic and usage of the sports complex and James Way.
4. Permit Conditions: The Project Team identified multiple permit agencies and requirements.
5. Piggability: Non-piggable.
6. Pipe Vintage: 1932.
7. Existing Pipe Attributes: Existing non-piggable plug valves and unbarred tees.
8. Longseam Type: Unknown.
9. Longseam Repair History: No identified issues.
10. Condition of Coating: No identified issues.

11. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Constructability:
   a. The Project Team initially scoped Supply Line 36-9-09 North Section 5 as a single project. Due to long lead delays and constructability issues for crossing Pismo Creek and railroad tracks, the Project Team determined that Supply Line 36-9-09 North Section 5 needed to be sectioned into 5A, 5B, and 5C, and project execution commenced on Sections 5A and 5C. The Project Team identified the following as potential delays:
      i. Existing fiber optic lines in close proximity to the train tracks that would require additional railroad oversight when work is performed adjacent to the tracks.
      ii. A geotechnical evaluation that revealed a risk of lateral movement in the event of an earthquake for the planned horizontal directional drill (HDD) crossing of Pismo Creek.
   b. The existing pipeline remained in service while the Project Team planned and designed Section 5B in accordance to the requirements set forth by the City of Pismo Beach.
   c. The Project Team determined that due to delays in the City of Pismo Beach's own construction plans in the proposed alignment for 5B, that it must be split into two sections, 5B-01 and 5B-02. The Project Team could move forward with project execution of 5B-02, while 5B-01 would need to wait until the City of Pismo Beach completed their construction project.

d. In order to address constructability issues and reduce community impact, the Project Team designed the Project with two HDD crossings. One to cross under a railroad ROW and the other was under an access road behind the nearby sports complex, avoiding the need to restrict access to the local community.

2. Reroute: Due to residential and commercial development that had occurred since the original installation of the pipeline in 1932, the Project Team determined that a rerouted alignment within the city franchise which runs alongside Highway 101 would improve accessibility for routine maintenance and emergency response.
3. Shut-In Analysis: The Project Team completed an RER analysis and concluded the line could be shut-in by using PCFs.
4. Customer Impact: The Project Team determined that utilizing a PCF will facilitate tying into the existing Supply Line 36-9-09 North without disruption of service. One regulator station would be replaced to maintain uninterrupted customer service.
5. Community Impact:
   a. The Section 5B-02 Project was designed to include one HDD to cross under an access road at the City of Pismo Beach's sports complex and reduce impacts to the sports complex's facilities.
   b. The Section 5C Project was designed to maintain two open lanes of traffic along James Way (parallel to Highway 101) during construction to minimize the impact to the community.
6. Permit Conditions: The Project Team identified multiple permit agencies and requirements:
   a. City of Pismo Beach required an encroachment permit that allowed for two lanes of traffic along James Way and curb to curb repaving of the roadway.
   b. Caltrans required an encroachment permit to close the northbound Highway 101 ramp near James Way.
   c. The Railroad required a permit for crossing ROW using an HDD.

7. Diameter Changes: The Project Team replaced the existing [redacted] line with a [redacted] line based on the recommendation of the RER and to standardize the pipeline for future piggability purposes.
8. Substructures: The Project Team identified multiple substructures within the proposed construction alignment by reviewing public records and completing pre-construction potholing.
9. Environmental: The Project Team planned for typical abatement activities.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design for Sections 5B-02 and 5C. Following completion of the engineering, design, and planning activities described above, the Project Team evaluated the scope of the projects and determined to execute construction of Section 5B-02 by utilizing competitive bids while executing Section 5C through the Performance Partner. SoCalGas awarded Section 5B-02 to the successful bidder.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], that was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Supply Line 36-9-09 North Section 5B-02	
Construction Start Date	11/13/2018
Construction Completion Date	03/20/2019
NOP Date	01/31/2019
Supply Line 36-9-09 North Section 5C	
Construction Start Date	12/12/2016
Construction Completion Date	03/24/2017
NOP Date	03/09/2017

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $654,000 in change orders.

Section 5B-02

1. Site Restoration: The City of Pismo Beach required extensive additional restoration work at the Sports Complex including replacement of the scoreboard.
2. Schedule Delay: Due to conditions encountered during construction, the duration of construction was extended by approximately eight weeks. Additional field support costs were incurred to support the completion of this project.
3. Constructability Issues: The Construction Contractor encountered ground water approximately eight feet below the grade that required additional activities to prevent the water from overflow and the trench from collapsing.

Section 5C

1. Site Restoration: The City of Pismo Beach permit requirement to repave the roadway from curb to curb from tie-in to tie-in was added by the City after the Construction Contractor submitted their estimate.
2. Substructures: A forced sewer main (FSM) encased in a 35-inch steel casing was not included in the plans provided by the City of Pismo Beach and was discovered during construction. The Project Team realigned the pipeline to avoid this sewer line.
3. Weather: Due to poor weather conditions, construction was delayed by 12 days.

Figure 6: Test Head and Material Staging at Sports Complex

Figure 7: Access Road Leading to James Way Horizontal Directional Drill Exit Pit

Figure 8: Excavation in Progress for James Way Horizontal Directional Drill Exit Pit

Figure 9: Applying Epoxy Coating to New Pipeline

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $16,093,296. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $13,741,772.

Table 4: Section 5B-02 and 5C Estimated and Actual Direct Costs and Variances[8]

Direct Costs ($)	Estimate	Actuals[9]	Delta Over/(Under)
Company Labor	897,232	458,128	(439,104)
Materials	571,353	388,481	(182,872)
Construction Contractor	8,518,269	5,582,388	(2,935,881)
Construction Management & Support	833,154	630,297	(202,857)
Environmental	600,119	402,340	(197,779)
Engineering & Design	1,501,215	2,382,953	881,738
Project Management & Services	867,513	283,440	(584,073)
ROW & Permits	508,739	424,314	(84,425)
GMA	1,795,702	1,270,447	(525,255)
Total Direct Costs	**16,093,296**	**11,822,788**	**(4,270,508)**

Table 5: Section 5B-02 and 5C Estimated and Actual Indirect Costs, Total Costs, and Variances[10]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,833,504	1,411,316	(422,188)
AFUDC	1,931,762	443,960	(1,487,802)
Property Taxes	424,709	63,019	(361,690)
Total Indirect Costs	**4,189,975**	**1,918,295**	**(2,271,680)**
Total Direct Costs	**16,093,296**	**11,822,788**	**(4,270,508)**
Total Loaded Costs	**20,283,271**	**13,741,083**	**(6,542,188)**

The Actual Full-Time Equivalents[11] (FTEs) for this Project are 1.32.

[8] Values may not add to total due to rounding.
[9] Actual Material and Construction Contractor costs exclude the cost of upsizing the pipe.
[10] Values may not add to total due to rounding.
[11] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 36-9-09 North Sections 5B-02 and 5C Replacement Project, Actual Direct Costs were less than the preliminary estimate by $4,270,508. This variance is attributable to a variety of factors including: detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors, and as a result, the Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted] environmental sensitivity and survey requirements were lower than originally expected, resulting in lower monitoring requirements during construction; and due to difficulties in confirming substructures and obtaining approvals from Union Pacific Railroad, a 1,200 foot section of pipeline replacement scope was redesigned, which reduced total permitting and land use costs.

E. Disallowance

The scope of the Line 36-9-09 North Sections 5B-02 and 5C Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 36-9-09 North Sections 5B-02 and 5C Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.894 miles of pipe in the City of Pismo Beach. The total loaded cost of the Project is $13,741,772.

SoCalGas executed this project prudently through installing 0.894 miles of pipeline in the City of Pismo Beach, including two HDD crossings to minimize impact to the community and a new regulator station.

SoCalGas engaged in prudent cost avoidance efforts by successfully negotiating site restoration alternatives with the City of Pismo Beach.

End of Supply Line 36-9-09 North Sections 5B-02 and 5C Replacement Project Final Report

I. SUPPLY LINE 36-9-09 NORTH SECTION 6B REPLACEMENT PROJECT

A. Background and Summary

Supply Line 36-9-09 North Section 6B is a predominantly [redacted] diameter transmission line that runs approximately 1.5 miles in Arroyo Grande, through residential neighborhoods, agricultural land, and commercial areas. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Supply Line 36-9-09 North Section 6B Replacement Project which consists of the replacement and reroute of 1.732 miles of pipeline using three horizontal directional drill (HDD) crossings, three flat slick bores along Alpine Street, and three flat bores along Valley Road. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $15,915,851.

The Supply Line 36-9-09 North Section 6B Replacement Project is a component of Supply Line 36-9-09-North, which was identified in the 2011 PSEP filing[1] as a 16.016 mile replacement project. The pipeline is located in the cities of Atascadero, San Luis Obispo, Pismo Beach, and Arroyo Grande. For project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline, SoCalGas divided Supply Line-36-9-09 North into several project sections to be managed individually (see Figure 1). Two key reasons drove the decision to manage the work on Supply Line 36-9-09 North in this manner; the sections were in different locations and physically separated from each other by non-PSEP segments of pipeline, and the project scopes (hydrotesting, replacement, or abandonment) differed among the sections and had differing permit acquisition timelines. Additionally, the entire length of Supply Line 36-9-09 North was made up of varying pipe diameters. SoCalGas standardized the pipeline diameter to make the pipeline piggable.

[1]See Amended December 2, 2011 Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E.

Table 1: General Project Information

Project Name	**Supply Line 36-9-09 North Section 6B**		
Project Type	Replacement		
Length	1.732 miles		
Location	Arroyo Grande		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1955		
Construction Start	10/23/2017		
Construction Finish	04/18/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	15,915,851	-	15,915,851
Disallowed Costs	-	-	-

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Map of Supply Line 36-9-09 North PSEP Projects

Figure 2: Satellite Image of Supply Line 36-9-09 North Section 6B Replacement Project

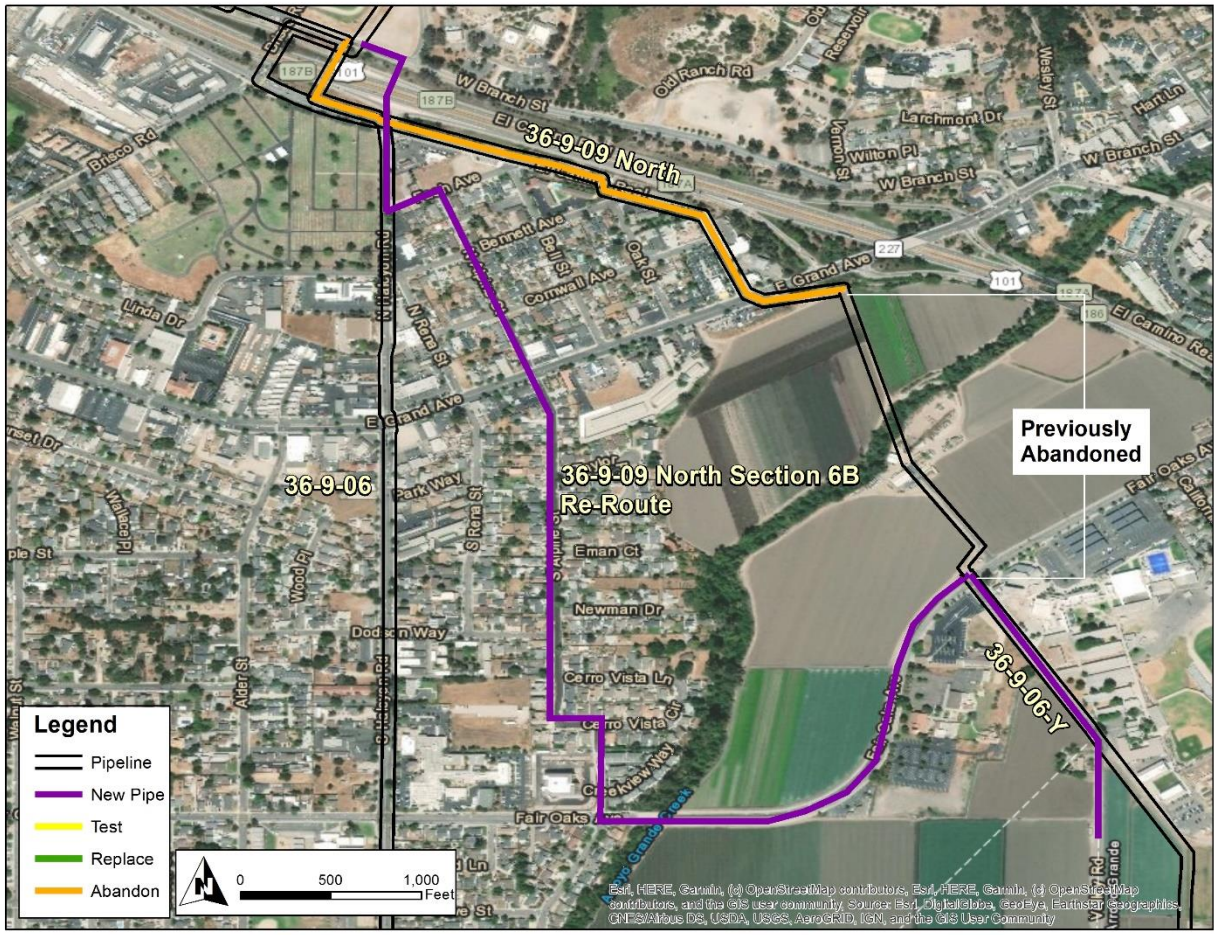
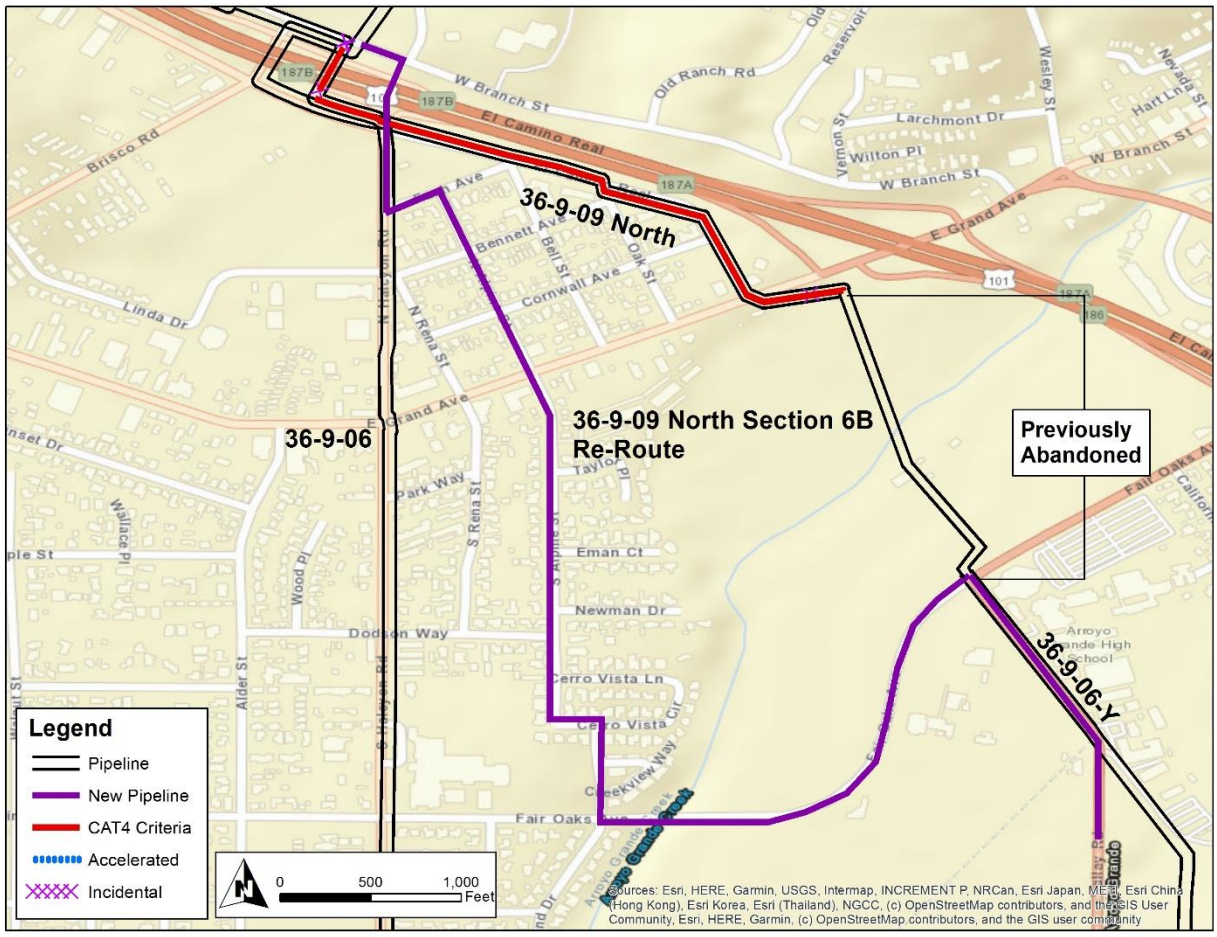


Figure 3: Overview Map of Supply Line 36-9-09 North Section 6B Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated	Incidental	New	Total[3]
Final Mileage	0.605 mi.	0 mi.	0.016 mi.	1.112 mi.	1.732 mi.
	3,192 ft.	0 ft.	82 ft.	5,871 ft.	9,145 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 36-9-09 North as a Phase 1A Replacement Project comprised of 9.662 miles of Category 4 Criteria pipe and 6.354 miles of Accelerated pipe. Supply Line 36-9-09 Section 6B is a section within that project.
2. Scope Validation: Due to the unique characteristics of the non-contiguous portions of the Project, SoCalGas successfully reduced the scope of the Project by 9.048 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project could not follow the existing alignment due to land owner concerns over the Project impacting farming operations resulting in a reroute of approximately 0.325 miles of pipe along Fair Oaks Avenue and Valley Road around this property.

[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. The reroute alignment was the best option the Project Team could obtain following negotiations with the City of Arroyo Grande.
c. Three HDD crossings were utilized for Highway 101, Grand Avenue, and culturally sensitive areas.
d. Three flat slick bores were utilized along Alpine Street to avoid plating for pedestrian safety.
e. Three flat bores were utilized along Valley Road to reduce the construction duration and complete work within the two week winter break of an adjacent high school.
f. Incidental mileage was included for the constructability of the reroute.

4. Final Project Scope: The final project scope consists of a 1.732 mile Replacement and 82 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 36-9-09 North Section 6B and confirmed the project design should commence as a Replacement Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line be shut-in during any season as long as the PG&E Morro Bay inter-tie is online and supplying the system during the winter season.
2. Customer Impacts: Customers impacted by the Project were transferred to the adjacent medium pressure system prior to the construction of the Project to prevent impacts and avoid CNG costs.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1955.
5. Existing Pipe Attributes: Multiple pipe diameters.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities including reviewing public records, potholing, and ground penetrating radar (GPR) of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded that the line could be shut-in during any season as long as the PG&E Morro Bay inter-tie is online and supplying the system during the winter season.
2. Customer Impact: Per the RER, customers impacted by the Project would be transferred to the adjacent medium pressure system prior to the construction of the Project to prevent impacts and avoid CNG costs.
3. Community Impact:

a. The Project required closure of one lane of the roadway and two way traffic was maintained using flaggers.
b. Residences along Alpine Street could experience occasional blocking of driveways. The Project Team coordinated with residents and communicated when the blockages would occur. The Project Team made adjustments as needed to minimize any inconveniences.
c. For the HDD crossing under Highway 101, a portion of Halcyon Road was closed and traffic was diverted around the site.
d. For installation of pipe on Faeh Avenue, the street was temporarily closed and traffic was diverted around the site.

4. Diameter Changes: The Project Team replaced the existing multiple diameter line with a [redacted] line to standardize the pipeline for future piggability purposes.
5. Schedule Coordination: Impacted customers were tied-over and converted to an adjacent medium pressure system prior to construction to avoid CNG costs.
6. Substructures: The Project Team initially planned to route the new pipeline along Halcyon Road to Fair Oaks Avenue. Following the completion of potholing, it was determined that it was too congested with existing substructures to install another pipeline within that corridor. This resulted in the rerouting along Alpine Street. Extensive potholing was completed along Alpine Street to confirm this route.
7. Permit Conditions: The Project Team identified multiple agencies along the proposed alignment that included:
   a. Caltrans Encroachment Permit.
   b. County of San Luis Obispo Encroachment Permit.
   c. Arroyo Grande Temporary Use Permit.
   d. Arroyo Grande Encroachment Permit. This permit contained a condition to repave Alpine Street.
8. Environmental:

a. Due to the cultural sensitivity of the Project area, the Project Team consulted with representatives of the Chumash Tribe to receive input on the final disposition of any findings during construction.
b. Potholing, slot trench efforts, and GPR was performed in the culturally sensitive areas. The Project Team determined that utilizing an HDD under the culturally sensitive areas would minimize impact.
c. A California Department of Fish and Wildlife (CDFW) permit was required for work on the Fair Oaks Avenue bridge crossing of Arroyo Grande Creek. The Project Team determined that using pipe hangers from the bridge would minimize impact to this environmentally sensitive area.
d. The Central Coast Regional Water Quality Control required that construction on the Fair Oaks Avenue bridge crossing of Arroyo Grande Creek be completed prior to November 30, as no construction activities could occur between December 1 and May 21.
e. The Project Team identified that a Storm Water Pollution Prevention Plan (SWPPP) would be required.

9. Reroute:
   a. Land owner concerns over the Project impacting farming operations resulted in a reroute along Fair Oaks Avenue and Valley Road around this property.
   b. Reroute along Brisco Road was required to cross Highway 101.
10. Tie-In: The southern tie-in location was relocated to existing easement space and the public ROW due to a land owner preventing the use of temporary workspace.

D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. The notable change in scope made after the preliminary cost estimate was developed and approved was to address the land owner concerns over the Project alignment impacting farming operations. The solution resulted in revisions and a reroute of approximately 0.325 miles of pipe along Fair Oaks Avenue and Valley Road around this private property.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered a competitive bidding process to select a construction contractor, that included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Bid (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/23/2017
Construction Completion Date	04/18/2018
NOP Date	04/09/2018

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 4: Pipe Strung Out Along Alpine Street

Figure 5: Pipe Being Lowered into Trench

Figure 6: Site Restoration / Repaved Street

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: Abandonment and tie over work was done prior to the replacement project to save on CNG costs and help with the tie over.
2. Water Management: Test water reused for dust mitigation.
3. Construction Execution:
   a. Flat slick bores were installed for safety and ease of construction through the intersection on Alpine and on Valley Road during the short holiday work period.
   b. During the pothole operations on Woodland Road, a [redacted] gas line was found to be off location. With the gas line plotted in the right location, the Construction Contractor was able to install the pipe over a large storm drain.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $14,972,448. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $15,915,851.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	887,368	465,393	(421,975)
Materials	410,520	432,628	22,108
Construction Contractor	7,514,367	7,241,400	(272,967)
Construction Management & Support	541,639	849,900	308,261
Environmental	902,029	631,368	(270,661)
Engineering & Design	1,286,606	2,047,791	761,185
Project Management & Services	1,609,174	562,299	(1,046,875)
ROW & Permits	263,637	159,884	(103,753)
GMA	1,557,108	1,533,271	(23,837)
Total Direct Costs	**14,972,448**	**13,923,934**	**(1,048,514)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,255,063	1,379,935	124,872
AFUDC	2,561,688	533,904	(2,027,784)
Property Taxes	574,748	78,078	(496,670)
Total Indirect Costs	**4,391,499**	**1,991,917**	**(2,399,582)**
Total Direct Costs	**14,972,448**	**13,923,934**	**(1,048,514)**
Total Loaded Costs	**19,363,946**	**15,915,851**	**(3,448,095)**

[5] Values may not add to total due to rounding.
[6] Ibid.

The Actual Full-Time Equivalents[7] (FTEs) for this Project are 1.05.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 36-9-09 North Section 6B Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $1,048,514. This variance can be attributed to several factors including: The Project Team utilized slick boring along Alpine and Valley Road for pedestrian safety and to avoid potential construction obstacles (i.e. street crown, traffic congestion) which expedited the completion of the project within the two week winter break timeframe; the project initially planned to use company labor for project management and engineering resources, however, these activities were ultimately completed with contractor support; the initial project assumed encountering culturally sensitive artifacts within the project area, and although the Project Team encountered

[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

minor findings, they were able to address and manage these items effectively to avoid project delays during construction; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design.

E. Disallowance

The scope of the Line 36-9-09 North Section 6B Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 36-9-09 North Section 6B Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 1.732 miles of pipeline. The total loaded cost of the Project is $15,915,851.

SoCalGas executed this project prudently by using three HDD crossings to avoid culturally sensitive areas and three flat slick bores along Alpine Street, and three flat bores along Valley Road.

End of Supply Line 36-9-09 North Section 6B Replacement Project Final Report

I. SUPPLY LINE 36-9-21 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 36-9-21 is a predominantly [redacted] diameter transmission line that runs approximately 0.464 miles from Paso Robles to Templeton along Vine Street, crossing Highway 101, through commercial areas in Paso Robles. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Supply Line 36-9-21 Replacement Project which consists of the replacement and reroute of 0.463 miles of pipeline that includes a horizontal directional drill (HDD) under Highway 101. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $6,796,200.

Table 1: General Project Information

Project Name	**Supply Line 36-9-21**		
Project Type	Replacement		
Length	0.464 miles		
Location	Paso Robles		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1950		
Construction Start	08/21/2017		
Construction Finish	11/15/2017		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	6,796,200	0	6,796,200
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 36-9-21 Replacement Project

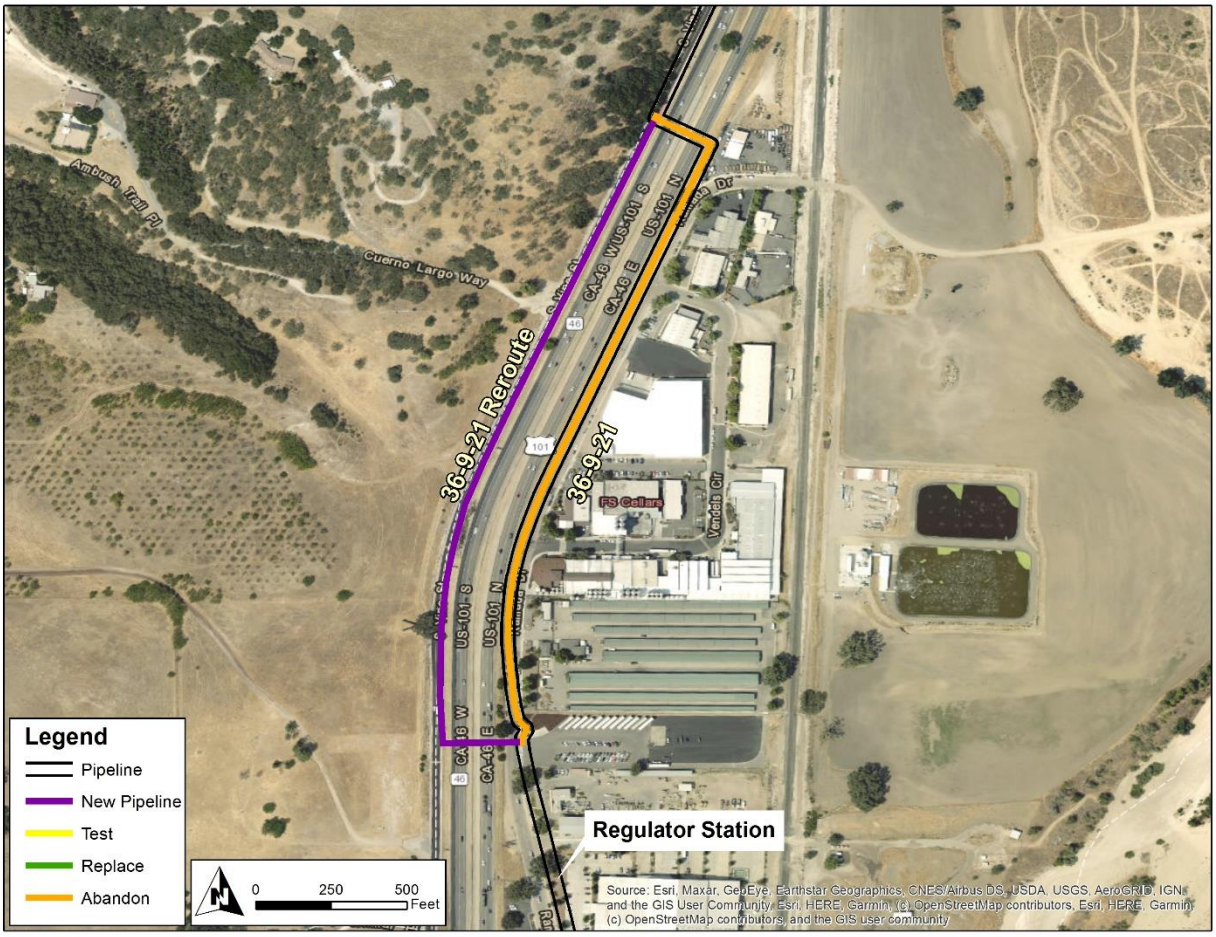
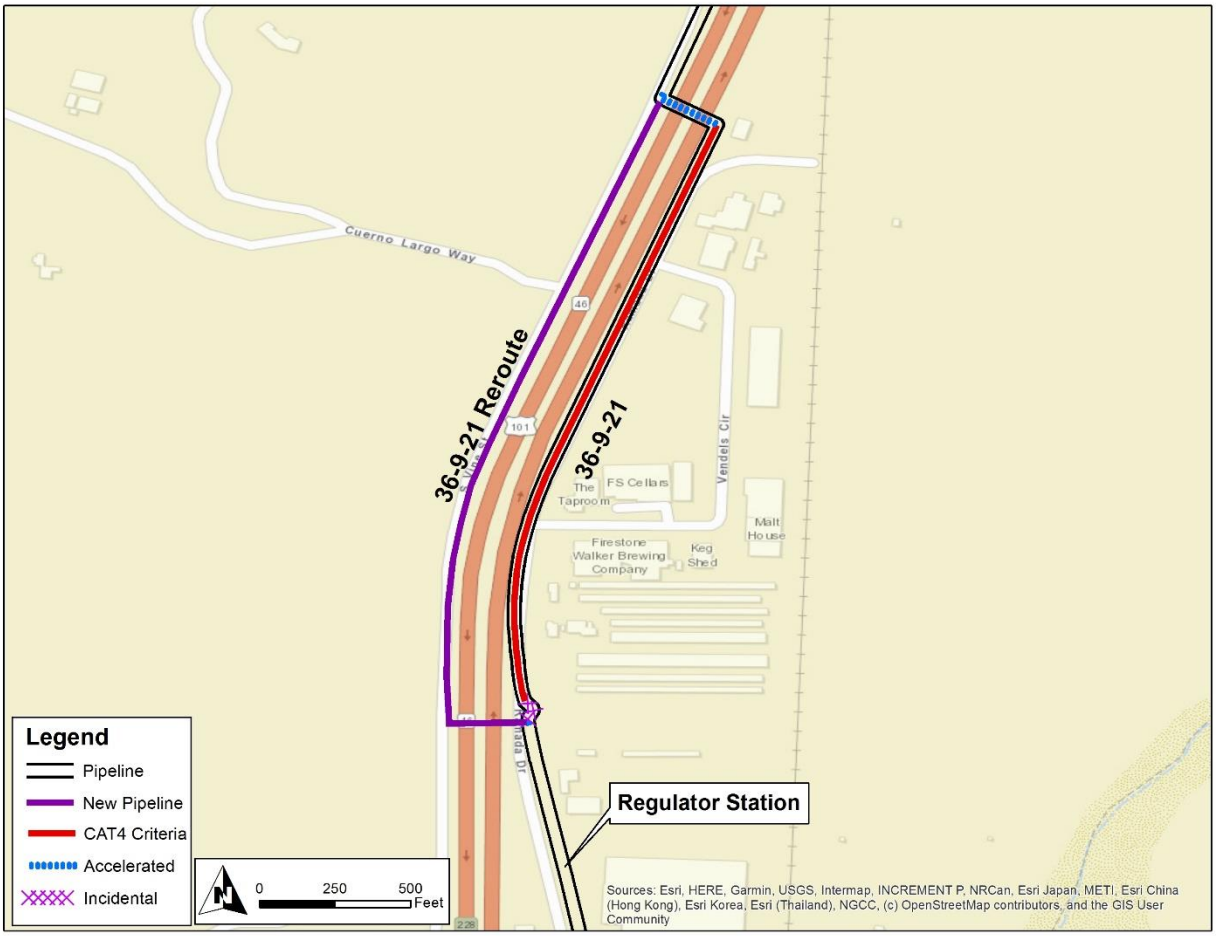


Figure 2: Overview Map of Supply Line 36-9-21 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[2]	Incidental	New	Total[3]
Final Mileage	0.387 mi.	0.042 mi.	0.016 mi.	0.020 mi.	0.464 mi.
	2,041 ft.	221 ft.	83 ft.	106 ft.	2,451 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 36-9-21 as a Phase 1A Replacement Project comprised of 0.389 miles of Category 4 Criteria pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas confirmed the scope of the Project of 0.389 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. To reduce impacts to local businesses, the Project Team installed the new pipeline along Vine Street as opposed to Ramada Drive where the existing pipeline was located.
   b. Accelerated mileage and Incidental mileage was included to facilitate the tie-in.

[2] Accelerated mileage includes Phase 2B pipe. Phase 2B includes pipelines without record of a pressure test to modern – Subpart J – standards (Phase 2B). The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

4. Final Project Scope: The final project scope consists of a 0.464 mile Replacement. The Accelerated mileage consists of 221 feet of Phase 2B pipe, and 83 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 36-9-21 and confirmed the project design should commence as a Replacement Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that there is no transmission line that feeds Supply Line 36-9-21 from the North so it cannot be shut-in. Utilizing a bypass would alleviate customer impacts during tie-in.
2. Customer Impacts: The Project Team identified that utilizing a bypass would alleviate customer impacts. The Project Team identified one customer within the replacement region; however, by utilizing the bypass, adequate pressure would be maintained without interrupting service to customers along Ramada Drive.

3. Community Impacts: Potential impact to local businesses resulted in a reroute of the original alignment from Ramada Drive to Vine Street.
4. Permit Conditions:
   a. The City of Paso Robles required an encroachment permit and traffic control. The city provided permit approval for mid-August 2017 to mid-November 2017 so that the Project Team could complete the Project prior to the holiday shopping season due to the proximity of shopping areas.
   b. A Caltrans encroachment permit was required for the HDD crossing of Highway 101.
5. Piggability: Non-piggable.
6. Pipe Vintage: 1950.
7. Existing Pipe Attributes: Multiple diameters.
8. Longseam Type: Unknown.
9. Longseam Repair History: No identified issues.
10. Condition of Coating: No identified issues.
11. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed an RER analysis and concluded that the line could be shut-in with the installation of a by-pass.
2. Customer Impact: Per the RER, two unutilized customer taps were abandoned. Further review confirmed that there were no active customer taps within the planned alignment. The Project Team maintained customer service utilizing stopple fittings.

3. Community Impact: Potential impact to local businesses resulted in a reroute of the original alignment from Ramada Drive to Vine Street.
4. Diameter Changes: The Project Team replaced the existing [redacted] line with a [redacted] line based on the recommendation of the RER and to standardize the pipeline for future piggability purposes.
5. Substructures: The Project Team identified multiple utilities prior to construction and included them in the Project design.
6. Permit Conditions: Negotiations with the City of Paso Robles yielded less repaving work.
7. Land Use: Landowner concerns at the northern end of Ramada Drive prevented the tie-in to the existing Highway 101 crossing, resulting in the relocation of the HDD under Highway 101 to the southern end of the Project.
8. Environmental: The Project Team planned for typical abatement activities when removing existing pipe for tie-ins.
9. Reroute: Potential impact to local businesses resulted in a reroute of the original alignment from Ramada Drive to Vine Street. Landowner concerns at the northern end of Ramada Drive also prevented the tie-in to the existing Highway 101 crossing, resulting in the relocation of the HDD under Highway 101 to the southern end of the Project.
10. Coupons: The Project Team conducted an examination study to confirm the existing pipe was within PSEP scope.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	08/21/2017
Construction Completion Date	11/15/2017
NOP Date	10/19/2017

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Trenching Along Vine Street

Figure 4: PCF Connecting the Old and New Pipeline

Figure 5: Preparation for the HDD Across Highway 101

Figure 6: Back Reamer for HDD

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Water Management: Water sourcing was negotiated with the city and the project was allowed to use a nearby fire hydrant for hydrotest.
2. Future Maintenance: The Project Team removed an existing mainline valve (MLV) after confirming it was no longer needed for system isolation.
3. Permit Conditions: Negotiations with the City of Paso Robles yielded less repaving work. The city required the project to repave only up to the center line on the road of Vine Street as opposed to the entire width.
4. Construction Execution: Prior to construction, the project design utilized a temporary bypass method at the tie-in points to maintain gas flow. During construction, the Project Team reevaluated the design to utilize simpler Pressure Control Fittings.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $6,895,764. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $6,796,200.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals[6]	Delta Over/(Under)
Company Labor	321,332	241,528	(79,804)
Materials	269,290	145,601	(123,689)
Construction Contractor	3,504,860	2,711,024	(793,836)
Construction Management & Support	254,703	292,996	38,293
Environmental	275,155	155,183	(119,972)
Engineering & Design	1,116,499	1,278,308	161,809
Project Management & Services	412,527	310,034	(102,493)
ROW & Permits	115,500	127,405	11,905
GMA	625,898	648,552	22,654
Total Direct Costs	**6,895,764**	**5,910,631**	**(985,133)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[7]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	628,634	597,259	(31,375)
AFUDC	398,874	256,151	(142,723)
Property Taxes	77,257	32,159	(45,098)
Total Indirect Costs	**1,104,765**	**885,569**	**(219,196)**
Total Direct Costs	**6,895,764**	**5,910,631**	**(985,133)**
Total Loaded Costs	**8,000,529**	**6,796,200**	**(1,204,329)**

[5] Values may not add to total due to rounding.
[6] Actual Material and Construction Contractor costs exclude the cost of upsizing the pipe.
[7] Values may not add to total due to rounding.

The Actual Full-Time Equivalent[8] (FTE) for this Project is 0.50.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 36-9-21 Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $985,133. This variance can be attributed to several factors including: the removal of the tie-in assembly and the implementation of a pressure control fitting (PCF) design significantly reduced the labor required for gas handling; the project utilized a PCF for the tie-in instead of the planned tie-in assembly, significantly lowering costs, receiving a credit for minimizing work at the tie-in, reducing field overhead, and eliminating the need to excavate a driveway, which further reduced costs associated with additional excavation, shoring, backfill, and paving; the water from the hydrotest was reused by a business along the project route, eliminating the need for transportation and disposal; the

[8] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

Project Team initially considered the cost of obtaining an easement from a nearby landowner, but instead adjusted the alignment and avoiding this expense; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

The scope of the Line 36-9-21 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 36-9-21 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.464 miles of pipeline in Paso Robles. The total loaded cost of the Project is $6,796,200.

SoCalGas executed this project prudently through replacement and reroute along Vine Street that included an HDD under Highway 101.

SoCalGas engaged in prudent cost avoidance efforts by removing a MLV no longer needed for system isolation, negotiating less repaving work with the city, and utilizing PCF bottom out fittings as opposed to a temporary bypass.

End of Supply Line 36-9-21 Replacement Project Final Report

I. SUPPLY LINE 37-18-K REPLACEMENT PROJECT

A. Background and Summary

Supply Line 37-18-K is a predominantly [redacted] diameter transmission line that runs approximately three miles along the heavily trafficked 190th Street from Flagler Lane to Crenshaw Boulevard, through residential neighborhoods and commercial areas within the City of Redondo Beach and City of Torrance. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with the Supply Line 37-18-K Replacement Project which consists of the replacement of two segments of pipeline totaling 1.928 miles and the installation of two mainline valves (MLVs). The post-completion pressure test was conducted in one continuous test rather than two, thus capturing approximately 950 feet of Incidental pipe avoiding the cost of two separate post-completion pressure tests. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $16,812,563.

Table 1: General Project Information

Project Name	Supply Line 37-18-K		
Project Type	Replacement		
Length	1.928 miles		
Location	City of Redondo Beach and City of Torrance		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1949		
Construction Start	03/05/2018		
Construction Finish	07/27/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	16,812,563	-	16,812,563
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 37-18-K Replacement Project

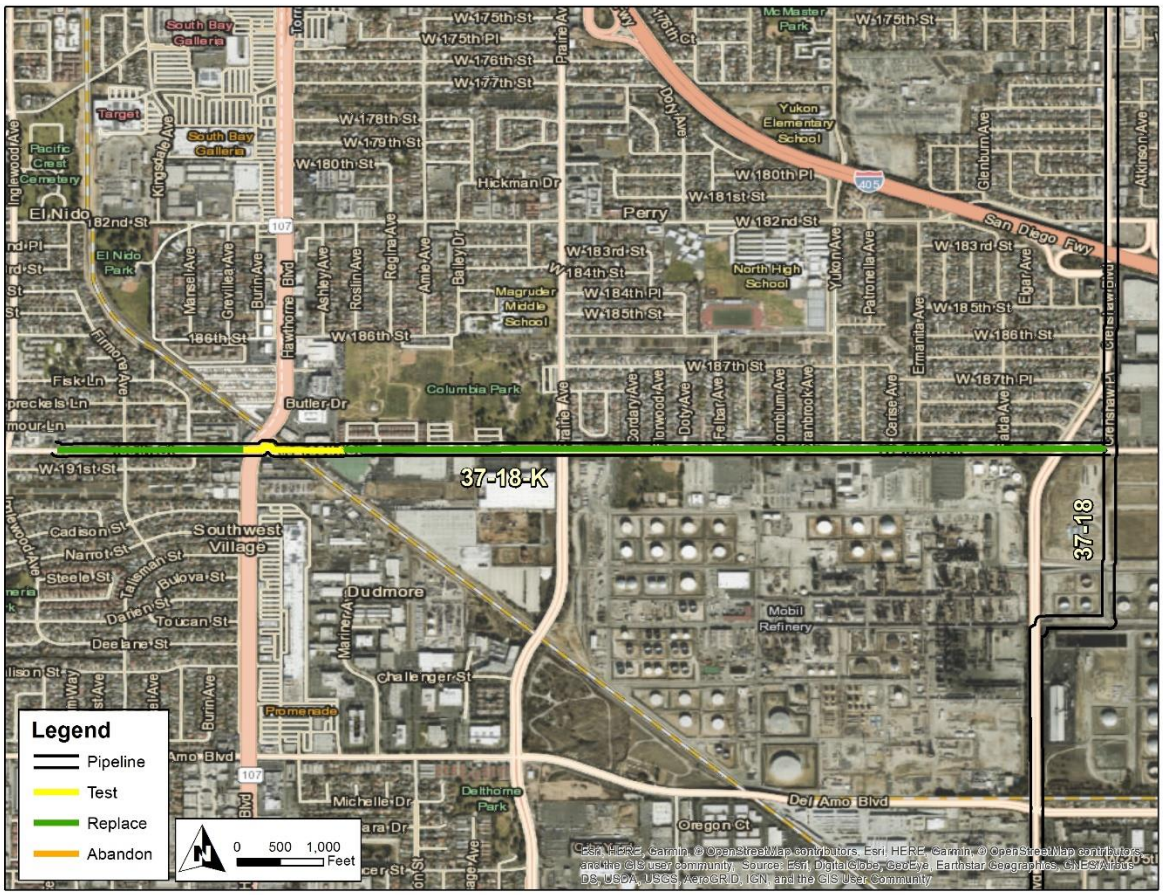
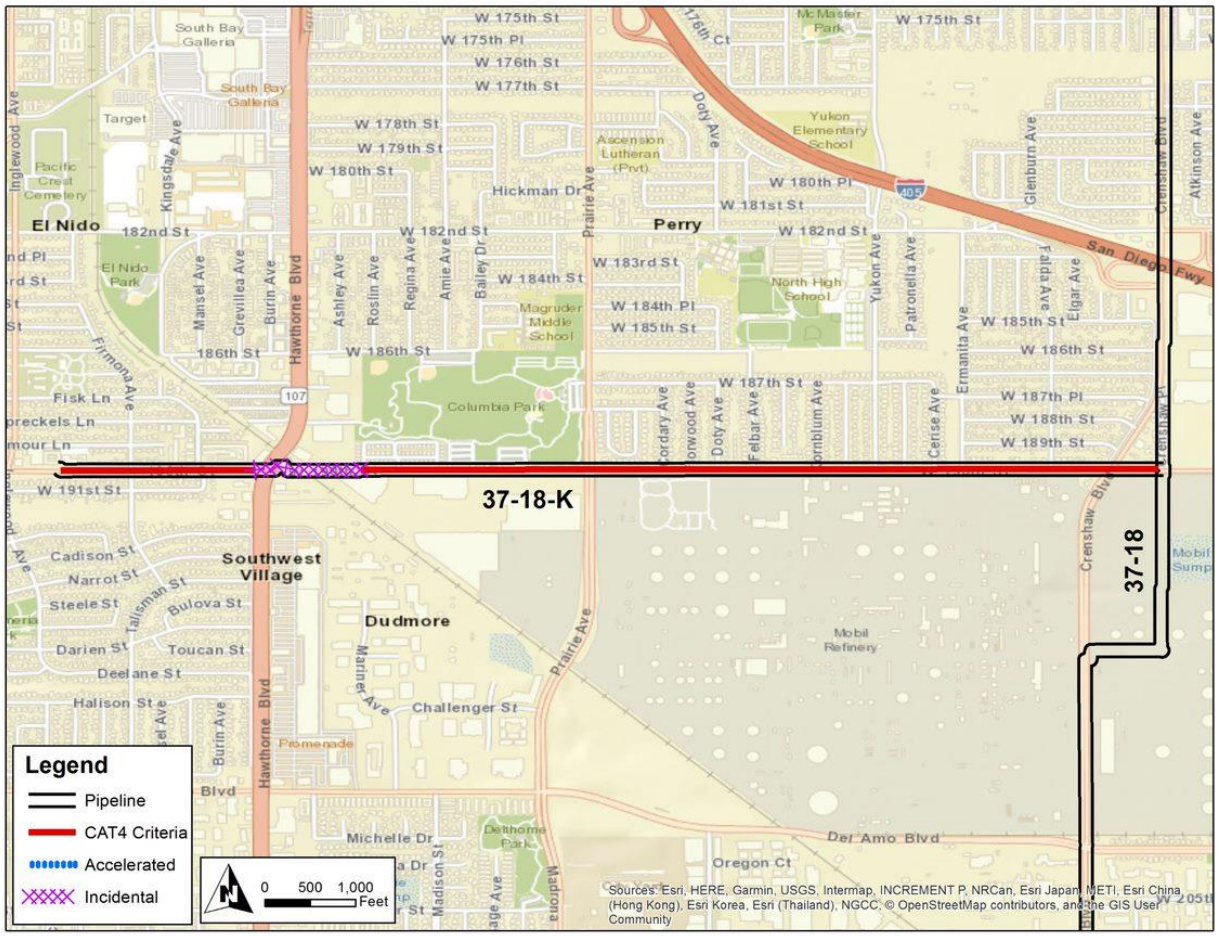


Figure 2: Overview Map of Supply Line 37-18-K Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated	Incidental	New	Total[2]
Final Mileage	1.714 mi.	0 mi.	0.202 mi.	0.012 mi.	1.928 mi.
	9,052 ft.	0 ft.	1064 ft.	63 ft.	10,179 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[3] Prior to initiating execution of the Project in 2018, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 37-18-K as a Phase 1A Replacement Project comprised of 2.850 miles of Category 4 Criteria pipe and no Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 1.114 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. Supply Line 37-18-K was filed as a Phase 1A replacement project and the Test versus Replacement (TVR) analysis ultimately concluded that replacement was the best option.
   b. Incidental mileage was included to allow the post-completion pressure test to be executed in one continuous test rather than multiple tests. This avoided additional costs for land acquisition and test head materials.

[2] Values may not add to total due to rounding.
[3] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

4. Final Project Scope: The final project scope consists of a 1.928 mile Replacement, including the installation of two MLVs. There is 0.202 miles of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 37-18-K and initially concluded the project design should commence as a Hydrotest.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

As scope development continued, SoCalGas reviewed the results of several External Corrosion Direct Assessments (ECDA), which indicated potential long seam related flaws increasing the risk of a pressure test failure. Based on this information and the lack of piggability, the Project Team recommended replacement rather than hydrotest as the best option.

Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line could be shut-in only under summer conditions with manageable system impacts.
2. Customer Impacts: Customers impacted by the shut-in of the line would need to be transferred to a nearby medium pressure line or be fed by an alternate source.
3. Community Impacts: Significant traffic impacts and occasional noise.

4. Permit Conditions: Multiple issues relating to traffic control, work times, moratoriums, and coordinating between multiple permitting agencies.
5. Piggability: Non-piggable.
6. Pipe Vintage: 1949.
7. Existing Pipe Attributes: The line is not suitable for smart-pigging due to the existence of multiple plug valves.
8. Longseam Type: Unknown.
9. Longseam Repair History: SoCalGas performed several ECDAs that yielded results indicating potential longseam related flaws. Five repair bands had been installed by SoCalGas to remediate the longseam issues. The ECDAs indicated potential longseam related flaws which increases the risks in case of a hydrotest failure. The change from hydrotest to replacement eliminates the risk.
10. Condition of Coating: Coal tar wrap in poor condition.
11. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded that the line could only be shut-in and backfed under summer conditions.
2. Customer Impact: A core customer fed by Supply Line 37-18-K on Prairie Avenue was transferred from a high pressure to a medium pressure feed to avoid the use of CNG.
3. Community Impact: Significant traffic impacts and occasional noise.

4. Constructability: The Project Team determined that it was feasible and would be more efficient to perform the post-completion pressure test in one continuous test rather than two separate tests.
5. Substructures: Potholing activities were performed and confirmed known substructures.
6. Permit Conditions: The Project Team identified multiple agencies along the proposed alignment that included
   a. Caltrans Traffic Control Permit.
   b. City of Torrance Encroachment Permit.
   c. City of Torrance Traffic Control Permit.
   d. City of Redondo Beach Encroachment Permit.
   e. City of Redondo Beach Traffic Control Permit.
7. Land Use: A laydown yard was shared with the PSEP Supply Line 30-18 Section 2 Project.
8. Environmental: The Project Team planned for typical abatement activities when removing existing pipe for tie-ins.
9. Valves: The Project Team planned to replace two existing mainline plug valves with two new mainline ball valves for piggability purposes.
10. Tie-In: To facilitate the tie-in at 190th Street and Hawthorne Boulevard, the Project Team replaced two lateral valves on Supply Line 37-18-K1 and Supply Line 37-18-K1BR1 with new ball valves.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	03/05/2018
Construction Completion Date	07/27/2018
NOP Date	07/11/2018

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Positioning New Pipe Along 190th Street

Figure 4: Installing Pipe Along 190th Street

Figure 5: Trenching Along 190th Street Near Hawthorne Boulevard

Figure 6: Traffic Control Along 190th Street Near Crenshaw Boulevard

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Engineering & Design: The post completion hydrotest was designed to be completed in one continuous test rather than multiple tests to avoid additional land acquisition and test head material costs.
2. Schedule Coordination: The Project Team was able to take advantage of resources from the Supply Line 30-18 Section 2 Project by planning the Supply Line 37-18-K Project to begin construction sequentially after Supply Line 30-18 Section 2 was completed. Construction down time and project costs were reduced by utilizing the same crew and sharing laydown yards.
3. Land Use: Laydown yard was shared with the PSEP Supply Line 30-18 Section 2 Project.
4. Future Maintenance: One of the factors driving the Supply Line 37-18-K Replacement Project was the need to replace the line in the future due to existing non-piggable pipeline features. The Project Team removed the existing non-piggable plug valves and installed new ball valves.
5. Construction Execution: The Project was planned to be sequenced with other PSEP Projects within the area to reduce mobilization costs.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $21,316,490. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $16,812,563.

Table 4: Estimated and Actual Direct Costs and Variances[4]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	867,962	389,384	(478,578)
Materials	1,698,070	862,654	(835,416)
Construction Contractor	10,918,315	9,319,633	(1,598,682)
Construction Management & Support	473,982	370,781	(103,201)
Environmental	288,956	161,215	(127,741)
Engineering & Design	2,550,067	1,495,561	(1,054,506)
Project Management & Services	2,174,934	211,959	(1,962,975)
ROW & Permits	61,879	439,107	377,228
GMA	2,282,325	1,647,320	(635,005)
Total Direct Costs	**21,316,490**	**14,897,615**	**(6,418,875)**

[4] Values may not add to total due to rounding.

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[5]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	2,053,422	1,560,165	(493,257)
AFUDC	3,377,516	308,391	(3,069,125)
Property Taxes	767,207	46,392	(720,815)
Total Indirect Costs	**6,198,145**	**1,914,947**	**(4,283,198)**
Total Direct Costs	**21,316,490**	**14,897,615**	**(6,418,875)**
Total Loaded Costs	**27,514,635**	**16,812,563**	**(10,702,072)**

The Actual Full-Time Equivalent[6] (FTE) for this Project is 0.79.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 37-18-K Replacement Project, Actual Direct Costs were less than the preliminary estimate by $6,418,875. This variance is attributable to a

[5] Values may not add to total due to rounding.
[6] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

variety of factors including: the reduced pipeline replacement length and number of fittings in the final design allowed for construction to be completed ahead of the original schedule and at lower cost; schedule coordination with another SoCalGas Project allowed for sequential construction which reduced construction costs; the engineering and design firm was able to reuse prior work when the project scope was changed from a hydrotest to a replacement project; customer service was able to be maintained without the use of CNG/LNG by transferring a customer's connection to a nearby pipeline during construction.

E. Disallowance

The scope of the Line 37-18-K Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 37-18-K Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 1.928 miles of pipe and two mainline valves (MLVs) in the cities of Redondo Beach and Torrance. The total loaded cost of the Project is $16,812,563.

SoCalGas executed this project prudently through minimizing community impacts, conducting the post-completion pressure test in one continuous test rather than two, and improving safety by executing this Project as a replacement rather than a hydrotest project.

SoCalGas engaged in prudent cost avoidance efforts by sharing the same crew and laydown yard with the Supply Line 30-18 Section 2 Replacement Project.

End of Supply Line 37-18-K Replacement Project Final Report

I. SUPPLY LINE 38-101 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 38-101 is a predominantly [redacted] diameter pipeline that runs approximately 12 miles through agricultural land in Kern County. The pipeline is primarily routed across a Class 1 location. This report describes the activities associated with the Supply Line 38-101 Replacement Project that consists of replacement and reroute of 3.955 with the installation of 4.525 miles of pipeline and the removal of 1.175 miles of pipeline. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $14,466,706.

The Project Team divided Supply Line 38-101 Replacement Project construction activity into separate Sections, at two separate construction locations. Section 1 consisted of the installation of 1.799 miles of [redacted] pipe paralleling the east side of Interstate 5 to the junction of Highway 99. Section 2 consisted of the installation of 2.726 miles of [redacted] pipe and the removal of 1.175 miles of [redacted] pipe west of Interstate 5.

Table 1: General Project Information

Project Name	**Supply Line 38-101 Section 1**		
Project Type	Replacement		
Length	1.799 miles		
Location	Kern County		
Class	Class 1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1921		
Construction Start	05/17/2019		
Construction Finish	08/27/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Name	**Supply Line 38-101 Section 2**		
Project Type	Replacement		
Length	2.726 miles		
Location	Kern County		
Class	Class 1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1921		
Construction Start	01/23/2020		
Construction Finish	02/26/2020		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	14,466,706	-	14,466,706
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[2] Ibid

B. Maps and Images

Figure 1: Satellite Image of Supply Line 38-101 Replacement Project

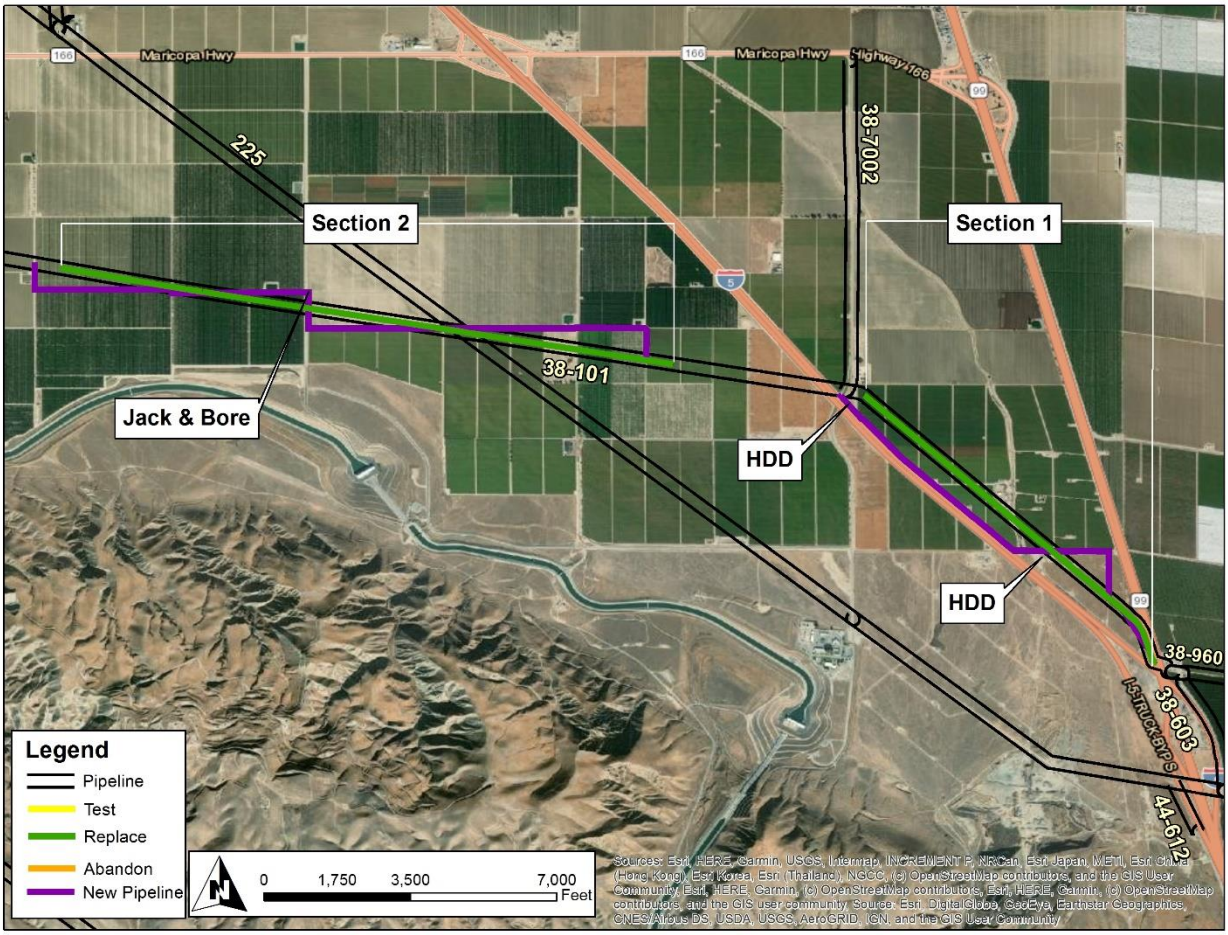
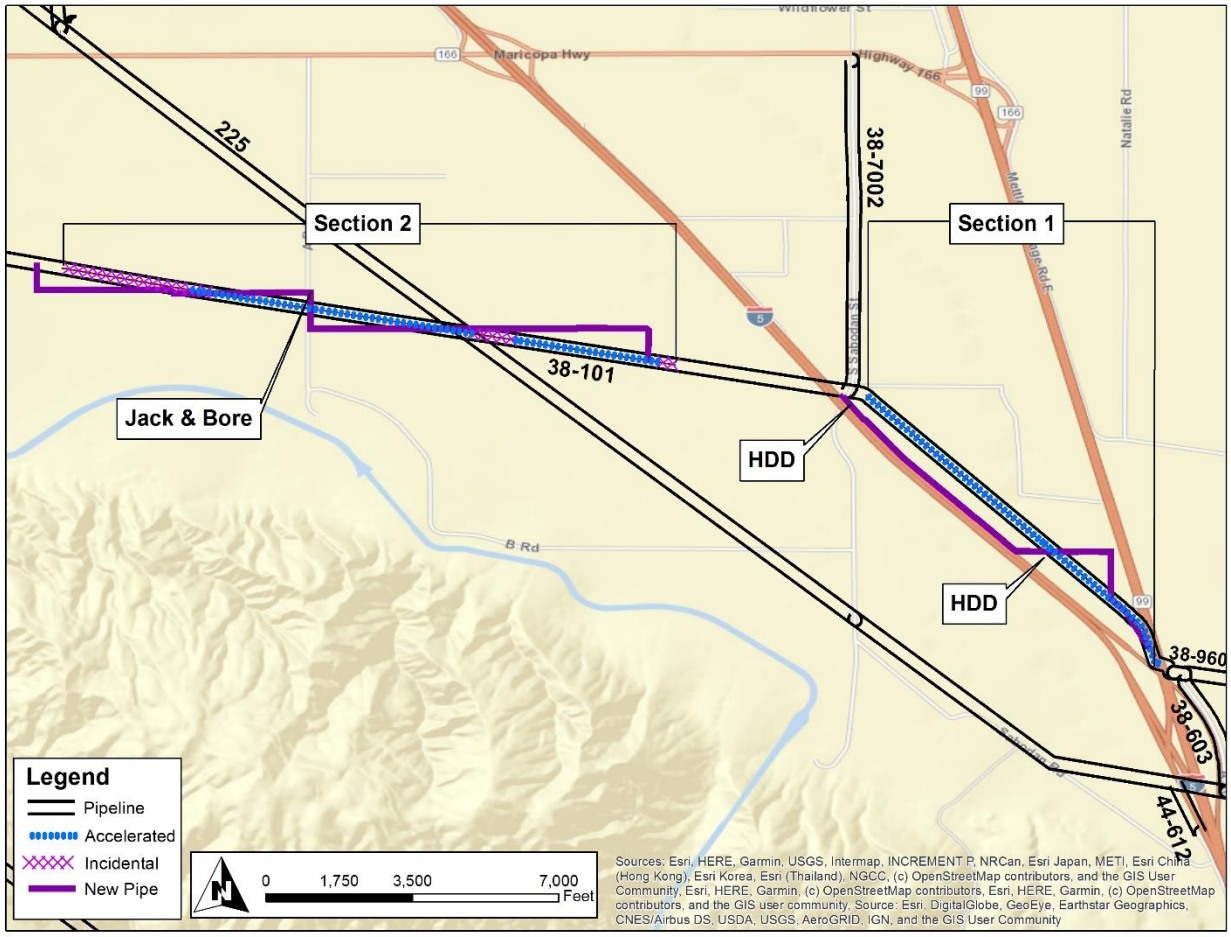


Figure 2: Overview Map of Supply Line 38-101 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Section 1	1.561 mi.	0.066 mi.	0 mi.	0.172 mi.	1.798 mi.
	8,243 ft.	346 ft.	0 ft.	907 ft.	9,496 ft.
Section 2	1.554 mi.	0.023 mi.	0.743 mi.	0.407 mi.	2.727 mi.
	8,205 ft.	120 ft.	3,924 ft.	2,148 ft.	14,397 ft.
Final Mileage	3.115 mi.	0.088 mi.	0.743 mi.	0.579 mi.	4.525 mi.
	16,448 ft.	466 ft.	3,924 ft.	3,055 ft.	23,893 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[5] Prior to initiating execution of the Project in 2019, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified the Supply Line 38-101 Replacement Project as a Phase 1B Replacement Project comprised of approximately 7.32 miles of Phase 1B pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas identified 7.212 miles of Phase 1B pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team rerouted Supply Line 38-101 from agriculture fields to an adjacent dirt road and at a greater depth any reduce the likelihood of a third party incident due to the agricultural activities within the area.

[3] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. Two Horizonal Directional Drills (HDDs) were utilized for the crossings of Tecuya Creek and Sabodan Street. One jack and bore was utilized to cross under the Wheeler Ridge Access Road.
c. Landowner negotiations with for the easement providing the most efficient pipeline route resulted in the removal of 1.175 miles of pipeline.
d. The Project Team included incidental pipe for constructability purposes and the location between segments of Phase 1B pipe.

4. Final Project Scope: The final project scope consists of replacement and reroute of 3.955 with the installation of 4.525 miles of pipeline and the removal of 1.175 miles of pipeline. The Criteria mileage consists of 3.115 miles of Phase 1B pipe. The Accelerated mileage consists of 320 feet of Phase 2A pipe, 146 feet of Phase 2B pipe and 0.743 miles of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 38-101 and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas have already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for in-line inspection, likely have non-state-of-the-art welds, and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be

capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in.
2. Customer Impacts: The Project Team determined that customer service could be maintained to core and non-core customers by utilizing pressure control fittings (PCFs) during the tie-in.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1921
5. Existing Pipe Attributes: The Project Team identified multiple existing non-piggable features such as short radius elbows, plug valves, non-piggable tees, and multiple diameter changes on the existing pipeline rendering the pipeline non-piggable.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: The Project Team identified past leaks due to third party incidents.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground

utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the line could be shut-in.
2. Customer Impact: The Project Team determined that service could be maintained to core and non-core customers by utilizing pressure control fittings (PCFs) during the tie-in.
3. Community Impact: No identified issues.
4. Reroute:
   a. The Project Team rerouted Supply Line 38-101 from agriculture fields to an adjacent dirt road at a greater depth any reduce the likelihood of a third party incident due to agricultural activities within the area.
   b. The reroute resulted in the need to utilize an HDD to cross under both the Tecuya Creek and Interstate 5 interchange, and a slick bore to cross under the Wheeler Ridge Access Road.
5. Land Use:
   a. Landowner negotiations to obtain the easement providing the most efficient pipeline route resulted in the removal of 1.175 miles of existing Supply Line 38-101.
   b. The Project Team rerouted Supply Line 38-101 from agriculture fields to an adjacent dirt road and at a greater depth any reduce the likelihood of a third party incident due to agricultural activities within the area.
6. Diameter Changes: The Project Team replaced the existing [redacted] portion of the pipeline with [redacted] pipe based on the recommendation of the RER and to standardize the pipeline diameter to facilitate future pigging activities.
7. Substructures: The Project Team identified multiple utilities prior to construction and included them in the Project design.
8. Permit Conditions: The Project Team obtained encroachment permits from Kern County and the California Department of Water Resources (DWR).

9. Environmental
    a. California Department of Fish and Wildlife (CDFW) required a permit to cross Tecuya Creek utilizing an HDD.
    b. The Project Team determined that the pipe coating on the existing pipeline likely contained asbestos and planned for abatement activities wherever existing pipe was to be exposed.

D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. Summarized below are notable changes in scope made after the preliminary cost estimate was developed and approved.

1. The Project Team reduced the replacement scope by approximately one mile and removed the installation of a new regulator station from the Project scope.
2. The Project Team initially planned to utilize water to pressure test the new pipe. The test medium was changed after the creation of the TIC to nitrogen.
3. The Project Team redesigned the replacement for Section 2 and removed an HDD of approximately 575 feet in length.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a construction contractor, that included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted] which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Supply Line 38-101 Section 1	
Construction Start Date	05/17/2019
Construction Completion Date	08/27/2019
NOP Date	07/23/2019
Supply Line 38-101 Section 2	
Construction Start Date	01/23/2020
Construction Completion Date	02/26/2020
NOP Date	02/11/2020

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $525,000 in change orders.

1. Field Design Changes:
   a. The Construction Contractor estimated for the installation of the new pipeline in 50 foot lengths of pipe while the average length of pipe available was 44 feet. Additional welding was required for the shorter length of pipe.
   b. The Project Team installed a portion of the new pipeline deeper than estimated due to agricultural activities.

Figure 3: Lowering in Pipe at the Wheeler Ridge Access Road Crossing

Figure 4: Excavation for Section 2 Reroute

Figure 5: Pipe Prepared for HDD under Sabodan Street

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection, and placement of the pipeline back into service, transportation, and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $22,172,339. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $14,466,706.

Table 4: Estimated and Actual Direct Costs and Variances[6]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	884,867	437,746	(447,121)
Materials	2,136,931	1,280,570	(856,361)
Construction Contractor	11,760,326	6,001,202	(5,759,124)
Construction Management & Support	1,201,477	444,226	(757,251)
Environmental	737,344	337,880	(399,464)
Engineering & Design	1,218,738	2,445,021	1,226,283
Project Management & Services	1,119,470	161,527	(957,943)
ROW & Permits	604,472	665,859	61,387
GMA	2,508,714	459,426	(2,049,288)
Total Direct Costs	**22,172,339**	**12,233,455**	**(9,938,884)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[7]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	2,153,017	1,836,343	(316,674)
AFUDC	3,306,421	343,674	(2,962,747)
Property Taxes	1,128,378	53,233	(1,075,145)
Total Indirect Costs	**6,587,816**	**2,233,250**	**(4,354,566)**
Total Direct Costs	**22,172,339**	**12,233,455**	**(9,938,884)**
Total Loaded Costs	**28,760,155**	**14,466,706**	**(14,293,449)**

The Actual Full-Time Equivalents[8] (FTEs) for this Project are 0.91.

[6] Values may not add to total due to rounding.
[7] Values may not add to total due to rounding.
[8] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 38-101 Replacement Project, Actual Direct Costs were less than the preliminary estimate by $9,938,884. This variance is attributable to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; the Project Team reduced the project scope after the creation of the initial estimate, removing one mile of replacement and the installation of a new regulator station from the project scope, reducing overall project costs; construction was expected to take around 27 weeks, however it was completed in approximately 15 weeks, significantly reducing construction and project management costs; the pressure test certification and environmental costs decreased due to the change in test medium from water to nitrogen, as there was no longer a need for water storage and disposal; and the engineering firm provided Project Manager and Project Engineer support during development, construction, and closeout, these costs were recognized under Engineering and Design.

E. Disallowance

The scope of the Supply Line 38-101 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 38-101 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 3.955 miles of pipeline by installing 4.525 miles of pipeline and removing 1.13 miles of abandoned pipeline in Mettler and Kern County. The total loaded cost of the Project is $14,466,706.

SoCalGas executed this project prudently rerouting the pipeline to avoid existing substructures and minimize the risk of third party line strikes, removal of portions of abandoned pipeline to obtain easements, and coordinating work efforts with the acquisition of permits.

SoCalGas engaged in prudent cost avoidance efforts by using nitrogen for the post completion pressure test of the new pipeline. SoCalGas also negotiated with landowners to obtain easements and allow for easier future maintenance by rerouting out of agricultural fields.

End of Supply Line 38-101 Replacement Project Final Report

I. SUPPLY LINE 41-6001-2 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 41-6001-2 is a [redacted] diameter transmission line that runs approximately 35 miles from Niland Station to El Centro, through agricultural land and commercial areas. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Supply Line 41-6001-2 Replacement Project which consists of the replacement of 26 feet of pipeline in the City of Brawley. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $722,536.

Table 1: General Project Information

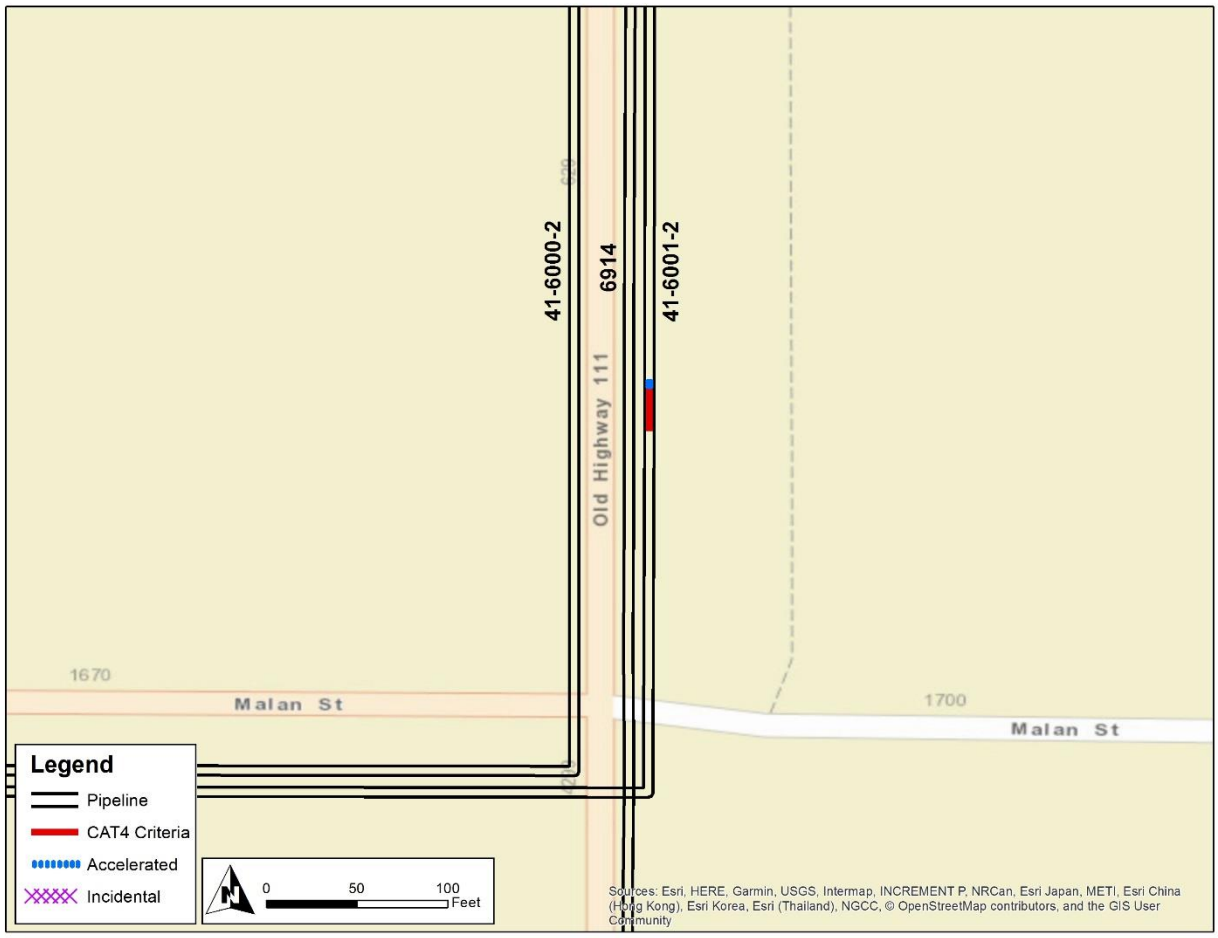
Project Name	Supply Line 41-6001-2		
Project Type	Replacement		
Length	26 feet		
Location	Brawley		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1967		
Construction Start	10/02/2017		
Construction Finish	12/19/2017		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	722,536	-	722,536
Disallowed Costs	7,692	-	7,692

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 41-6001-2 Replacement Project

Figure 2: Overview Map of Supply Line 41-6001-2 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[2]	Incidental	New	Total[3]
Final Mileage	0.005 mi.	0 mi.	0 mi.	0 mi.	0.005 mi.
	24 ft.	2 ft.	0 ft.	0 ft.	26 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 41-6001-2 as a Phase 1A Replacement Project comprised of 24 feet of Category 4 Criteria.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas confirmed the scope of the Project.
3. Engineering, Design, and Constructability:
   a. The Project Team coordinated the shut-in with the PSEP Supply Line 41-6000-2 Abandonment Project.
   b. Accelerated mileage was included to realize efficiencies and enhance project constructability.

[2] Accelerated mileage includes Phase 2B pipe. Phase 2B includes pipelines without record of a pressure test to modern – Subpart J – standards (Phase 2B). The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

4. Final Project Scope: The final project scope consists of a 26 foot pipeline replacement. The Accelerated mileage consists of 2 feet of Phase 2B pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 41-6001-2 and confirmed the project design should commence as a Replacement Project.

Segments of less than 1,000 feet are identified for replacement under the approved PSEP Decision Tree because, for short segments of pipe, the logistical costs associated with pressure testing (for example, permitting, construction, water handling, and service disruptions for a non-looped system) can approach or exceed the cost of replacement. In such circumstances, replacement affords a more cost-effective approach to achieving compliance with D.11-06-017 while providing equal safety enhancement benefits. Moreover, installation of the new segment can usually be performed while the existing service is maintained to customers, thereby avoiding service disruptions that may otherwise occur during pressure testing.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in without system impacts.
2. Community Impacts: Minimal traffic impacts.
3. Piggability: Piggable.
4. Pipe Vintage: 1967.
5. Existing Pipe Attributes: No identified issues.
6. Longseam Type: Seamless.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the line could be shut-in, but service could not be interrupted to a major core customer and all residential customers would need to be fed from an alternate source during the shut-in.
2. Customer Impact: To maintain service to all core and residential customers the Project Team utilized an existing pressure control fitting (PCF) and coordinated with a planned customer maintenance outage.
3. Community Impact: Traffic control with limited impact.
4. Schedule Coordination: The Project Team coordinated with the PSEP Supply Line 41-6000-2 Abandonment Project shut-in.
5. Substructures: Potholing was completed, no design changes were made.
6. Permit Conditions: City of Brawley encroachment permit.
7. Land Use:
   a. The Project shared a laydown yard with the PSEP Supply Line 41-6000-2 Abandonment Project.
   b. The existing pipeline is located in the street near the edge of the pavement and adjacent to Imperial Irrigation District (IID) right of way (ROW). Due to the IID permitting process typically taking nine months, the Project Team completed the excavation without encroaching on IID ROW to avoid this delay.
8. Environmental: The Project Team planned for typical abatement activities when removing existing pipe.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a construction contractor. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Bid (*confidential*): The Construction Contractor's bid was [redacted], that was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/02/2017
Construction Completion Date	12/19/2017
NOP Date	12/16/2017

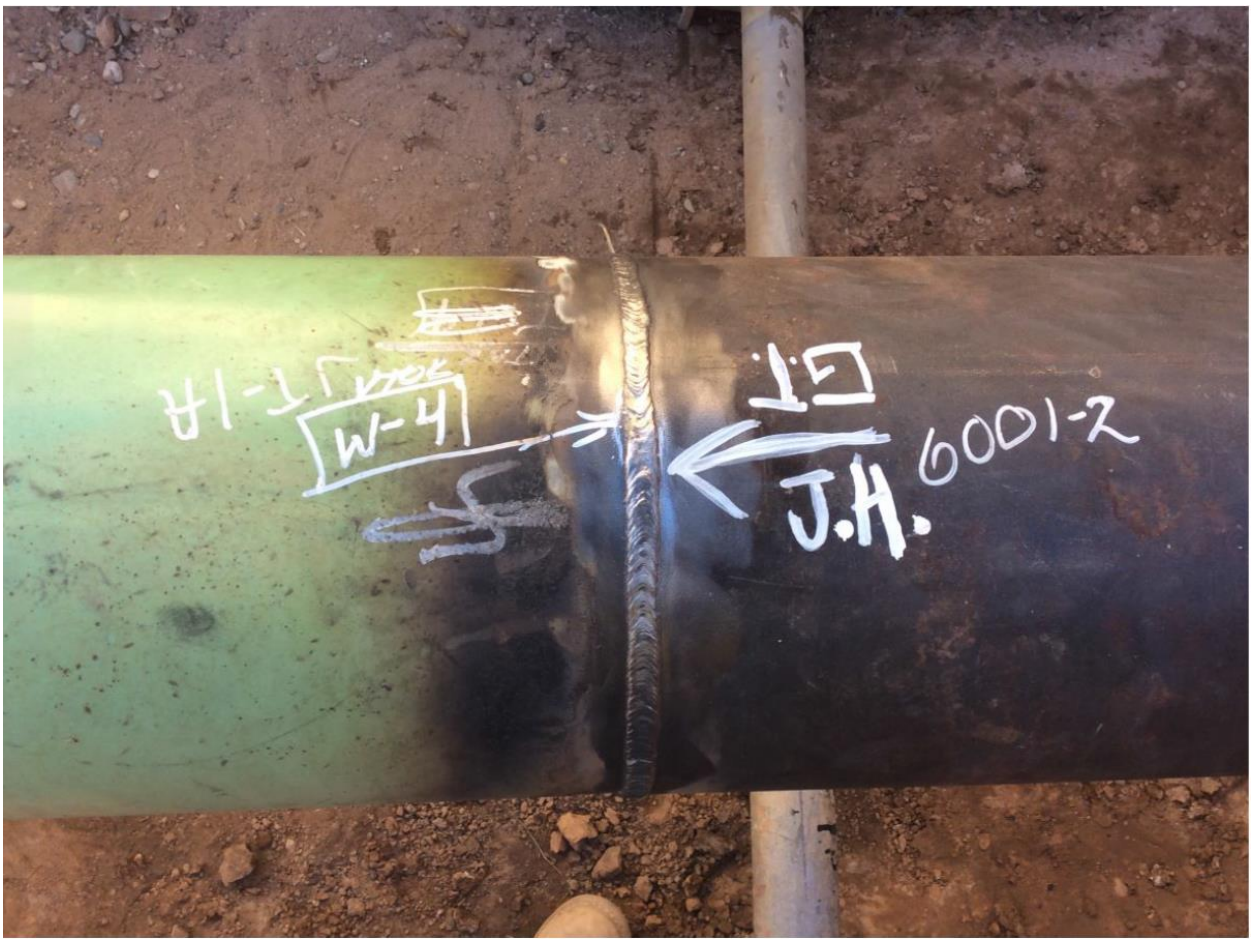
C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Excavation and Removal of Asphalt

Figure 4: Cut of Existing Pipeline for Replacement

Figure 5: Tie-in Weld



D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: The Project Team coordinated shut-in with the PSEP Supply Line 41-6000-2 Abandonment Project.
2. Construction Execution: Mobilization costs were shared with the PSEP Supply Line 41-6000-2 Abandonment Project.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $498,232. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in

accordance with Company overhead allocation policies. The total loaded cost of the Project is $722,536.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	50,390	48,802	(1,588)
Materials	11,747	8,858	(2,889)
Construction Contractor	302,139	254,928	(47,211)
Construction Management & Support	8,506	9,975	1,469
Environmental	12,654	20,063	7,409
Engineering & Design	43,231	123,944	80,714
Project Management & Services	28,712	8,036	(20,676)
ROW & Permits	4,754	564	(4,190)
GMA	36,099	71,837	35,738
Total Direct Costs	**498,232**	**547,008**	**48,777**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	55,317	91,259	35,942
AFUDC	26,129	74,701	48,572
Property Taxes	6,135	9,568	3,433
Total Indirect Costs	**87,581**	**175,528**	**87,947**
Total Direct Costs	**498,232**	**547,008**	**48,777**
Total Loaded Costs	**585,812**	**722,536**	**136,724**

The Actual Full-Time Equivalent[7] (FTE) for this Project is 0.13.

[5] Values may not add to total due to rounding.
[6] Ibid.
[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 41-6001-2 Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were more than the preliminary estimate by $48,777. This variance can be attributed to several factors including: the Project Team coordinates construction shared with another SoCalGas project and share mobilization costs; additional surveying was required to locate a reference point to verify stationing for project closeout; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

For this replacement project, SoCalGas identified 24 feet of pipe as being installed after 1955 and lacking records that provide the minimum information necessary to demonstrate compliance with then-applicable industry standards or regulatory strength testing and recordkeeping requirements. Of the pipeline that was replaced, 24 feet of Phase 1A pipe is disallowed. Therefore, a $7,692 reduction to rate base was calculated by multiplying 0.0045 miles of pipe by $1,709,257 per mile, which was SoCalGas and SDG&E's system average cost of pressure testing at the time the pipeline was returned to service.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 41-6001-2 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 26 feet of pipeline in the City of Brawley. The total loaded cost of the Project is $722,536.

SoCalGas executed this project prudently through coordination with the PSEP Supply Line 41-6001-2 and Supply Line 41-6000-2 projects for shut-in.

SoCalGas engaged in prudent cost avoidance efforts by sharing mobilization costs with the PSEP Supply Line 41-6000-2 Abandonment Project and utilized bulk ordered pipe, providing volume pricing for the [redacted] pipe.

End of Supply Line 41-6001-2 Replacement Project Final Report

I. SUPPLY LINE 43-121 NORTH SECTIONS 2, 3, AND 4 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 43-121 is a [redacted] diameter transmission pipeline that runs approximately 15 miles along several major arterial roads and parallels Interstate 405, through highly developed and congested residential and commercial areas in the City of Los Angeles. The pipeline is primarily routed across a Class 3 location and traverses some Class 1, 2, and 4 locations. This report describes the activities associated with Supply Line 43-121 North Sections 2, 3, and 4 Replacement Project which consist of the installation of a new mainline valve (MLV), the removal of 0.964 miles of pipeline, and the replacement of 1.054 miles of pipeline along the heavily trafficked Sepulveda Boulevard. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $22,641,902.

SoCalGas separated the Supply Line 43-121 Project into four separate projects: Supply Line 43-121[1] Sections 1, 2, 3, and 4 for project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline.

[1] Supply Line 43-121 Section 1 Replacement Project was filed for recovery in A.18-11-010 and authorized in D.20-08-034.

Table 1: General Project Information

Project Name	**Supply Line 43-121 North Section 2**
Project Type	Replacement
Length	704 feet
Location	Los Angeles
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1930
Construction Start	04/03/2017
Construction Finish	08/07/2017
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[2] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]
Project Name	**Supply Line 43-121 North Section 3**
Project Type	Replacement
Length	800 feet
Location	Los Angeles
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1930
Construction Start	04/17/2017
Construction Finish	08/07/2017
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[3] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[3] Ibid.

Table 1: General Project Information (Continued)

Project Name	**Supply Line 43-121 North Section 4**		
Project Type	Replacement		
Length	0.769 miles		
Location	Los Angeles		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1930		
Construction Start	08/07/2017		
Construction Finish	12/15/2017		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[4] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	22,641,902	-	22,641,902
Disallowed Costs	-	-	-

[4] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview Image of Supply Line 43-121 Replacement Project

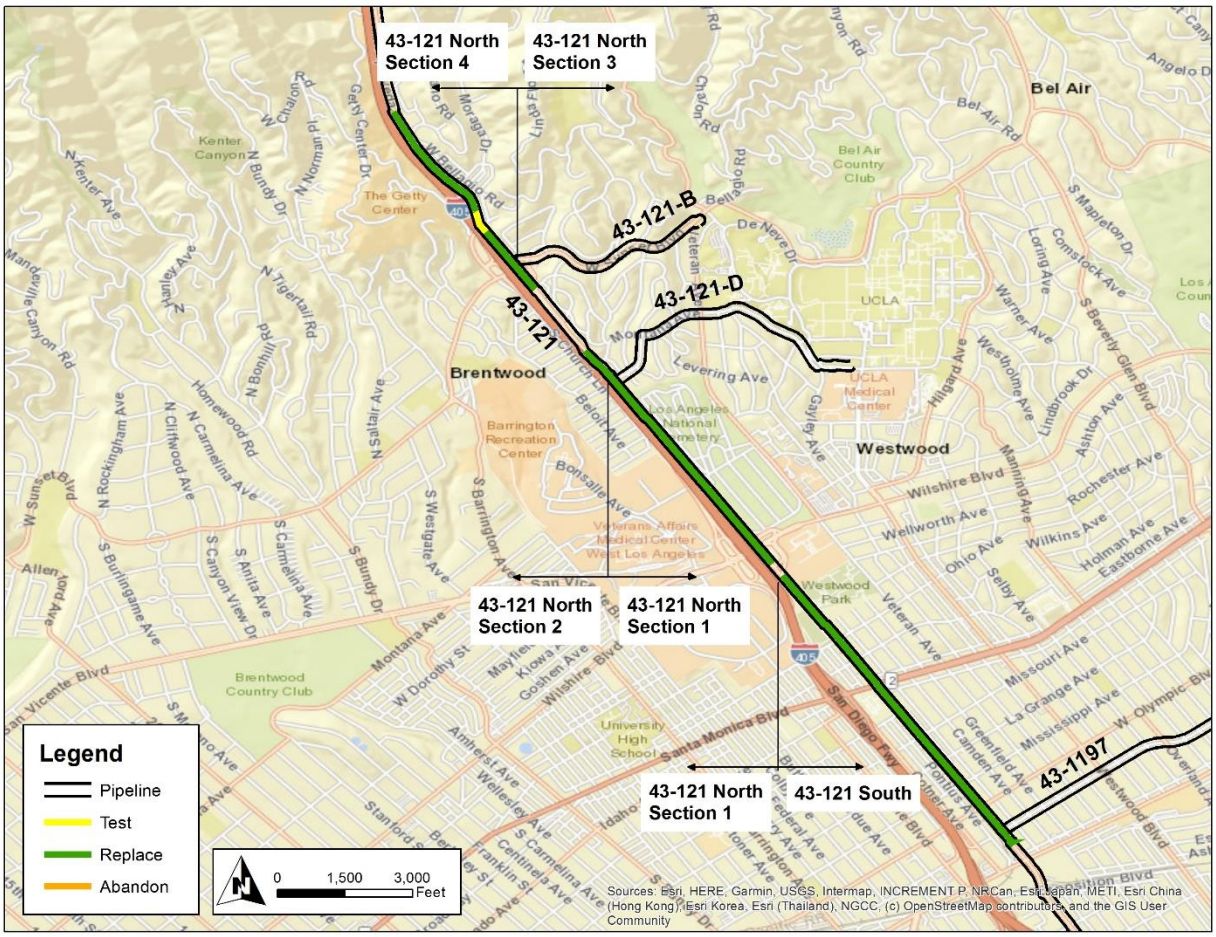


Figure 2: Satellite Image of Supply Line 43-121 North Sections 2, 3, and 4 Replacement Project

Figure 3: Overview Image of Supply Line 43-121 North Sections 2, 3, and 4 Replacement Project

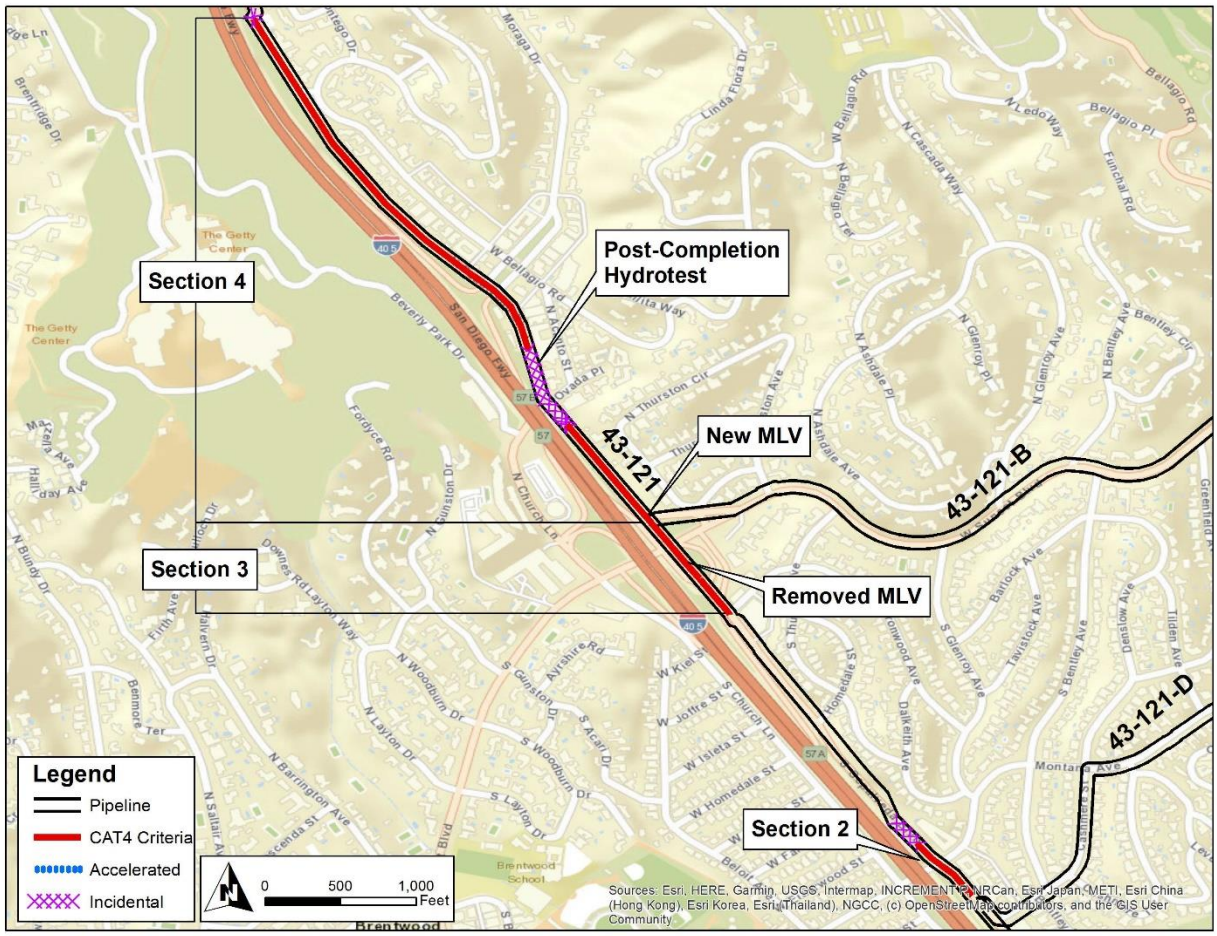


Figure 4: Satellite Image of Supply Line 43-121 North Section 2 Replacement Project

Figure 5: Overview Map of Supply Line 43-121 North Section 2 Replacement Project

Figure 6: Satellite Image of Supply Line 43-121 North Section 3 and Section 4 Replacement Project

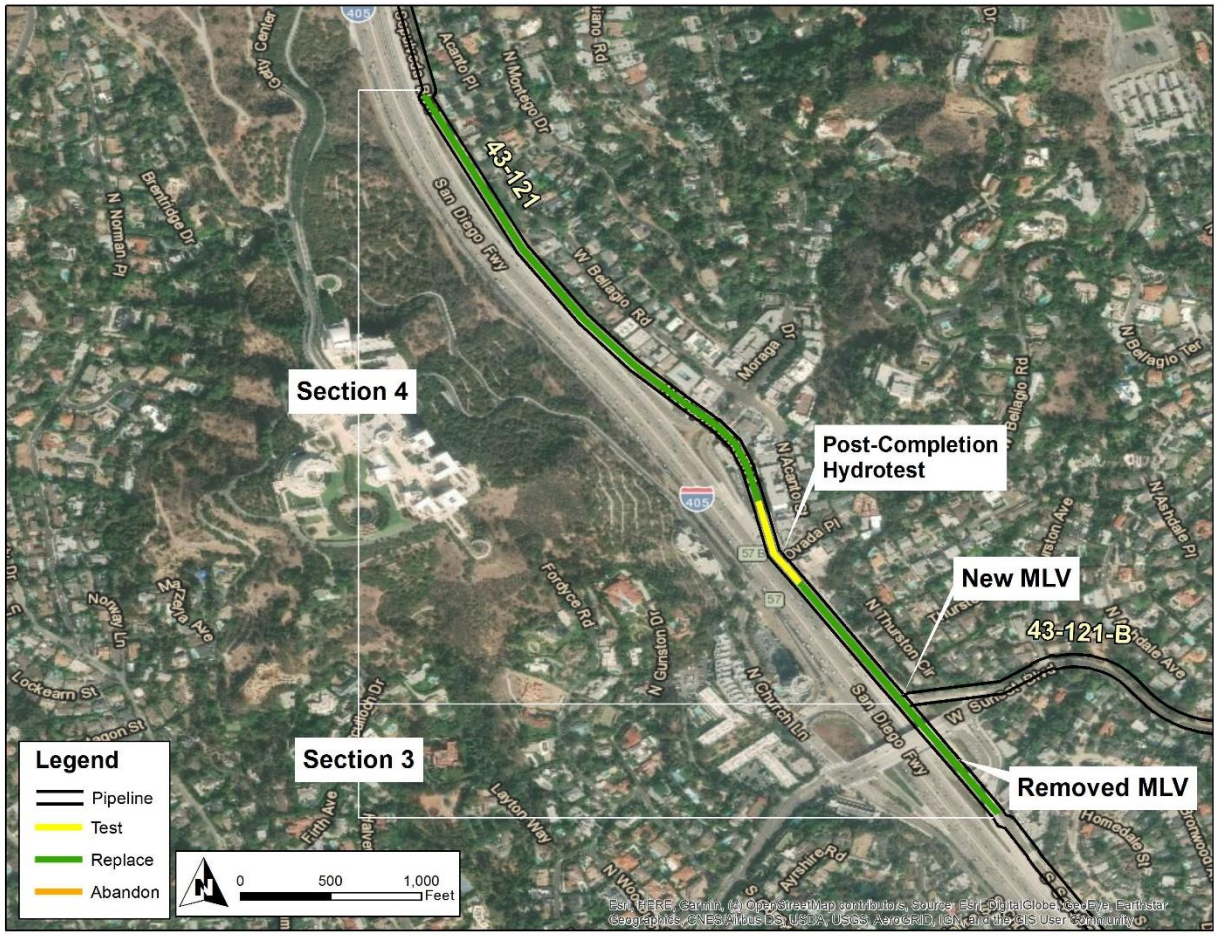
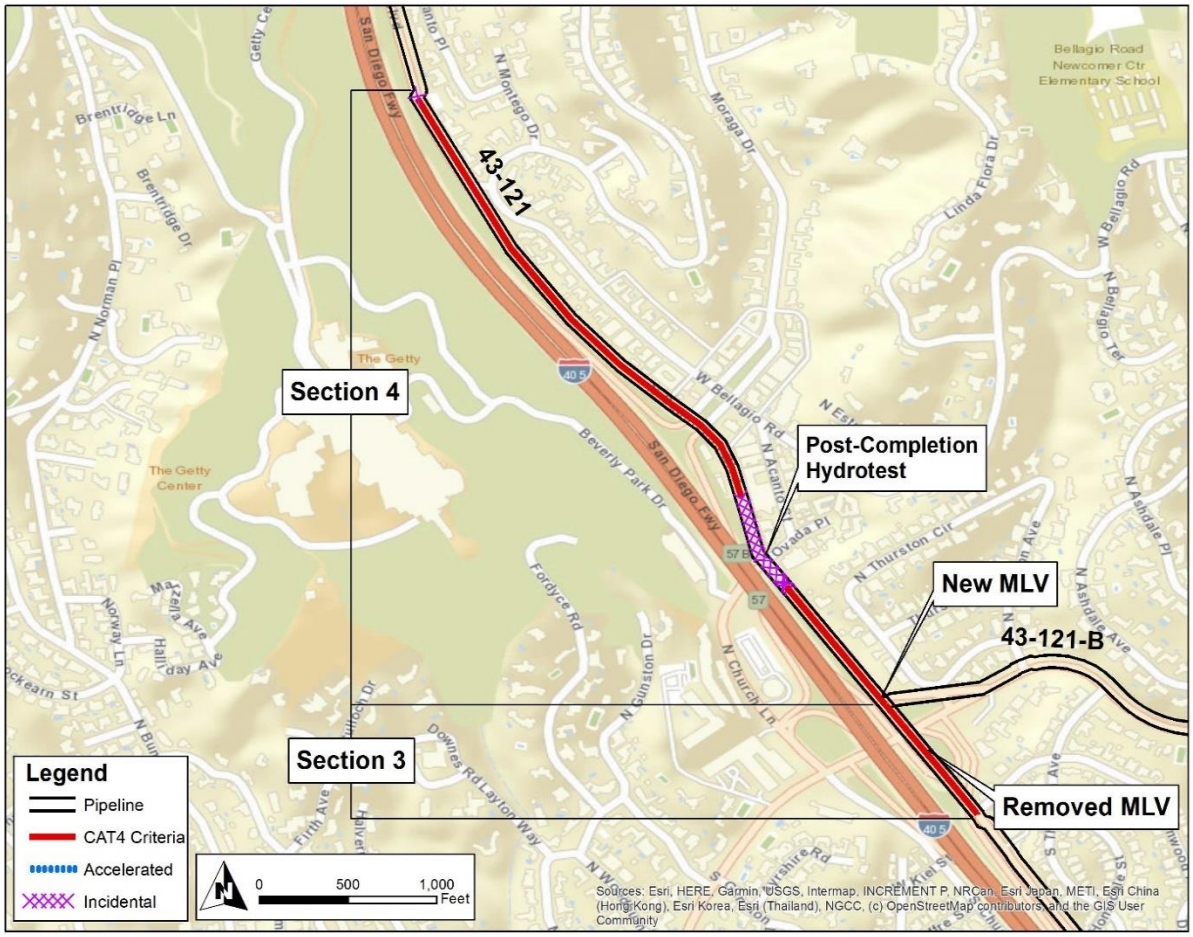


Figure 7: Overview Map of Supply Line 43-121 North Section 3 and Section 4 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNNG

A. Project Scope

Table 2: Mileage Information[5]

	Criteria	Accelerated	Incidental	New	Total[6]
Section 2	0.071 mi.	0 mi.	0.074 mi.	0 mi.	0.133 mi.
	377 ft.	0 ft.	393 ft.	0 ft.	704 ft.
Section 3	0.134 mi.	0 mi.	0.008 mi.	0.009 mi.	0.152 mi.
	710 ft.	0 ft.	41 ft.	49 ft.	800 ft.
Section 4	0.661 mi.	0 mi.	0.105 mi.	0.003 mi.	0.769 mi.
	3,489 ft.	0 ft.	556 ft.	16 ft.	4,061 ft.
Final Mileage	0.867 mi.	0 mi.	0.188 mi.	0 mi.	1.054 mi.
	4,576 ft.	0 ft.	990 ft.	0 ft.	5,565 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[7] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 43-121 North as a Phase 1A Replacement Project comprised of 2.766 miles of Category 4 Criteria pipe and 1.645 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas increased the scope of the Project by 0.544 miles of Category 4 Criteria pipe.

[5] Total mileage of the completed project differs from the mileage of the pipe addressed due to realignment of the pipeline route.
[6] Values may not add to total due to rounding.
[7] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

3. Engineering, Design, and Constructability: Due to the non-contiguous locations of Criteria pipe segments along the length of the pipeline and for constructability purposes, SoCalGas strategically separated and executed the project in multiple sections[8]:
   a. Section 2: Replacement of 855 feet and removal of 770 feet of pipe along Sepulveda Boulevard between Montana Avenue and Cashmere Street.
   b. Section 3: Replacement of 800 feet and removal of 751 feet of pipe. This project section runs along Sepulveda Boulevard, between Sunset Boulevard and Bronwood Avenue.
   c. Section 4: Replacement of 0.769 miles and removal of 0.676 miles of pipe along Sepulveda Boulevard, between Casiano Road and Sunset Boulevard.
   d. The Project Team planned the scope of Supply Line 43-121 North Sections 3 and 4 as two replacement segments (0.692 miles) but one post-completion pressure test that incorporated 450 feet of incidental pipe to reduce the number of test breaks and reduce the impact of construction on the community.
   e. Incidental mileage was included for constructability and the location between segments of Category 4 Criteria pipe.
4. Final Project Scope: The final project scope consists of three non-contiguous replacement sections that total 1.054 miles, the removal of 0.964 miles of pipe, and installation of a new MLV. The Incidental mileage totals 990 feet of pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 43-121 North and confirmed the project design should commence as a Replacement Project.

[8] Section 1 South: This 1.477 mile section of the project was completed in 2016 and included for reasonableness review in A.18-11-010. It is located outside of the Caltrans Right of Way (ROW) and was executed separately to meet the PSEP objective of executing projects as soon as practicable.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas had already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for in-line inspection, likely have non-state-of-the-art welds and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace these sections include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the pipeline could only be shut-in during summer conditions.
2. Customer Impacts: The Project Team identified no customer impacts; back feeding averted the need to provide CNG or to shut-in customers.
3. Piggability: Piggable.
4. Pipe Vintage: 1930.

5. Existing Pipe Attributes: The Project Team identified a non-active tap along the existing pipeline.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: Unknown.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

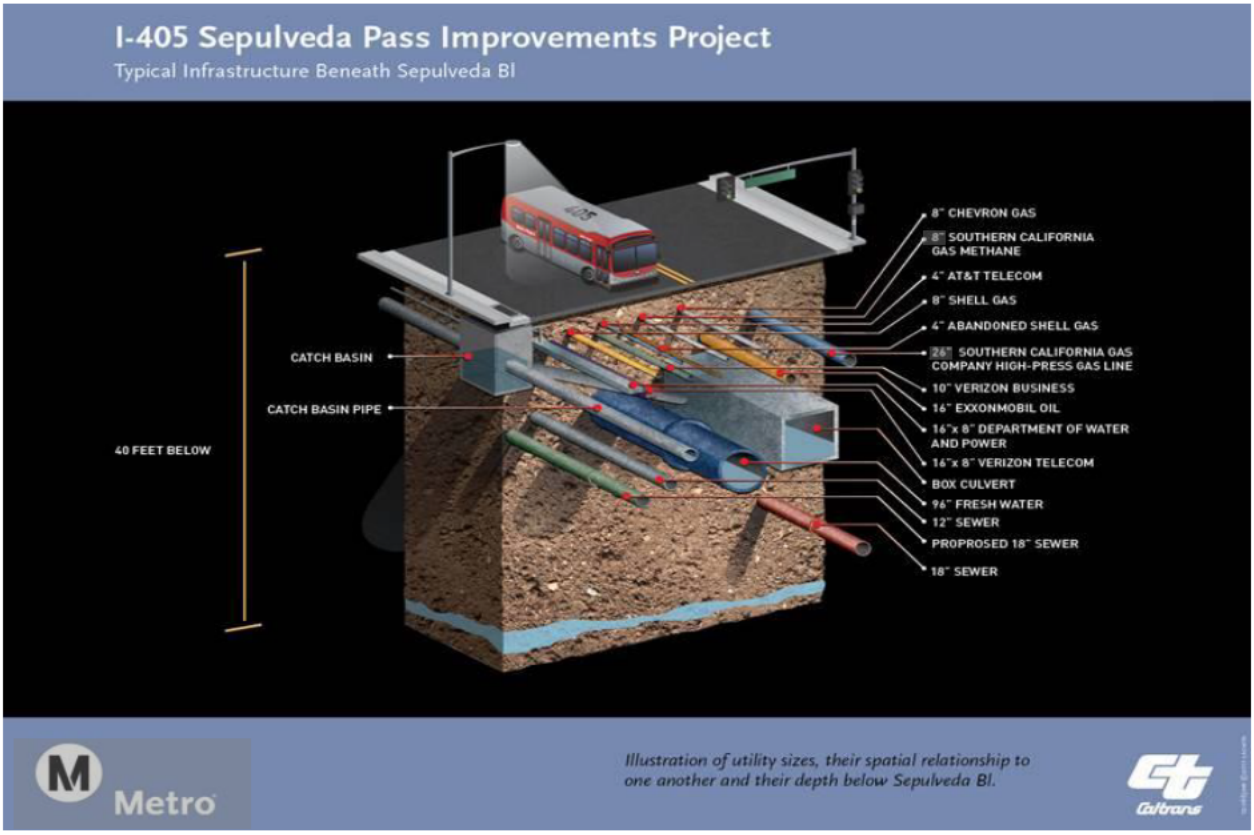
SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the pipeline could only be shut-in during summer conditions.
2. Customer Impact: The Project Team identified no customer impacts because back feeding averted the need to provide CNG or to shut-in customers.
3. Community Impact: The Project is located along the heavily congested Sepulveda Boulevard alongside a residential area. The northern tie-in location for Section 4 is adjacent to the intersection of Sepulveda Boulevard and Moraga Drive and Interstate 405 off ramp.
4. Diameter Changes: SoCalGas analyzed typical load demands and future capacity planning and determined that a smaller replacement diameter of [redacted] would be sufficient and could serve present and future demand.
5. Substructures: The Project Team researched existing records and survey results and identified multiple substructures within the construction alignment.
6. Permit Conditions:
   a. City of Los Angeles and Caltrans permits were required for encroachment, excavation, and traffic control plans.

b. The work hours were limited to Monday through Friday from 9AM to 3:30PM with a ten-hour Saturday option from 8AM to 6PM.

7. Land Use: The Project used one primary laydown yard.
8. Environmental: The Project Team planned for typical abatement activities when removing existing pipe.
9. Valves: One MLV and vault was removed and relocated along with a new bridle assembly connecting to Supply Line 43-121-B.
10. Tie-In: Each tie-in location was subject to space constraints and limited work hours due to the circumstances described below:
    a. Section 2: Criteria pipe for the northern tie-in was located in the heavily trafficked intersection of Sepulveda Boulevard and Montana Avenue. The Project Team extended the northern tie-in outside of the intersection to reduce the impact to traffic. The southern tie-in location had no conflicts.
    b. Section 3: The northern tie-in was located by the intersection of Sepulveda Boulevard and Sepulveda Way, a high traffic three-way intersection. The southern tie-in was located in a residential area.
    c. Section 4: The northern tie-in was located near the intersection on Sepulveda Boulevard near Casiano Road. The southern tie-in ties into the north end of Section 3, located by the intersection of Sepulveda Boulevard and Sepulveda Way, a high traffic three-way intersection.

Figure 8: Cross Section of Typical Substructures Beneath Sepulveda Boulevard



D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], that was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Section 2	
Construction Start	04/03/2017
Construction Completion	08/07/2017
NOP Date	07/17/2017
Section 3	
Construction Start	04/17/2017
Construction Completion	08/07/2017
NOP Date	07/17/2017
Section 4	
Construction Start	08/07/2017
Construction Completion	12/15/2017
NOP Date	11/27/2017

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 9: Demolition of a Concrete Vault

Figure 10: Lowering in of New Pipe

Figure 11: Removal of Hydraulic Shoring and Road Plates

Figure 12: Construction Crew Welding

Figure 13: Pipeline Warning Tape

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Materials: Bulk ordered pipe provided volume pricing for the [redacted] pipe.
2. Land Use: All Project sections shared one primary laydown yard avoiding costs for mobilization and demobilization.
3. Water Management: Water from the Section 2 post completion pressure test was reused for the Section 3 and 4 post completion pressure test.
4. Engineering & Design: The post completion pressure test for Sections 3 and 4 were designed and executed in one continuous test to reduce the number of test breaks and reduce the impact of construction on the community.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared estimates of the Direct Costs of the Project in the amount of $38,816,329. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $22,641,902.

Table 4[9]: Estimated and Actual Direct Costs and Variances

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	4,035,906	425,117	(3,610,789)
Materials	1,135,411	703,647	(431,764)
Construction Contractor	19,965,282	10,919,331	(9,045,951)
Construction Management & Support	2,326,344	1,416,655	(909,689)
Environmental	720,200	362,607	(357,593)
Engineering & Design	3,464,020	2,549,456	(914,564)
Project Management & Services	2,634,990	828,420	(1,806,570)
ROW & Permits	1,093,260	825,747	(267,513)
GMA	3,440,916	2,084,814	(1,356,102)
Total Direct Costs	**38,816,329**	**20,115,793**	**(18,700,536)**

Table 5[10]: Estimated and Actual Indirect Costs, Total Costs, and Variances

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	4,989,569	1,648,633	(3,340,936)
AFUDC	1,987,696	723,849	(1,263,847)
Property Taxes	472,846	153,627	(319,219)
Total Indirect Costs	**7,450,111**	**2,526,109**	**(4,924,002)**
Total Direct Costs	**38,816,329**	**20,115,793**	**(18,700,536)**
Total Loaded Costs	**46,266,440**	**22,641,902**	**(23,624,538)**

[9] Values may not add to total due to rounding.
[10] Ibid.

The Actual Full-Time Equivalents[11] (FTEs) for this Project are 2.51.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 43-121 North Sections 2, 3, and 4 Replacement Project, Actual Direct Costs were less than the preliminary estimate by $18,700,536. This variance can be attributed to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; negotiations with the City of Los Angeles allowed for limited permit restrictions, enhancing productivity during construction of Section 4, which reduced the construction length by approximately nine weeks; the Project Team received a credit from the construction contractor due to increased productivity during construction; the Project Team was able to share laydown yards between the multiple sections during construction; and as detailed design progressed, the project route was

[11] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

optimized and required less pipe materials for project completion than originally anticipated.

E. Disallowance

The scope of the Line 43-121 North Sections 2, 3, and 4 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 43-121 North Replacement Projects. Through these Replacement Projects, SoCalGas successfully replaced 1.054 miles of pipeline in the City of Los Angeles. The total loaded cost of the Project is $22,641,902.

SoCalGas executed this project prudently through dividing Supply Line 43-121 North into several project sections to be managed individually.

SoCalGas engaged in prudent cost avoidance efforts by using the same laydown yard for all replacement sections, reusing hydrotest water, and bulk ordering pipe which provided volume pricing for the [redacted] pipe.

End of Supply Line 43-121 North Replacement Projects Final Report

I. SUPPLY LINE 45-120 SECTION 2 REPLACEMENT PROJECT

A. Background and Summary

Supply Line 45-120 is a predominately [redacted] diameter pipeline that runs approximately five miles from Newhall Station in the City of Santa Clarita, through mountainous terrain to the Sylmar Compressor Station in the City of Los Angeles. The pipeline is primarily routed across a Class 3 location and traverses some Class 1 locations. This report describes the activities associated with the Supply Line 45-120 Section 2 Replacement Project that consists of the replacement of 3.588 miles of pipeline rerouted from mountainous terrain to existing roadways through the Newhall Pass, the installation of four engineered crossings, and the replacement of one mainline valve (MLV). The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $91,982,404.

The Project Team divided Supply Line 45-120 Section 2 Replacement Project construction activity into separate construction sections, 2A and 2B, to execute the post completion hydrotest. Section 2A consisted of the installation of approximately 2.5 miles of [redacted] pipe along Sierra Highway and Foothill Boulevard. Section 2B consisted of the installation of approximately 1.01 miles along San Fernando Road, four engineered crossings, and tie-in with Supply Line 33-120.

Table 1: General Project Information

Project Name	**Supply Line 45-120 Section 2A**		
Project Type	Replacement		
Length	2.488 miles		
Location	City of Santa Clarita, City of Los Angeles		
Class	3		
MAOP (*confidential*)	[redacted]		
Pipe Vintage	1930		
Construction Start	09/02/2014		
Construction Finish	06/10/2017		
Original Pipe Diameter (*confidential*)	[redacted]		
New Diameter (*confidential*)	[redacted]		
Original SMYS[1] (*confidential*)	[redacted]		
New SMYS (*confidential*)	[redacted]		
Project Name	**Supply Line 45-120 Section 2B**		
Project Type	Replacement		
Length	1.101 miles		
Location	City of Los Angeles		
Class	3		
MAOP (*confidential*)	[redacted]		
Pipe Vintage	1930		
Construction Start	06/15/2017		
Construction Finish	02/01/2018		
Original Pipe Diameter (*confidential*)	[redacted]		
New Diameter (*confidential*)	[redacted]		
Original SMYS[2] (*confidential*)	[redacted]		
New SMYS (*confidential*)	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	91,957,056	25,348	91,982,404
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[2] Ibid

B. Maps and Images

Figure 1: Satellite Image of Supply Line 45-120 Sections 1 and 2 and Supply Line 33-120 Section 1 Replacement Projects

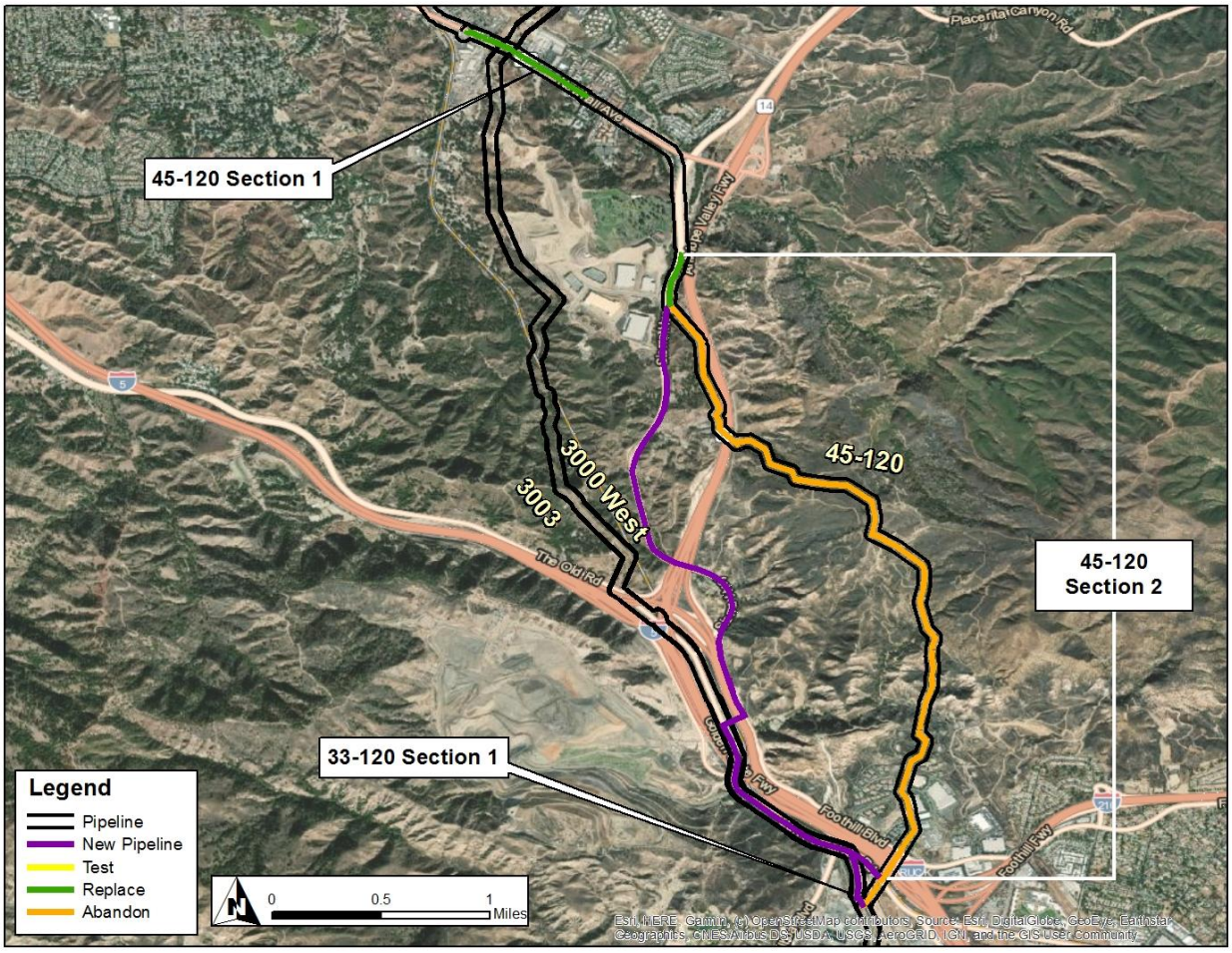


Figure 2: Satellite Image of Supply Line 45-120 Section 2 Replacement Project

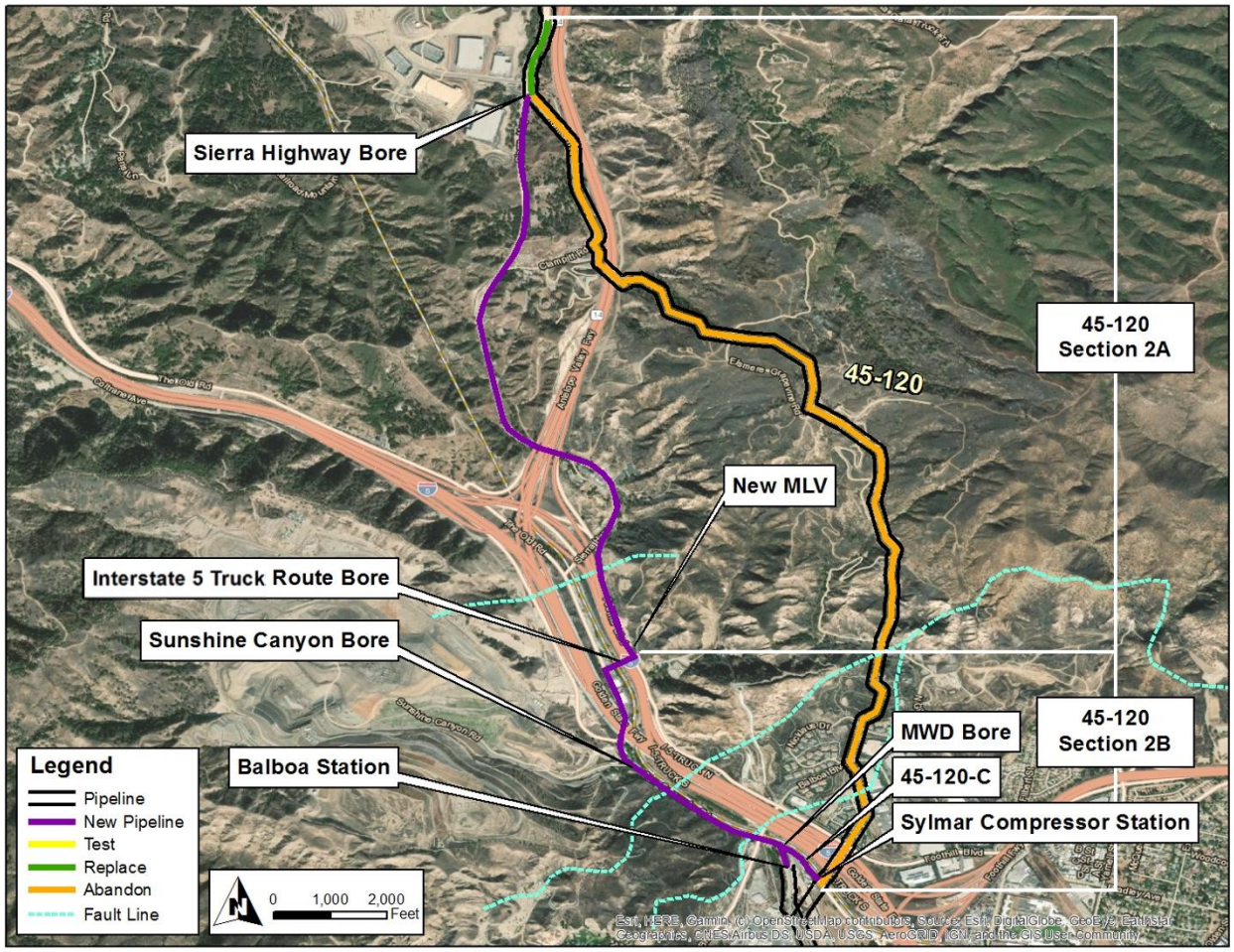


Figure 3: Overview Map of Supply Line 45-120 Section 2 Replacement Project

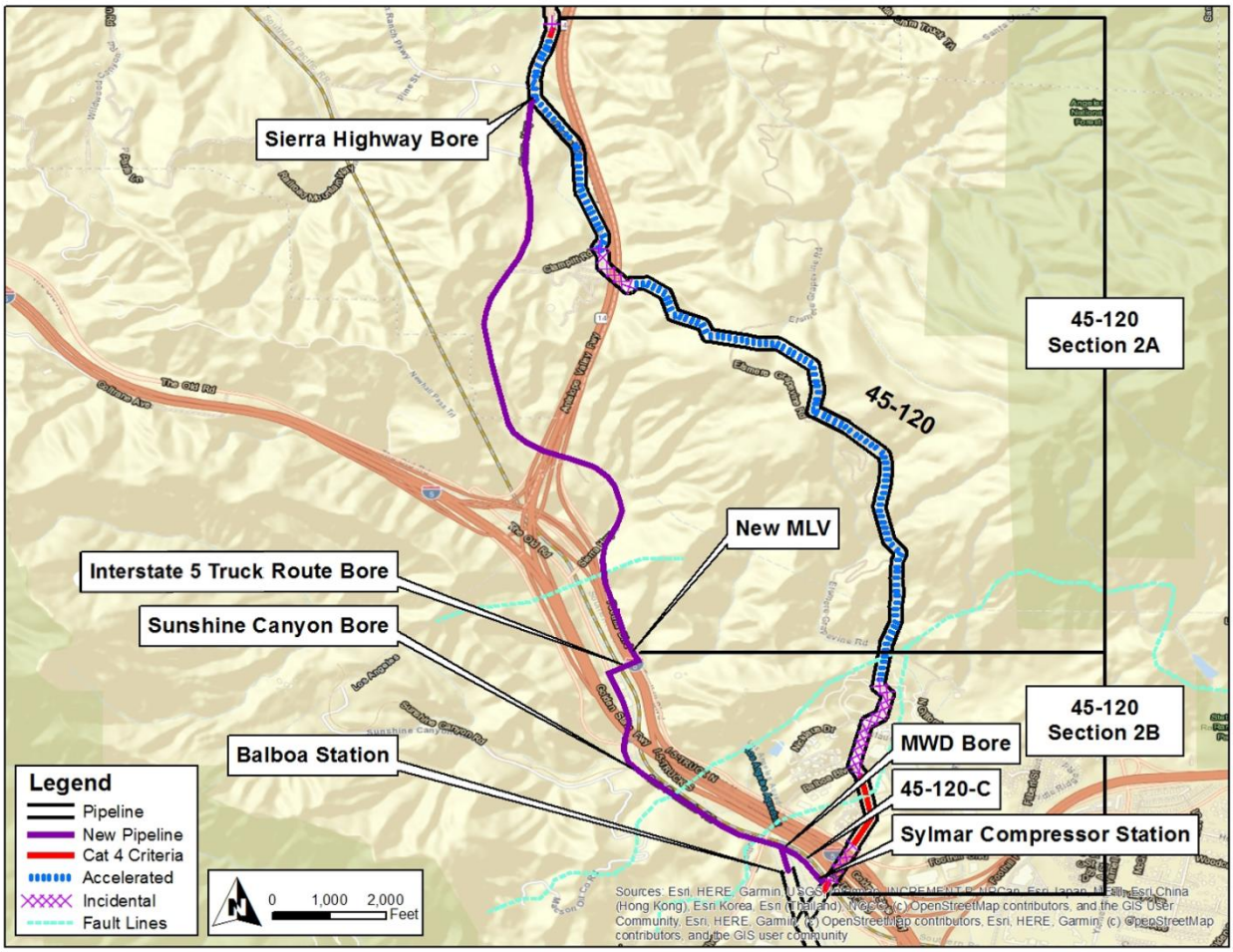
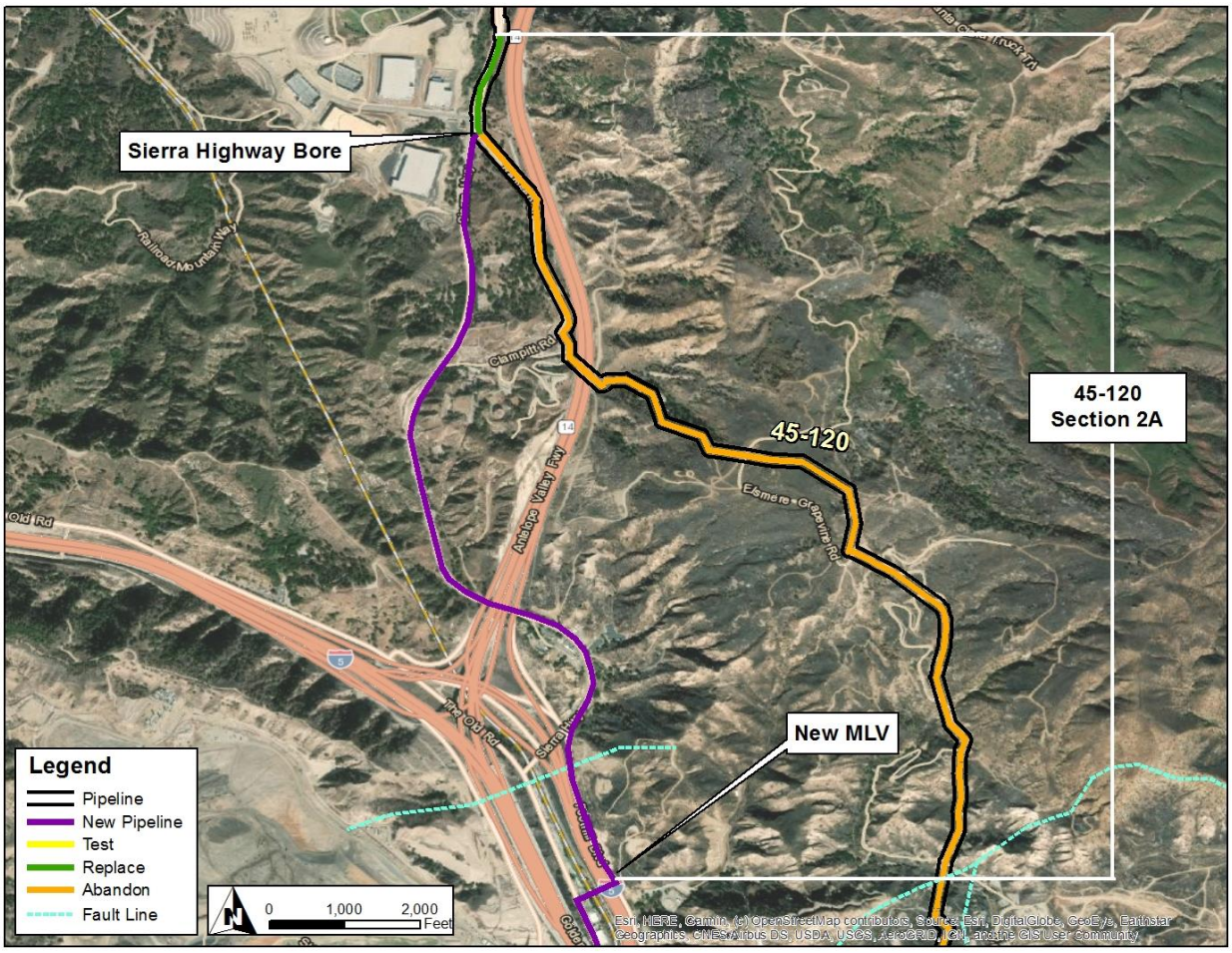


Figure 4: Satellite Image of Supply Line 45-120 Section 2A



Final Report for Supply Line 45-120 Section 2 Replacement Project

Figure 5: Overview Map of Supply Line 45-120 Section 2A

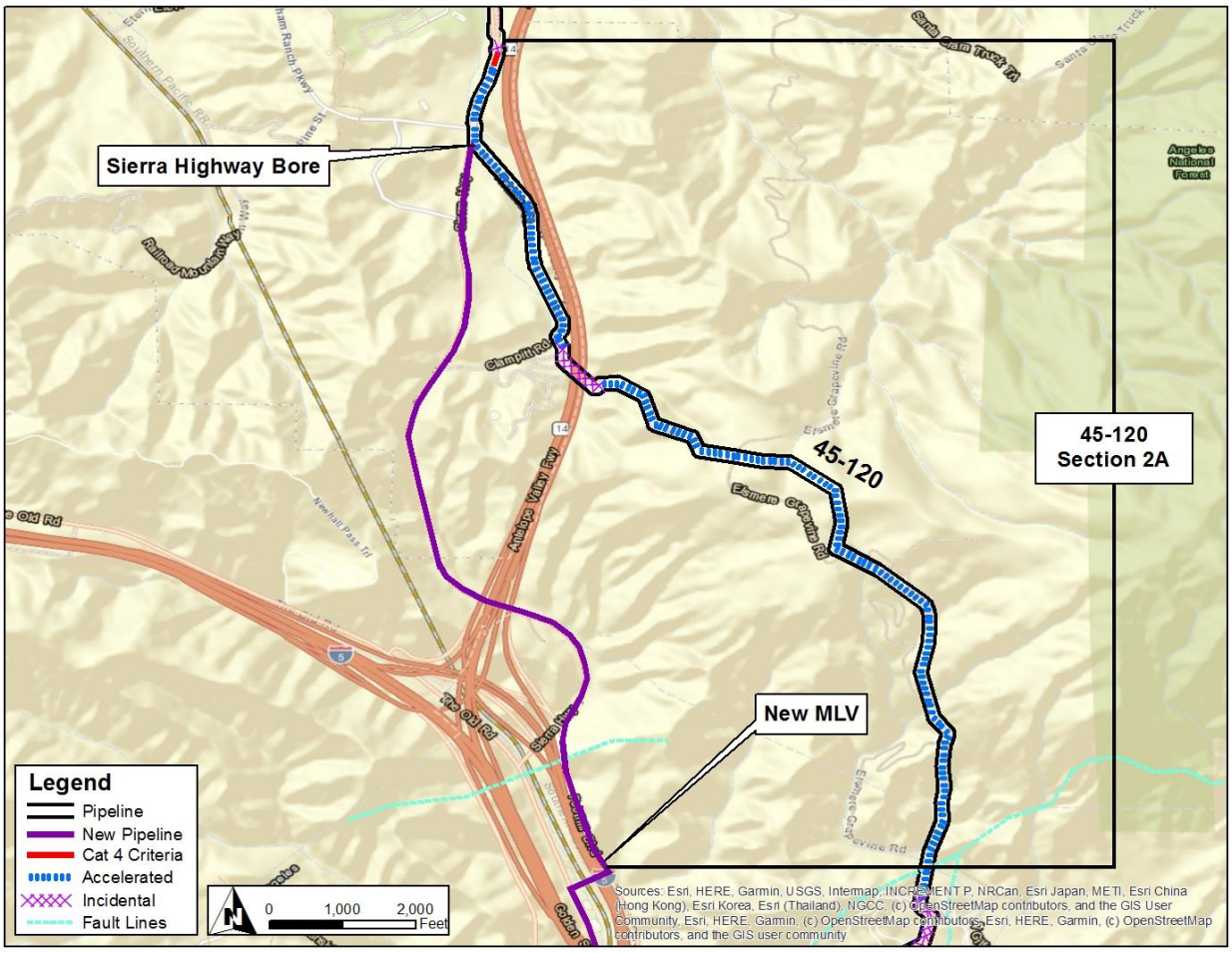


Figure 6: Satellite Image of Supply Line 45-120 Section 2B

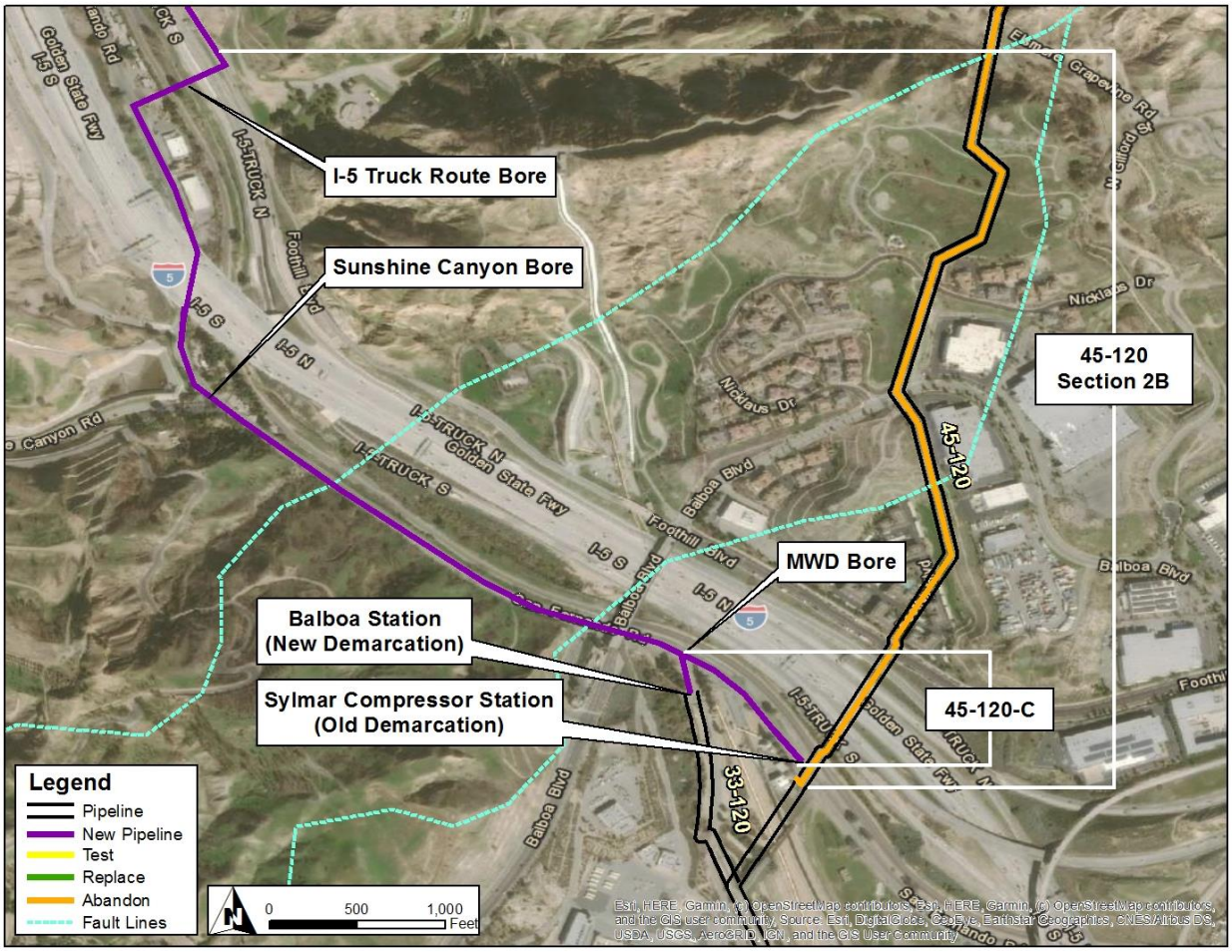
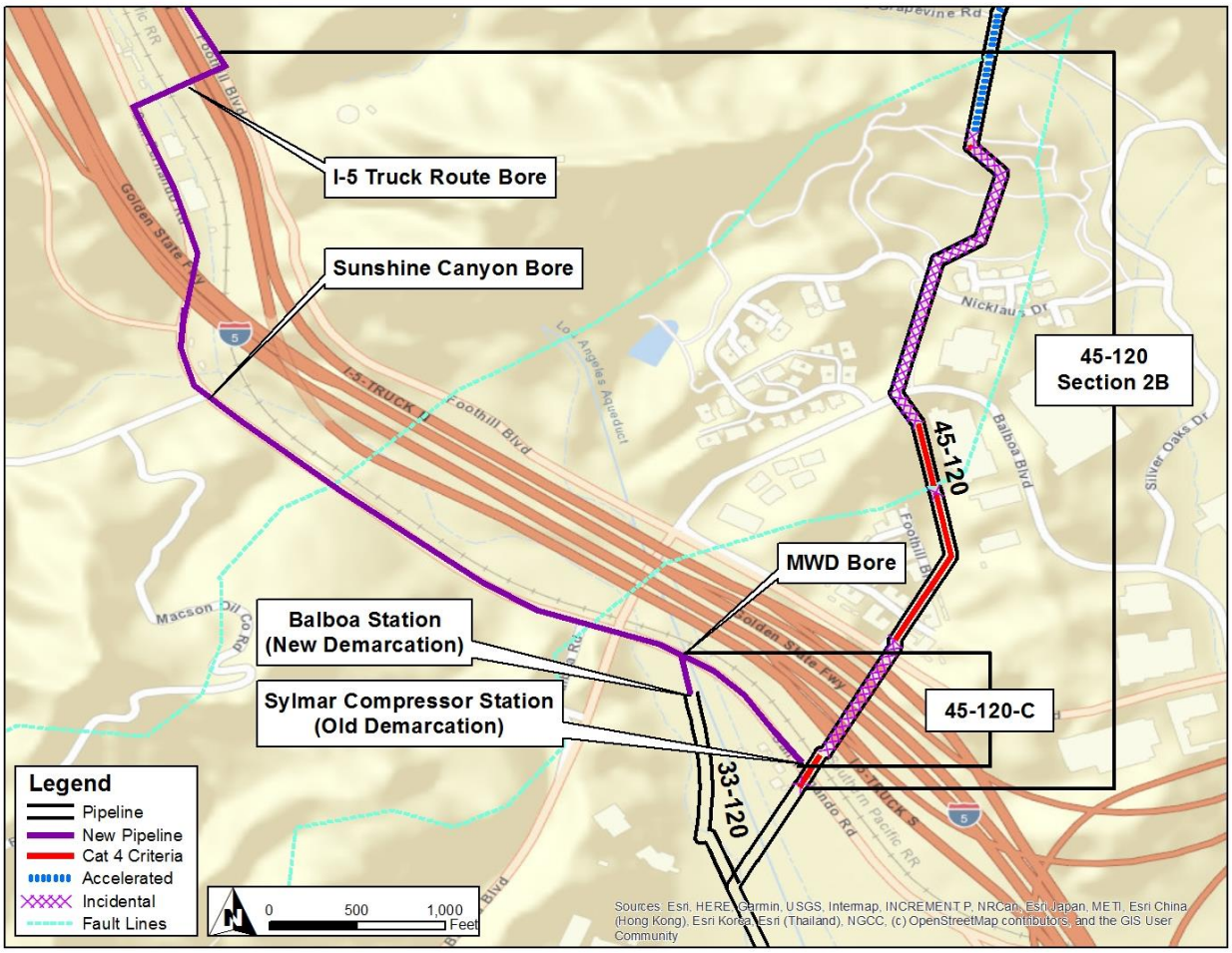


Figure 7: Overview Map of Supply Line 45-120 Section 2B



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Final Mileage	0.324 mi.	2.524 mi.	0.684 mi.	0.056 mi.	3.588 mi.
	1,712 ft.	13,325 ft.	3,610 ft.	296 ft.	18,943 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[5] Prior to initiating execution of the Project in 2014, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. The progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 45-120 as a Phase 1A Replacement Project comprised of 1.772 miles of Category 4 Criteria pipe and 2.529 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing, and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 1.484 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. For project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline, SoCalGas separated the Supply Line 45-120 Project into two separate projects: Supply Line 45-120 Section 1[6] Replacement Project, and Supply Line 45-120 Section 2 Replacement Project.

[3] Accelerated mileage includes Phase 1B. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.
[6] Supply Line 45-120 Section 1 Replacement Project was filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004.

Section 1 was executed and completed in 2014 to meet the requirements of the City of Santa Clarita's paving moratorium.

b. The Project Team engineered and designed a rerouted pipeline alignment from mountainous terrain for Section 2 to improve accessibility during routine maintenance and emergency responses.
c. The Project Team installed engineered crossings at four locations to cross substructures, roads, and highways.
d. The Project Team installed one new MLV.
e. The Project Team included Accelerated and Incidental mileage to accommodate the rerouted alignment.

4. Final Project Scope: The final project scope consists of a 3.588 mile Replacement. The final mileage consists of 2.524 miles of Accelerated Phase 1B pipe and 0.684 miles of Incidental pipe, one MLV and four engineered crossings.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 45-120 Section 2 and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas has already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas system are not suited for in-line inspection, likely have non-state-of-the-art welds, and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code

section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in with no system impact.
2. Customer Impacts: Per the RER, the Project Team was able to maintain service to customers without impact during tie-in activities.
3. Community Impacts: The location of this project is in a heavily trafficked area that required extensive traffic control measures and work hour restrictions to mitigate construction impact to business and residents along the construction route.
4. Piggability: Non-piggable.
5. Pipe Vintage: 1930.
6. Existing Pipe Attributes: The Project Team identified multiple diameters, short radius elbows, and unbarred tees along the existing pipeline.
7. Longseam Type: Unknown.
8. Longseam Repair History: No identified issues.
9. Condition of Coating: No identified issues.
10. History of Leaks: No identified issues.
11. Constructability: The existing pipeline traversed steep and mountainous terrain and was located in a seismically active area, crossing multiple fault lines. The Project Team rerouted the new pipeline to improve pipeline accessibility for routine and emergency maintenance.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed multiple site walks. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in with no system impact.
2. Customer Impact: Per the RER, the Project Team was able to maintain service to customers without impact during tie-in activities.
3. Community Impact:
   a. The Project is in a heavily trafficked area that required extensive traffic control measures and work hour restrictions to mitigate construction impact to business and residents along the construction route.
   b. Nightwork was performed at some Project sites to reduce impacts.
   c. The Project temporarily relocated three residences near the Sunshine Canyon Bore site.
4. Diameter Changes: The Project Team replaced the existing [redacted] line with a [redacted] line to standardize the pipeline for piggability purposes.
5. Valves: The Project Team installed one new MLV along Foothill Boulevard adjacent to the I-5 Truck Crossing bore.
6. Land Use:
   a. The Project Team determined this project would require multiple laydown yards and obtained Temporary Rights of Entry (TREs) for six locations along the construction route to use for materials and equipment staging, construction offices, water tank staging, and other construction related activities.

b. The Project Team acquired one easement for a bore site from the landowner on the west side of the I-5 Truck Route/Railroad bore. The remaining bore sites were within the new franchise.

7. Permit Conditions: The Project Team identified multiple jurisdictional agencies and permitting requirements that necessitated careful scheduling and coordination to synchronize the permit acquisition, being mindful of permit expiration dates as well. Permit acquisition time varied at each agency, depending on the type of permit being issued. This created a risk of approved permits expiring before the remaining permits for an area were approved. The Project Team identified the following agencies that had jurisdiction over portions of this project:
   a. Caltrans
   b. The City of Santa Clarita
   c. The City of Los Angeles (Bureau of Engineering, Bureau of Street Services, Department of Transportation, LAPD, Industrial Waste Division, etc.)
   d. The County of Los Angeles
   e. Metrolink - Los Angeles County Metropolitan Transit Authority (LACMTA)
   f. Metropolitan Water District (MWD)
8. Environmental:
   a. The Project Team obtained permits for the treatment and discharge of hydrotest water as well as the ground water encountered during construction.
   b. The Project Team planned for abatement activities for possible asbestos containing materials (ACMs) and lead based paint.
9. Schedule Coordination: The Project Team coordinated a portion of construction, the tie-in, and the post-completion hydrotest design with the PSEP Supply Line 33-120 Section 1 Replacement Project to avoid system disruptions. The two projects also shared a laydown yard.
10. Schedule Delay: The Project Team executed the design and construction of each pipeline section in the order that permits were being issued and/or reissued due to changes in design during construction. This allowed the Project Team to initiate

construction as soon as construction risks were identified, mitigation measures were in place and all necessary permits were obtained. As construction proceeded, unanticipated rock and sandy soil conditions resulted in delays and redesigns.

11. Reroute: The Project Team encountered a number of constraints along the preexisting route and determined that they could be mitigated by rerouting the pipeline alignment. In determining the rerouted alignment, the Project Team considered the following:
    a. Due to the residential and commercial development that had occurred since the original installation of the pipeline in 1930, the Project Team determined that a rerouted alignment primarily within the county and city franchise would improve accessibility for routine maintenance and emergency response.
    b. The existing pipeline is aligned in mountainous terrain and the Project Team determined that there was not sufficient space to safely complete construction in these areas. The Project Team rerouted the pipeline to existing roadways to provide adequate space for construction and to improve safety when accessing the pipeline for routine maintenance.
12. Tie-In: The Project Team relocated the demarcation of Supply Line 45-120 and Supply Line 33-120 from Sylmar Compressor Station to Balboa Station in order to abandon an existing span over a creek. These activities were a part of the PSEP Supply Line 33-120 Section 1 Replacement Project. In order to maintain suction pressure at the Sylmar Compressor Station after the updated pipeline configuration, the Project installed a new lateral, Supply Line 45-120-C.
13. Groundwater: The Project Team identified that the groundwater table was shallow along portions of San Fernando Road between Sierra Highway and Sunshine Canyon. The Project Team anticipated that this would be a factor at the trenching and bore sites at Interstate 5 and at Sunshine Canyon. The Project Team designed a one mile long dewatering system and installed piping from the Interstate 5 Truck Route/Railroad bore at the north end of San Fernando Road through Sunshine Canyon to a laydown yard where the sediment was removed.

14. Substructures:
    a. The Project Team designed the pipeline alignment to accommodate the existing above structures and substructures. The Project Team reviewed public records and potholed along the route, to the extent possible, to confirm the exact location of the underground substructures along the proposed pipeline alignment and soil conditions. Potholing necessitated Traffic Control Plans (TCPs) from the jurisdictional agencies that have oversight along each section of the alignment.
    b. The Project Team obtained TCPs and completed potholing in the City of Santa Clarita and Los Angeles County; however, the Project Team experienced delays of over a year in acquiring permits from the City of Los Angeles and Caltrans. The Project Team continued design activities without confirmation of substructures and soil conditions along San Fernando Road. Due to the restrictions on potholing, the Project Team anticipated encountering unknown substructures and other conditions once construction began.
15. Seismic Mitigation: The Project Team incorporated seismic mitigation measures into the final pipeline design. The new pipeline reroute crosses three active faults, the San Fernando Fault, the North Santa Susana Fault, and the South Santa Susana Fault.
16. Post Completion Hydrotest:
    a. The Project Team identified that a test break, Sections 2A and 2B, was necessary due to the elevation difference between the highest point of the rerouted pipeline to the lowest point of the pipeline.
    b. The test break was sited at the end of Section 2A at the new MLV sited at the I-5 Truck Route bore crossing.
    c. The post construction hydrotest for Section 2B incorporated the post completion hydrotest for Supply Line 33-120 Section 1 Replacement Project to eliminate an additional hydrotest for the Supply Line 33-120 Section 1 Replacement Project.
17. Constructability: The Project Team identified four locations that required crossing roadways and substructures. The Project encountered unforeseen conditions that

required redesigns with new permitting requirements, resulting in schedule delays. The details regarding the four engineered crossings are as follows:

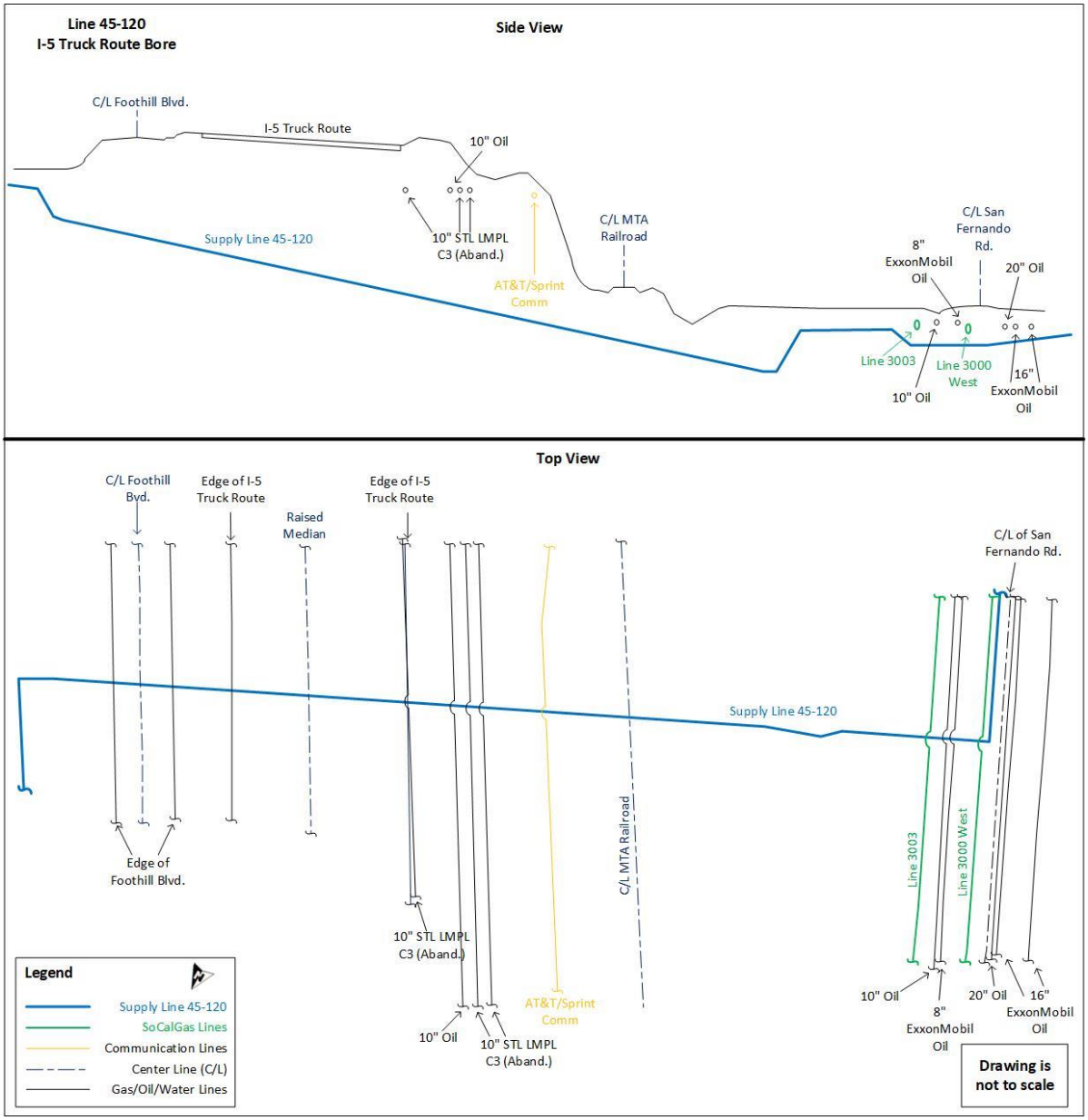
I-5 Truck Route Bore Crossing

The Project Team developed several preliminary plans to find the optimal location to cross from Sierra Highway and Foothill Boulevard under I-5 Truck Route to San Fernando Road. The Project Team encountered an abandoned tunnel near the Sierra Highway Bridge making the initial route impassable due to the narrow corridor. The Project Team identified an alternate location south of the Sierra Highway Bridge crossing along Foothill Boulevard under I-5 Truck Route and MTA railroad to San Fernando Road. This engineered crossing experienced extensive delays in obtaining permits.

1. Constructability: Approximately 120 feet into the bore, the Construction Contractor hit a hard, impenetrable object deflecting the pilot bore from its laser guided path. The Project Team determined that the bore was striking rock requiring a redesign of the bore crossing using a cased bore, requiring a new permit from Cal/OSHA. Once bore operations were continued and rock was encountered, the boring head was removed, and a crew member would manually excavate with a jack hammer through the rock.
2. Groundwater: The Project Team encountered groundwater in excess of what was anticipated undermining the bore pit. The Project Team excavated the groundwater wells and the area was shored immediately and backfilled with slurry to prevent cave-ins. Once the groundwater issue was under control, the Construction Contractor began manually excavating within the casing.
3. Permit Conditions:
    a. Caltrans required the redesigned bore to undergo a structural review. The redesigned bore diameter was 36-inches. The bore then qualified as a tunnel since it measured more than 30-inches in diameter. This initiated a tunneling requirements review as required by Caltrans. Once the Project Team submitted the application for the redesigned bore, Caltrans notified the Project Team that a Cal/OSHA mining and boring permit would be required.

b. Cal/OSHA mining and bore permit resulted in delaying the project schedule to complete the necessitated soil report.

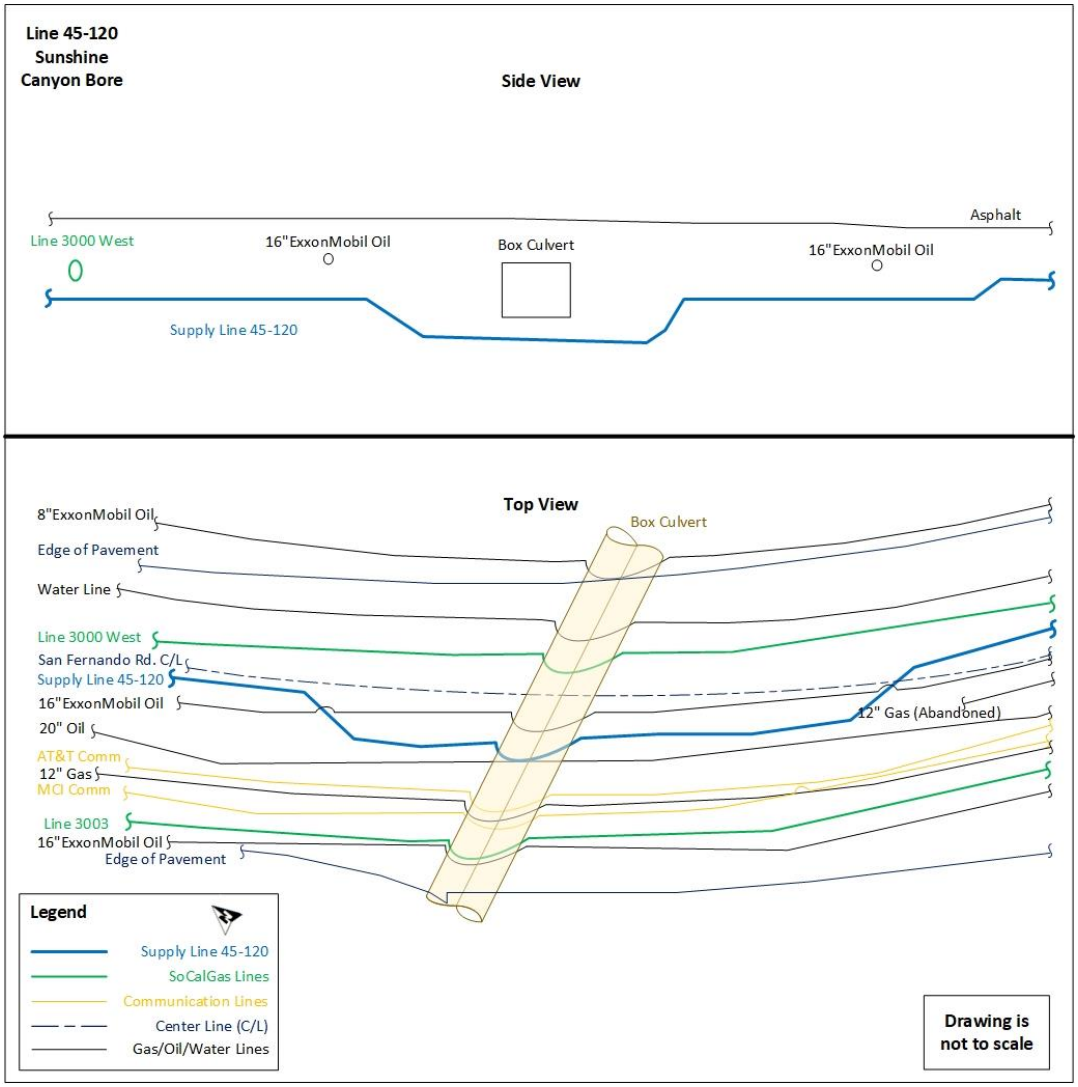
Figure 8: Schematic of Substructure Crossings of I-5 Truck Route



Sunshine Canyon Bore Crossing

The Sunshine Canyon bore crossing is located at the heavily trafficked intersection of San Fernando Road and Sunshine Canyon Road. This bore crossing was executed to cross under a large box culvert. The elevation of this area is at the lowest point of the Newhall Pass and the Project Team anticipated a substantial amount of groundwater and prepared for dewatering efforts.

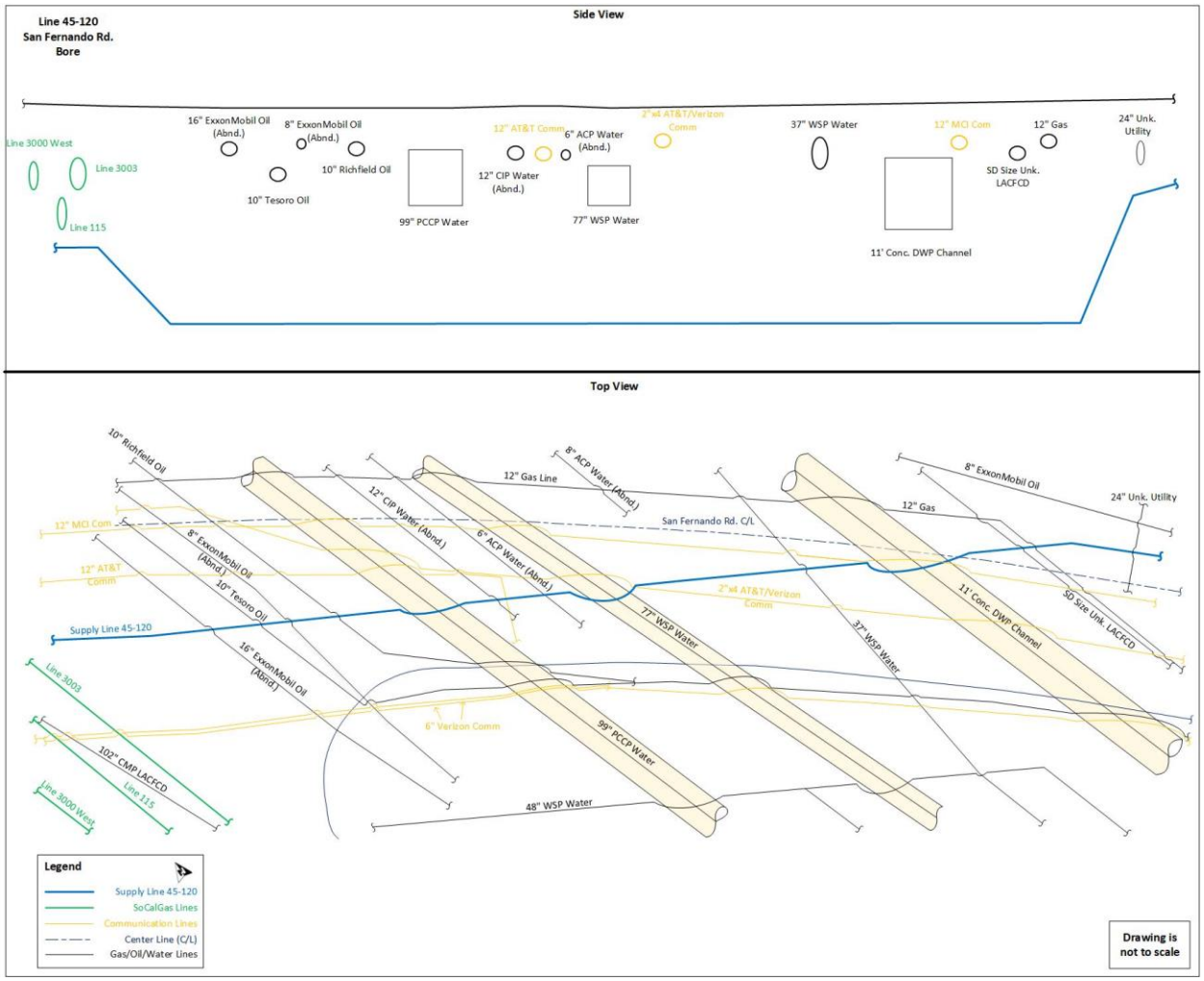
Figure 9: Schematic of Substructure Crossings Along Sunshine Canyon Road and San Fernando Road



MWD Bore Crossing

The MWD Bore is located along San Fernando Road at the primary entrance of an MWD Water Treatment Facility. This crossing was executed using jack and bore to cross under multiple large diameter LADWP substructures and to provide uninterrupted access for MWD vehicles to ingress and egress from the facility.

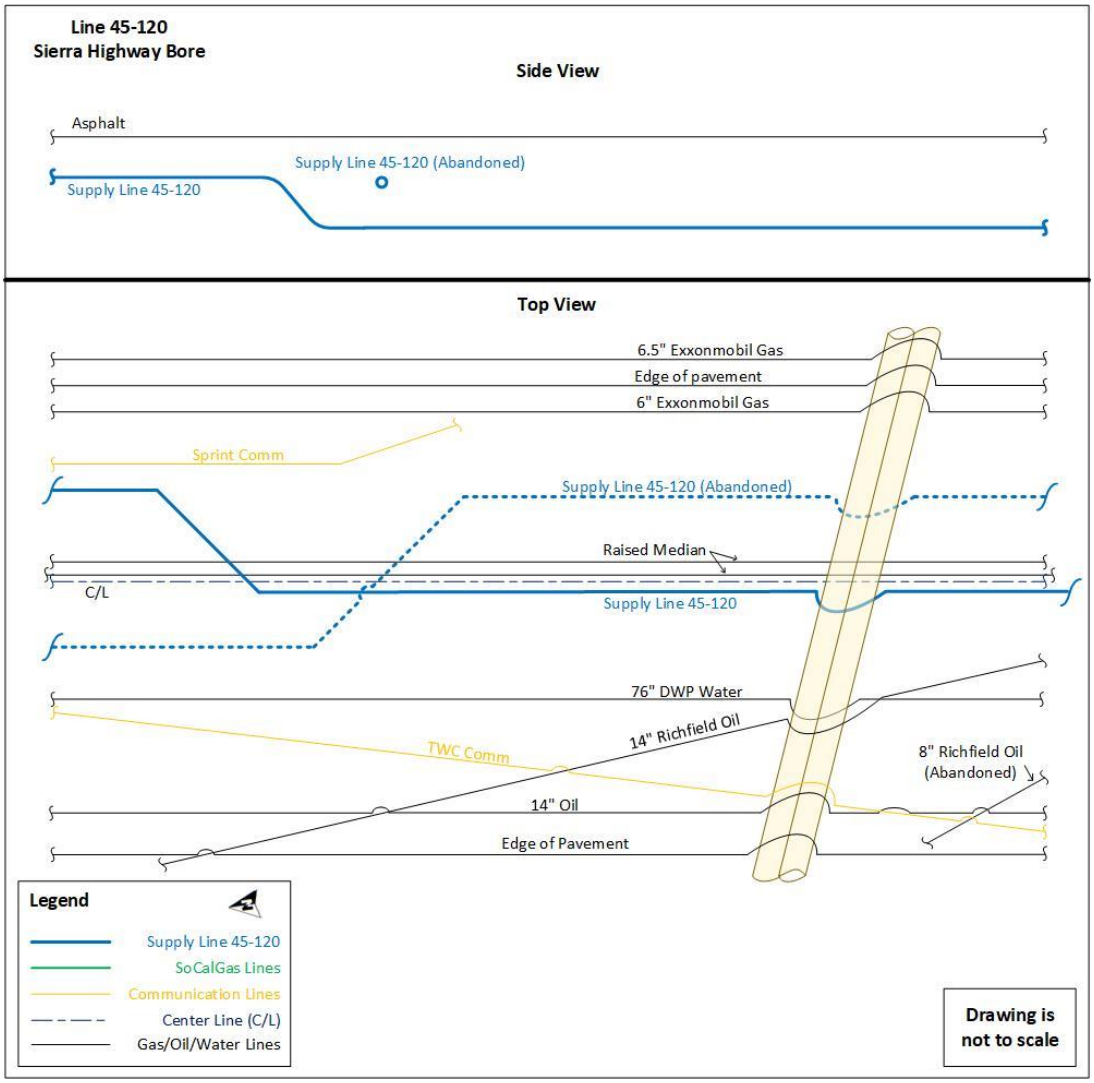
Figure 10: Schematic of Substructure Crossings Along San Fernando Road Near Balboa Boulevard – MWD Bore Crossing



Sierra Highway Bore Crossing

The Project Team determined that the bore pit at Sierra Highway and Remsen Street required engineered shoring since the bore pit was in excess of 30 feet deep. The Project Team encountered sand and cobble not previously identified requiring immediate backfill with slurry to prevent cave-ins as shoring was removed.

Figure 11: Schematic of Substructures Near Sierra Highway and Remsen Street



D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the additional Construction Contractor Costs are reflected in change orders; however, additional costs incurred by Engineering & Design, Project Management, Environment, etc. are not reflected in the preliminary estimate nor in change orders and include the following:

1. Construction Method: The I-5 Truck Route bore experienced three unsuccessful attempts to bore through what was assumed to be large boulders. It was determined there was a layer of bedrock causing the unsuccessful crossing attempts. Ultimately, a method of utilizing a casing and hand mining was used to complete the bore. Each crossing attempt required extensive engineering analysis to determine the feasibility of the crossing method, resubmittal of permits to Caltrans, MTA, and the City of Los Angeles.
2. Groundwater: Extensive amounts of groundwater ranging from 50,000 to 100,000 gallons of water per day were encountered along San Fernando Road, resulting in reduced Construction Contractor productivity from the planned installation of 90 feet per day to 10 feet per day. Groundwater mitigation efforts also resulted in additional environmental monitoring, water handling and storage, water filtration equipment, and disposal costs.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed a Performance Partner to prepare cost estimates for the Section 2A work. SoCalGas awarded the Section 2A construction contract to this Performance Partner. The Project Team directed a separated Performance Partner to prepare cost estimates for Section 2B. SoCalGas awarded the Section 2B to a separate Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractors' Price Estimates (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Section 2A	
Construction Start Date	09/02/2014
Construction Completion Date	06/10/2017
NOP Date	06/10/2017
Section 2B	
Construction Start Date	06/15/2017
Construction Completion Date	02/01/2018
NOP Date	12/22/2017

C. Changes During Construction

The conditions summarized below were encountered during construction and occurred in conjunction with the design challenges discussed above. Activities to address or mitigate these conditions resulted in approximately $11,262,000 in change orders.

1. Site Conditions:
   a. The Project Team encountered additional unidentified substructures, contaminated soil, and groundwater requiring the daily discharge of water in excess of the anticipated amount.
   b. The Construction Contractor hit a hard object while performing the I-5 Truck Route Bore. Due to hard soil conditions, the bore could not be completed as originally planned. During the evaluation of the alterative options to complete the bore, the Construction Contractor provided necessary equipment to maintain the bore pits.
   c. The Project Team encountered unstable soil conditions while removing the shoring box at the Sierra Highway Bore Crossing that required the bore pit to be backfilled with slurry to stabilize the soil and roadway.
2. Schedule Delay: Conditions encountered in the field extended the Project duration by approximately 20 weeks. Additional field support costs were incurred to support the completion of this project.
3. Traffic: Delays in obtaining approval of a traffic signal control plan (TCP) from LADOT prevented the cutting of a segment of traffic loops along the Project route. The Project Team completed work out of sequence and maintained shoring in the affected area until the approval of TCP.
4. Field Design Changes: The Construction Contractor completed additional potholing to locate utilities for the I-5 Truck Route Crossing.

Figure 12: Lowering in New Pipe

Figure 13: Bore Casing for Interstate 5 and Metrolink Crossing

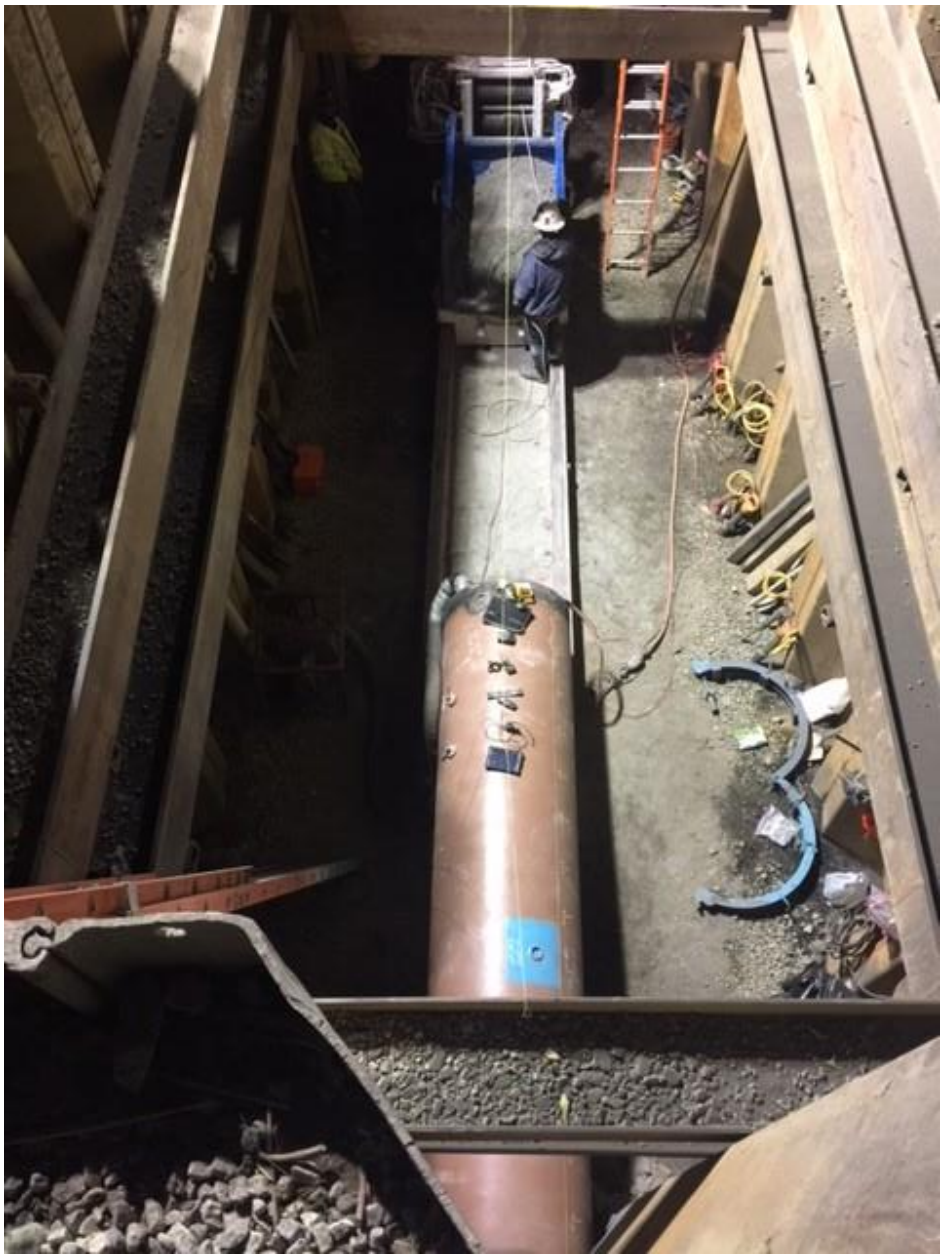
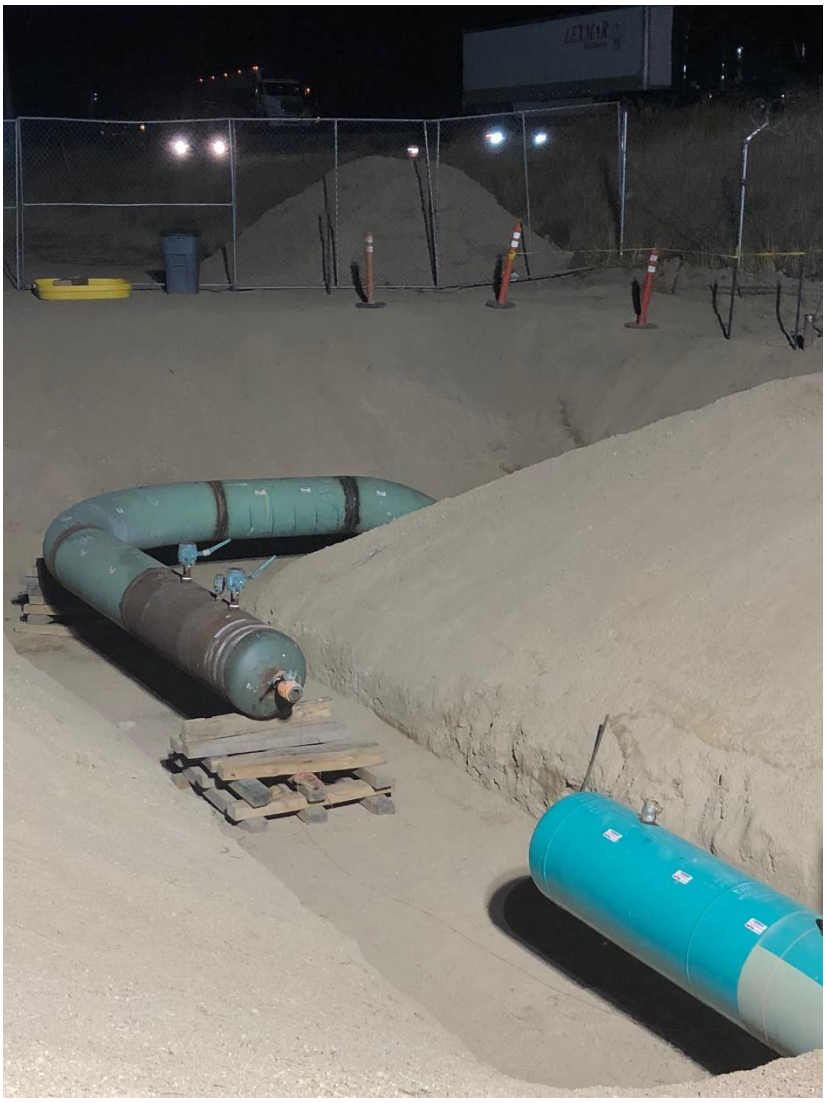


Figure 14: Test Heads at I-5 Truck Route Crossing



D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Land Use: A laydown yard was shared with the Supply Line 33-120 Section 1 Replacement Project.
2. Construction Execution:
   a. Construction crews were redeployed to other construction locations when delays occurred.
   b. During the potholing effort, the Construction Contractor trenched the validated potholes and secured permission from the City of Los Angeles to keep the trench open and avoided approximately 2,000 feet of retrenching.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $54,405,172. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $91,982,404.

Table 4: Estimated and Actual Direct Costs and Variances[7]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	348,116	1,098,712	750,596
Materials	6,979,498	2,309,212	(4,670,286)
Construction Contractor	28,434,162	43,725,028	15,290,866
Construction Management & Support	6,083,254	5,769,593	(313,661)
Environmental	1,502,253	5,606,349	4,104,096
Engineering & Design	3,404,093	6,954,122	3,550,029
Project Management & Services	1,289,514	1,768,943	479,429
ROW & Permits	616,157	1,839,993	1,223,836
GMA	5,748,125	6,971,211	1,223,086
Total Direct Costs	**54,405,172**	**76,043,163**	**21,637,991**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[8]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	2,476,414	5,191,222	2,714,808
AFUDC	2,155,659	9,473,334	7,317,675
Property Taxes	206,856	1,274,686	1,067,830
Total Indirect Costs	**4,838,929**	**15,939,241**	**11,100,312**
Total Direct Costs	**54,405,172**	**76,043,163**	**21,637,991**
Total Loaded Costs	**59,244,101**	**91,982,404**	**32,738,303**

[7] Values may not add to total due to rounding.
[8] Ibid

The actual Full-Time Equivalents[9] (FTEs) for the duration of this Project are 2.01.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

Due to the complexity of construction and field design changes resulting from unknown geological features and the substantially higher than anticipated groundwater encountered, additional time and support was required for Supply Line 45-120 Section 2 Replacement Project, leading to higher-than-anticipated management costs. The project team had to assess alternatives and execute an updated plan, which extended the construction schedule, especially when bedrock was encountered. Construction experienced additional challenges such as permit delays and unforeseen soil conditions, resulting in increased costs. Specifically, this project required the issuance of multiple permits from 11 different authorities, which in some cases required inter-agency coordination. Environmental costs rose due to extensive groundwater and contaminated soil encountered. Engineering and design costs exceeded estimates due to scope

[9] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor and are not typically provided for reasonableness reviews. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

changes and increased support needed during construction to update drawings and designs.

Despite these challenges, the project team found ways to reduce costs, examples include combining hydrotest activities with an adjacent project to reduce costs and redesigning portions of the project to avoid prolonged interruptions, resulting in the successful completion of the Supply Line 45-120 Section 2 Replacement Project. It is also important to note material costs saw significant savings as the Project Team optimized the project route during detailed design, reducing the required installation length of the [redacted] pipe and the number of elbows needed. Additionally, the scope was decreased by eliminating planned vault installations after further engineering review determined direct burial was feasible.

At the completion of the Supply Line 45-120 Section 2 Replacement Project, Actual Direct Costs exceeded the preliminary estimate by $21,637,991. This variance is attributable to a variety of factors including:

1. Company Labor: As explained in Section III. Part C, due to complexity of construction and the field design changes before and during construction as a result of identifying unknown geological features, Actual Direct Company Management costs were approximately $818,000 more than originally anticipated for the additional time and support that was needed to assess alternatives and execute an updated execution plan. For example, the change in construction methods due to the bedrock encountered resulted in an increase in the construction schedule.
2. Materials:
    a. The Project initially estimated approximately 26,000 feet of [redacted] pipe would be required, but as detailed design progressed, the project route was optimized and only required installation of approximately 16,000 feet, resulting in savings of $685,000.

b. The Project estimate included procurement of 160 elbows, but through detailed design and constructability reviews, the Project only required installation of 44 elbows, resulting in savings of $648,000.

c. Two vaults were originally planned for two new Mainline Valve installations. After further engineering review, it was determined that each valve could be direct buried and that one valve installation would be transferred to another SoCalGas Project, decreasing the scope to one valve installation and removing both precast vault installations.

3. Construction Contractor: Activities to address or mitigate conditions encountered during construction are detailed in Section III. Part C resulted in approximately $11,262,000 in change orders. Additional context has been provided below:

   a. The Construction Contractor hit a hard object while performing the I-5 Truck Route Bore that was later determined to be bedrock. This geological feature was located under the I-5 Truck Route in an area that would have been infeasible to pothole before executing the bore. Due to these unknown geological conditions along the bore route, it could not be completed as originally planned and required multiple boring attempts, increasing the construction costs by approximately $1,019,326.

   b. The Project Team encountered extensive amounts of groundwater, contaminated soil, and unidentified substructures during construction resulting in significantly reduced Construction Contractor productivity and an extended schedule, increasing the overall construction costs by $7,164,188. SoCalGas identified the high groundwater table before construction and incorporated this information into the project design by adding dewatering piping. To minimize groundwater issues, the project was also scheduled to begin in the summer months. However, groundwater conditions can vary due to factors such as seasonal precipitation and irrigation. Despite thorough upfront planning, the field conditions during construction were more challenging than anticipated.

c. Due to the unknown geological conditions along the I-5 Truck Route bore route, it could not be completed as originally planned and required hand mining activities during the Jack and bore to break up the bedrock, increasing the construction costs by approximately $4,825,000.

d. The Project Team experienced the following permitting challenges which contributed to the extended schedule and increased the cost of the project:

   i. The Project Team had initially planned to tie-in Supply Line 45-120 Section 2 simultaneously with another SoCalGas Project. However, as the adjacent project continued discussions with the Metropolitan Water District, it was determined the other project would be significantly delayed, as it would likely require a review pursuant to the California Environmental Quality Act (CEQA). This resulted in a change in the tie-in location which increased the pipeline installation length, including a Jack and Bore, for Supply Line 45-120 Section 2 to avoid prolonged interruptions during construction and for the continuity of the gas system.

   ii. The project encountered unexpected delays in securing the necessary Traffic Control Plans from the City of Los Angeles for the Foothill Boulevard closure, primarily due to the city's significant backlog and limited resources. Subsequently, the City of Los Angeles mandated an extended comment period from the Los Angeles Bureau of Street Services to assess the impacts on their jurisdiction. This process required further approval from the Board of Directors of the Los Angeles Bureau of Engineering. As a result of these unforeseen extended reviews and approvals, the Project Team had to demobilize for three months after completing the Los Angeles County portion of the project on Sierra Highway.

   iii. The Sunshine and MWD Bore locations received City of Los Angeles permit approvals but were still awaiting Caltrans to complete their Traffic Control permit for the sections between the City of Los Angeles areas. Although the Project Team submitted Caltrans Traffic Control Plans in advance, the

approval process took longer than anticipated and proved challenging. Collaborating with the various agencies was also necessary to reach a compromise on the final Traffic Control Plan. The overlapping Caltrans Traffic Control Plan was not approved within the estimated timeframe, leading to resequencing and parceling of construction activities, which ultimately reduced productivity.

iv. The Project Team also managed additional Caltrans permitting requirements during construction of the I-5 Truck Route Bore. This was a result of encountering bedrock, which necessitated an updated design to incorporate a larger diameter casing which enabled hand mining the bedrock. As a result, a mining and tunneling permit had to be submitted to the CAL OSHA Mining and Tunneling Unit. Therefore, the project had to demobilize the Jack and Bore construction crew until the permits were approved.

e. The Project Team encountered unforeseen sandy soil conditions at a bore pit location along the Sierra Highway which slowed construction considerably and required backfilling to stabilize the roadway before re-excavation was done to complete the pipeline installation. This resulted in a cost increase of $414,950.

4. Construction Management & Support: The Project Team combined tie-in and post completion Hydrotest activities with an adjacent SoCalGas Project, which decreased the inspection and Project Field Team personnel, provided shared logistics, and consolidated communication with the local jurisdiction inspection representatives, reducing the project costs by approximately $200,000.
5. Environmental: The Project incurred approximately $2,599,000 in additional environmental costs due to extensive amounts of groundwater (approximately 30 to 40 thousand gallons discharged daily), petroleum contamination in the soil, unknown petroleum pipeline crossings, and other substructures found during the execution of the Project on Section 2A. Environmental activities to address these conditions

included environmental monitoring, water handling and storage, water filtration equipment, and hazardous waste disposal.

6. Engineering & Design:
    a. Scope changes from the initial estimate resulted in increased engineering support during construction due to changes during detailed design, field conditions, and additional permitting requirements which necessitated segmenting the scope. This entailed extensive engineering efforts, including but not limited to, drawing package creation for each segment, traffic control plans, site visits, substructure research, feasibility studies, exhibits, reviewing specifications, and providing field support. As a result, Engineering & Design costs exceeded the initial estimate by approximately $1,036,000. See below for Illustrative examples that required these efforts:
        i. The Project was initially planned for one single post-completion hydrotest. However, during the detailed design phase, it was determined that the elevation changes along the pipeline necessitated separating it into two hydrotest sections. This required modifications to separate the test sections, leading to the development of additional drawing packages, exhibits, and other engineering deliverables.
        ii. The Project Team had initially planned to tie-in Supply Line 45-120 Section 2 simultaneously with another SoCalGas Project. However, as the adjacent project continued discussions with the Metropolitan Water District, it was determined this project would be significantly delayed, requiring the California Environmental Quality Act (CEQA) process. This resulted in increased Project Management and Services costs to support redesigning a portion of the Supply Line 45-120 Section 2 Replacement Project to avoid prolonged interruptions during construction and for the continuity of the gas system.
    b. Extensive survey activities beyond what was anticipated during preliminary design were required for the four engineered crossings, including additional

survey work during construction to determine an optimal route for the I-5 Truck Route Bore crossing after encountering an unknown layer of bedrock.

c. The Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs of $304,000 were recognized under Engineering and Design.

7. Project Management & Services:

a. The engineering firms provided Project Management & Services activities which were originally estimated under Project Management and Services, but approximately $304,000 of these costs were recognized in Engineering and Design.

b. The Project Team had initially planned to tie-in Supply Line 45-120 Section 2 simultaneously with another SoCalGas Project. However, as the adjacent project continued discussions with the Metropolitan Water District, it was determined this project would be significantly delayed, requiring the California Environmental Quality Act (CEQA) process. This resulted in increased Project Management and Services costs to support redesigning a portion of the Supply Line 45-120 Section 2 Replacement Project to avoid prolonged interruptions during construction.

8. ROW & Permits:

a. The project impacted numerous external stakeholders, including government entities, municipalities, and private commercial and residential landowners. These stakeholders were further identified and refined during the detailed design phase, leading to the actual costs of easements exceeding preliminary projections by approximately $862,000.

E. Disallowance

The scope of the Line 45-120 Section 2 Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 45-120 Section 2 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced and rerouted 3.588 miles of pipeline and one MLV in the City of Los Angeles and City of Santa Clarita. The total loaded cost of the Project is $91,982,404.

SoCalGas executed this project prudently through the replacement and reroute of 3.588 miles of pipeline utilizing open trench, three jack and bores, one slick bore beneath the I-5 Truck Route, and the replacement of one MLV.

SoCalGas engaged in prudent cost avoidance efforts by obtaining a groundwater discharge permit, as opposed to hauling water off-site to disposal facilities, rerouting the pipeline to avoid environmentally sensitive areas, and coordinating design and construction with the adjacent PSEP Supply Line 33-120 Section 1 Replacement Project.

End of Supply Line 45-120 Section 2 Replacement Project Final Report

I. LINE 404 SECTION 4A REPLACEMENT PROJECT

A. Background and Summary

Line 404 is an [redacted] diameter transmission line that runs approximately 55 miles through Ventura County and Los Angeles County, including the Cities of Ventura, Camarillo, Moorpark, Thousand Oaks, and Los Angeles, terminating in the Encino neighborhood in the City of Los Angeles. The pipeline is primarily routed across Class 3 locations. This report describes the activities associated with Line 404 Section 4A Replacement Project which consists of the replacement of 0.831 miles of non-piggable dual run pipeline with 0.400 miles of single run pipeline, one main line valve (MLV), and one jack and bore installation. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $18,676,954.

The Line 404 Section 4A Replacement Project is a component of Line 404, which was identified in the 2011 PSEP filing[1] as a 24.450 mile hydrotest project. For project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline, SoCalGas divided Line 404 into several project sections to be managed individually (see Figure 1). Three key reasons drove the decision to manage the work on Line 404 in this manner; the sections were in different locations and physically separated from each other by non-PSEP segments of pipeline, the project scopes (hydrotesting and replacement) differed among the sections, and the project sections had differing permit acquisition timelines. SoCalGas standardized the pipeline diameter as part of the effort to make the pipeline piggable.

[1] See Amended December 2, 2011 Pipeline Safety Enhancement Plan (PSEP) of SoCalGas and SDG&E.

Table 1: General Project Information

Project Name	Line 404 Section 4A		
Project Type	Replacement		
Length	0.831 miles		
Location	Ventura		
Class	1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1944		
Construction Start	08/13/2018		
Construction Finish	11/20/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	18,676,954	-	18,676,954
Disallowed Costs	342	-	342

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview Image of Line 404 Hydrotest and Replacement Projects

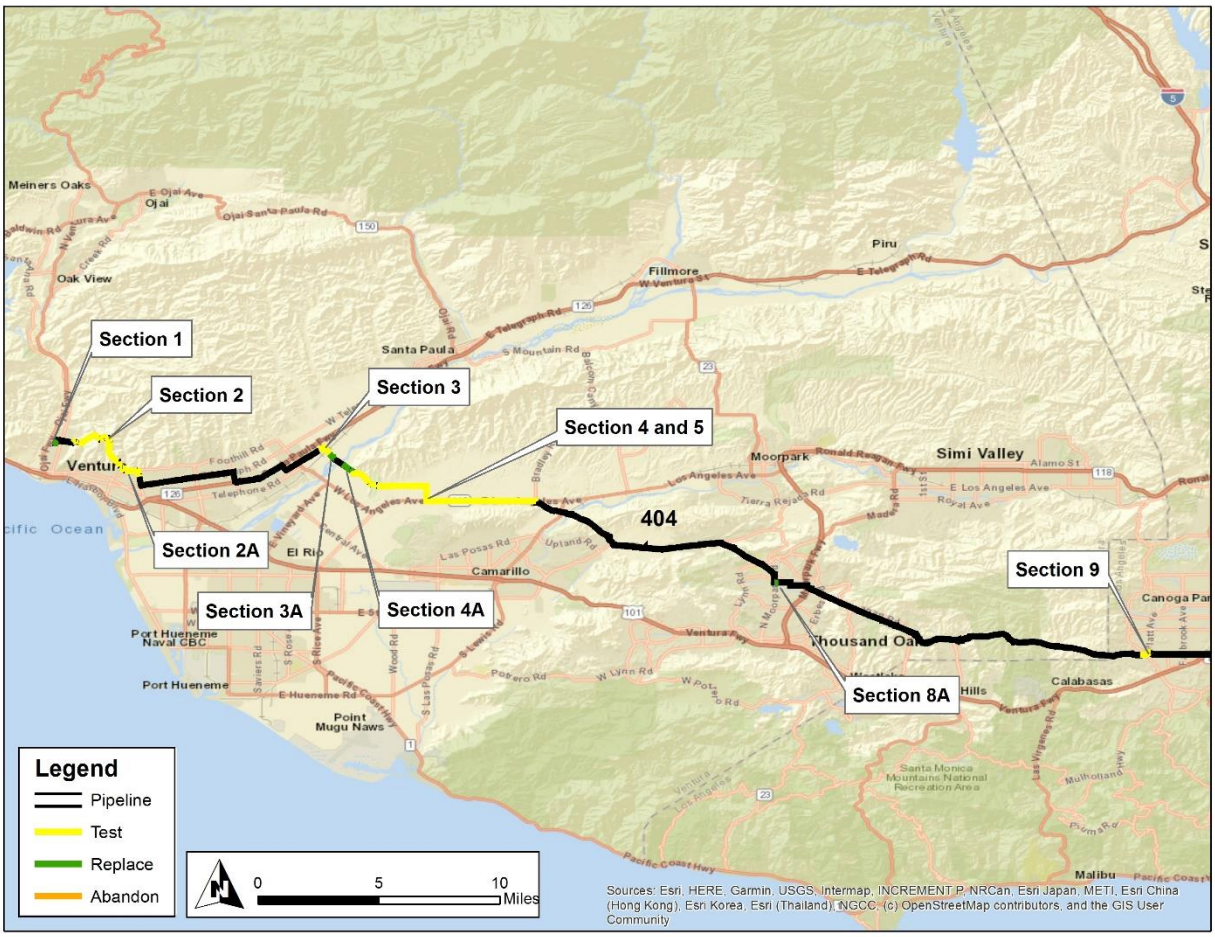


Figure 2: Satellite Image of Line 404 Section 3 Hydrotest, Section 3A Replacement, Section 4A Replacement and Section 4&5 Hydrotest Projects

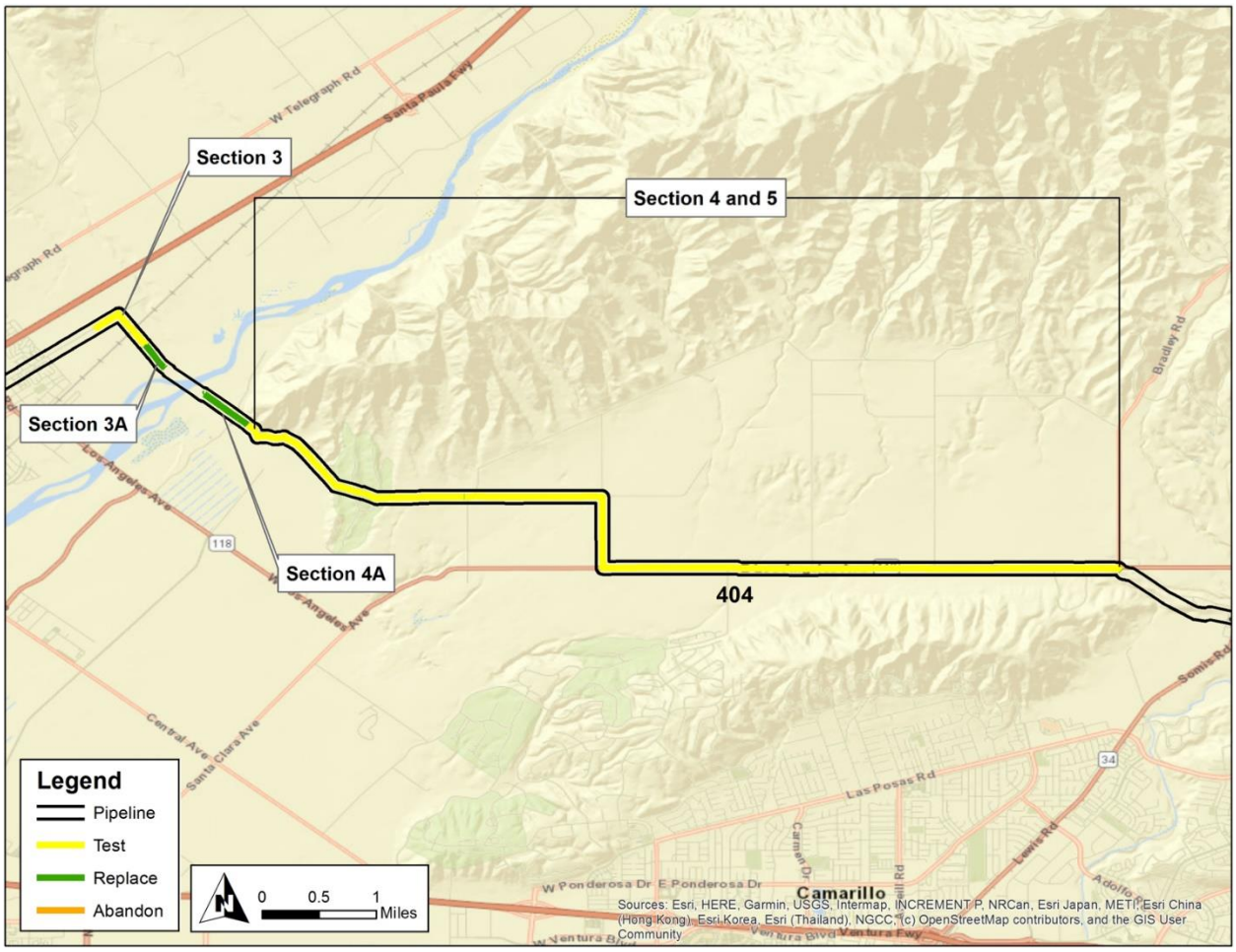


Figure 3: Satellite Image of Line 404 Section 4A Replacement Project

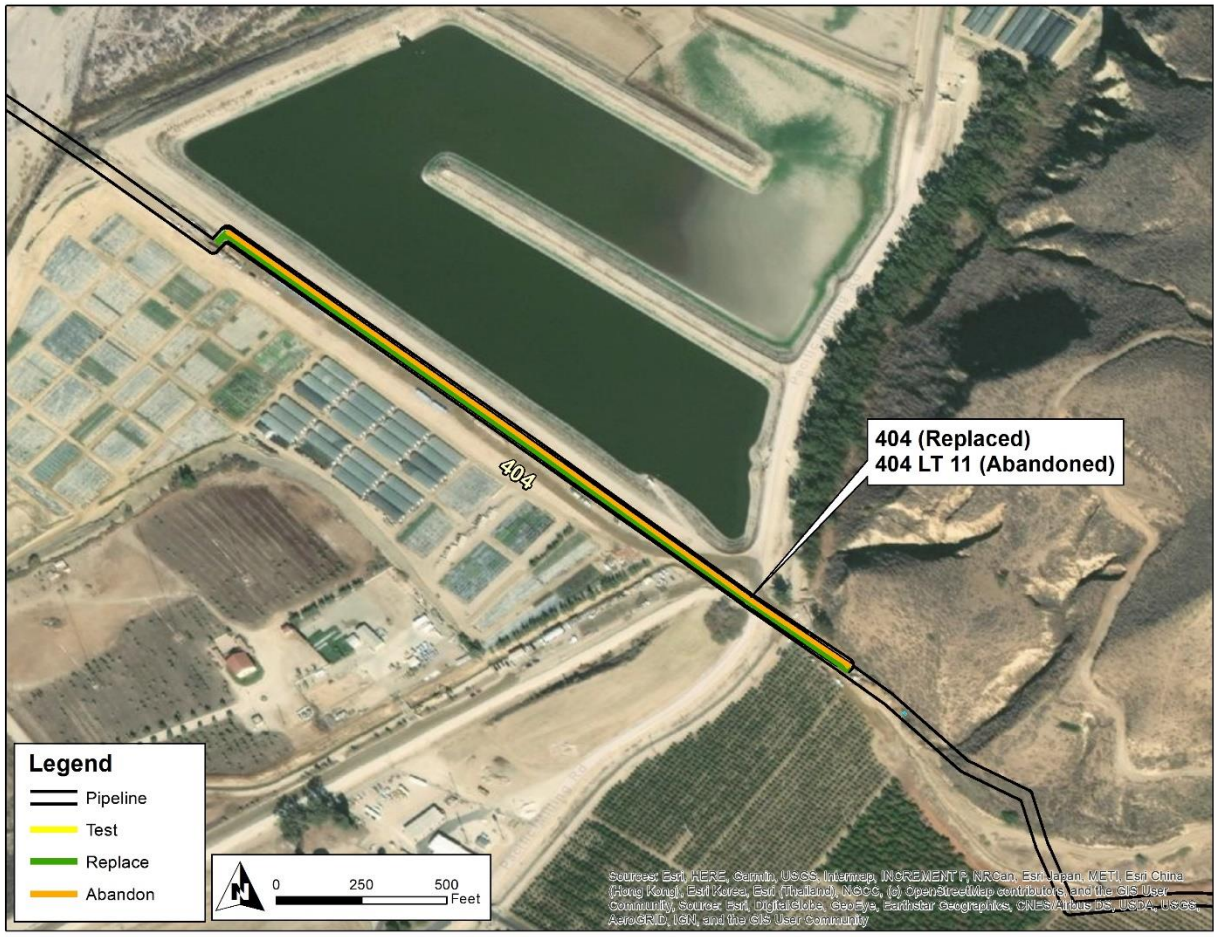
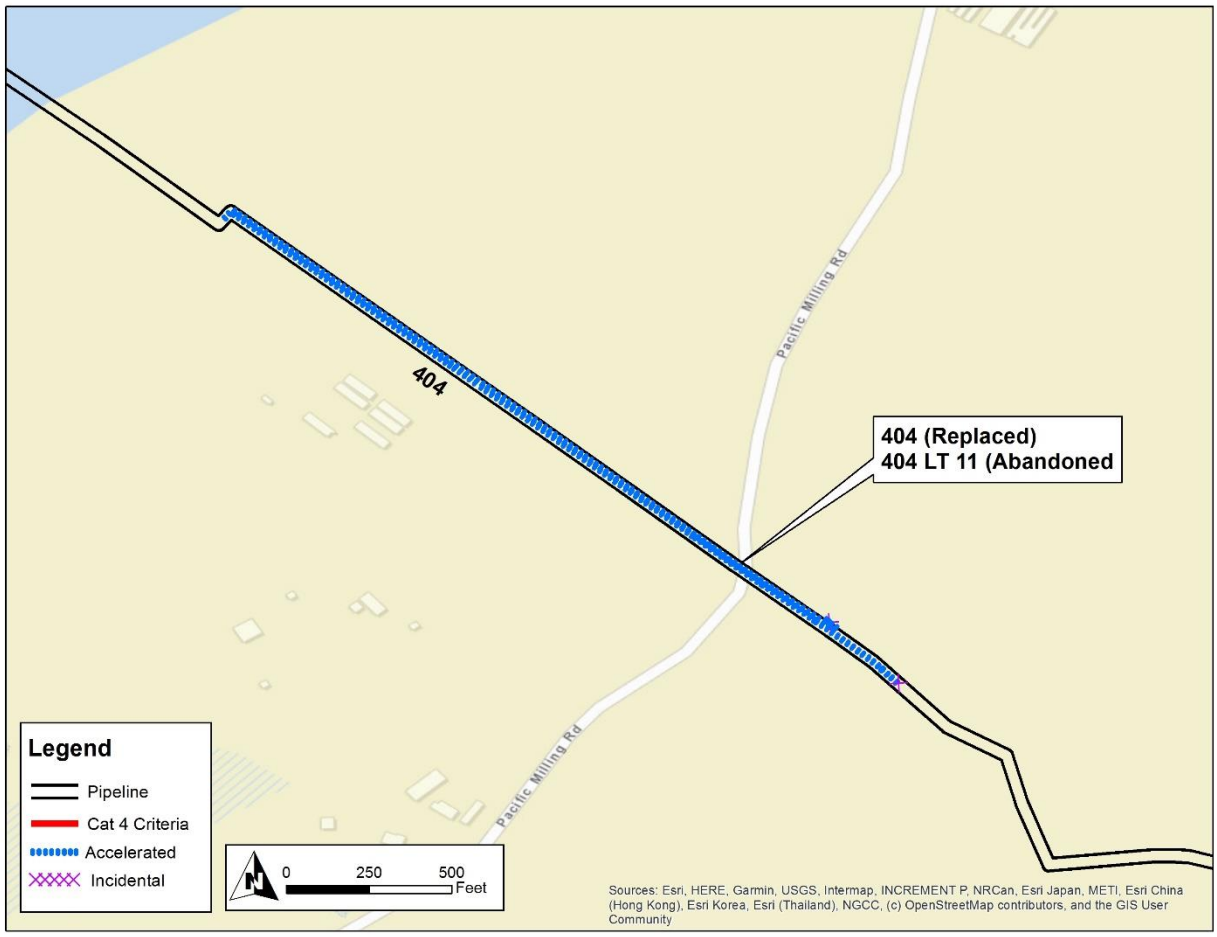


Figure 4: Overview Map of Line 404 Section 4A Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Final Mileage	0 mi.	0.964 mi.	0.001 mi.	0 mi.	0.831 mi.[5]
	0 ft.	5,092 ft.	7 ft.	0 ft.	4,387 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[6] Prior to initiating execution of the Project in 2018, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas & SDG&E identified Line 404 as a Phase 1A Hydrotest Project comprised of 24.450 miles of Category 4 Criteria pipe and 13.350 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of Line 404 by 18.874 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. SoCalGas reviewed existing pipeline records and determined that Section 4A was within a Class 1 location and was composed of Phase 1B, non-piggable pipe and was addressed in conjunction with the contiguous Phase 1A Line 404 projects.

[3] Accelerated mileage includes 0.331 miles of Phase 1B and 0.061 miles of Phase 2 pipe. The Phase 2 mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] Total Mileage for Section 4A includes both replacement and abandonment mileage of the dual piping.
[6] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. Line 404 Section 4A is a dual feed pipeline that consists of two separate parallel lengths of pipe. The scope of Line 404 Section 4A is approximately 2,042 feet and the parallel Line 404 LT 11 is approximately 2,005 feet. The Project Team designed Line 404 Section 4A Replacement Project to replace both sections of pipe with a single new pipeline.
c. Section 4A was further scoped to include the replacement of two preexisting, non-piggable, pre-46 valves (non-automated MLV and cross-tie valve).
d. Phase 1B Accelerated mileage was included to make the entire 55 mile run of Line 404 piggable and Phase 2 Accelerated and Incidental mileage was included for constructability.

4. Final Project Scope: The final project scope consists of a 0.390 mile replacement of dual run [redacted] pipe with a single run [redacted] diameter line. The Accelerated mileage consists of 0.900 miles of Phase 1B pipe, 278 feet of Phase 2A pipe, 61 feet of Phase 2B pipe, and 0.001 miles of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 404 and confirmed the project design should commence as a Replacement Project.

Pipeline segments installed prior to 1946 that are not capable of being assessed using in-line inspection technology are identified for replacement under the approved PSEP Decision Tree. As explained in the testimony supporting the approved PSEP, as part of the work previously completed during implementation federal gas transmission pipeline integrity management regulations (49 CFR 192, Subpart O), SoCalGas has already identified, retrofitted and in-line inspected pre-1946 transmission pipelines that were constructed using acceptable welding techniques and are operationally suited to in-line inspection. The remaining pre-1946 segments in the SoCalGas/SDG&E system are not suited for in-line inspection, likely have non-state-of-the-art welds, and would require significant investment for retrofitting to accommodate in-line inspection tools. Accordingly, consistent with the Commission's directive in D.11-06-017 to "address

retrofitting pipeline to allow for inline inspection tools," the requirement in California Public Utilities Code section 958 that upon completion of the PSEP, where warranted, pipelines are to be capable of accommodating in-line inspection devices, and the overarching objectives of PSEP to enhance the safety of the pipeline system in a proactive, cost effective manner, the approved PSEP Decision Tree identifies pre-1946 non-piggable pipeline segments for abandonment and/or replacement.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed an RER analysis and concluded that the line could be shut-in as long as the adjacent Line 406 remained in service.
2. Customer Impacts: The Project Team identified that Line 404 Section 4A as the primary feed to 27 customers. There were no non-core customers served by the line within the shut-in limits. The Project Team utilized CNG to prevent service disruptions to customers.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1944.
5. Existing Pipe Attributes: This section of Line 404 is non-piggable due to multiple tees and diameter changes. Additionally, the pipeline transitions from [redacted] pipe to a dual [redacted] run for approximately 2,000 feet. The pipeline then transitions back to a single run of pipe with a [redacted] diameter.
6. Longseam Type: Seamless.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed an RER analysis and concluded that the line could be shut-in as long as the adjacent Line 406 remained in service.
2. Customer Impact: Per the RER, The Project Team identified that Line 404 Section 4A is the primary feed to 27 customers. There were no non-core customers served by the line within the shut-in limits. The Project Team utilized CNG to prevent service disruptions to customers.
3. Community Impact: No identified issues.
4. Diameter Changes: The Project Team replaced the existing duel [redacted] line with a [redacted] line to standardize the pipeline diameter as part of the effort to make the pipeline piggable.
5. Schedule Coordination:
   a. The Project Team coordinated the shut-in with the PSEP Line 404-406 Replacement Project – Somis Station.
   b. The Project Team coordinated with other PSEP Line 404 Projects in order to have a fully piggable Line 404.
6. Substructures: The original pipe depth was assumed to be 7 feet, however once potholing was completed it was confirmed that pipe depth was approximately 30 feet.
7. Permit Conditions:
   a. The Project Team obtained an encroachment permit from the Ventura County Watershed Protection District.
   b. The Project Team obtained an encroachment permit and a traffic control permit from Caltrans for construction equipment traveling to the job site.

c. The Project Team obtained an encroachment permit form Ventura County.
d. The Project Team obtained an encroachment permit from the Army Corps of Engineers (ACOE). The acquisition of this permit delayed the start of construction.
e. The Project Team obtained an environmental permit from the State Water Resources Control Board for pipeline installation near the river crossing.

8. Land Use: The Project Team notified the adjacent property owner prior to the start of construction activities.
9. Environmental:
   a. The Project Team identified nesting bird habitat for a federally and state endangered bird near the excavation area with the potential impact to the construction activities.
   b. The Project Team planned for abatement activities for possible asbestos containing materials (ACMs) and lead based paint.
   c. The Project Team utilized applicable best management practices (BMPs) to prevent any discharged water from entering the Santa Clara River. This included the use of perimeter controls to prevent contaminants from entering the river via storm water runoff or leaving the Project site.
10. Valves: The Project Team replaced two preexisting non-piggable, pre-46 valves.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*):
   SoCalGas/SDG&E's preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	08/13/2018
Construction Completion Date	11/20/2019
NOP Date	10/24/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $4,435,000 in change orders.

1. Constructability Issues:

a. During HDD boring the Construction Contractor encountered rock in excess of two feet in diameter. The Project Team redesigned the bore to a larger reamer to clear the bore path of cobblestones.
b. Due to damage sustained by the HDD bore pipe during installation, the Project Team conducted a bell hole inspection and tether pig run. This included the excavation of 30 foot bell holes at the end of the HDD bore pipe for pig launcher and pig receiver area for the tether pig.
c. The Project Team redesigned the HDD to a jack and bore crossing to address unknown obstructions. During the boring operations, the Project Team encountered oversized cobble resulting in hand mining to work through the obstructions and limitations of the jack and bore equipment.

2. Environmental: Due to endangered bird nesting activity, the Project temporarily demobilized until the nesting birds left the Project site.
3. Construction Method: The ACOE required the Project Team to slurry fill the abandoned dual [redacted] pipeline. During the review with the ACOE, the Project Team negotiated the use of a less expensive slurry mix than what the ACOE had initially proposed. The initial ACOE slurry mix would only allow the slurry fill to occur in 500 foot increments with multiple excavations, while the Project Team's proposed slurry fill allowed the abandoned pipeline to be filled in one continuous fill and without additional excavations.

Figure 5: Horizontal Directional Drill Pullback

Figure 6: Lowering of Casing Pipe into Bore Pit

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: The Project Team coordinated the shut-in with the PSEP Line 404-406 Replacement Project – Somis Station.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $7,454,723. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in

accordance with Company overhead allocation policies. The total loaded cost of the Project is $18,676,954.

Table 4: Estimated and Actual Direct Costs and Variances[7]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	737,583	713,446	(24,137)
Materials	580,023	997,300	417,277
Construction Contractor	3,479,288	8,884,024	5,404,736
Construction Management & Support	505,286	911,977	406,691
Environmental	280,701	764,651	483,950
Engineering & Design	728,581	1,897,742	1,169,161
Project Management & Services	598,990	281,640	(317,350)
ROW & Permits	76,780	142,569	65,789
GMA	867,093	1,119,688	252,595
Total Direct Costs	**7,854,325**	**15,713,037**	**7,858,712**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[8]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,258,482	1,901,986	643,504
AFUDC	1,182,710	920,851	(261,859)
Property Taxes	272,260	141,079	(131,181)
Total Indirect Costs	**2,713,452**	**2,963,917**	**250,465**
Total Direct Costs	**7,854,325**	**15,713,037**	**7,858,712**
Total Loaded Costs	**10,567,777**	**18,676,954**	**8,109,177**

The actual Full-Time Equivalents[9] (FTEs) for the duration of this Project are 1.55.

[7] Values may not add to total due to rounding.
[8] Ibid.
[9] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

The initial design of the Line 404 Section 4A Replacement Project, as reflected in the preliminary estimate, assumed the use of Horizontal Directional Drilling (HDD) to install the [redacted] pipeline. However, during the HDD operation, the pipeline sustained significant coating damage and minor mechanical damage due to unforeseen rocky soil conditions. This is due to the soil composition varying significantly over short distances, and subsurface conditions are often unpredictable. Even with thorough pre-construction surveys and soil sampling, there can still be unexpected variations and anomalies that only become apparent during the drilling process. Following an integrity check and strength test of the installed pipeline, it was determined that it was not suitable for permanent service.

In response to the unsuccessful HDD operation, SoCalGas, the engineering firm, and the construction contractor utilized engineering judgment and operational expertise to determine that a scope change replacing the [redacted] HDD pipe with the installation of a [redacted] casing and a [redacted] carrier pipe using the Jack and Bore method was appropriate. Initially, mechanical tools were used for the bore; however, after encountering large boulders exceeding two feet in diameter, the construction method

shifted to hand mining. Despite this additional challenge, the project team successfully adapted to the new conditions and continued the pipeline installation.

The original project schedule was extended due to the change in installation method to the Jack and Bore hand mining installation. This caused the project schedule to enter bird nesting season, where identification of active Least Bell's Vireo birds caused a halt in construction activities, resulting in a demobilization period of approximately four months. At the time of demobilization, approximately 73% of project activities had been completed. The project remobilized in September 2019 and was completed in November 2019.

At the completion of the Line 404 Section 4A Replacement Project, Actual Direct Costs exceeded the preliminary estimate by $7,858,712 . This variance is primarily attributable to the issues encountered during construction and the corresponding design changes to manage these issues, along with related factors including:

1. Materials:
    a. Pipe coating and mechanical damage occurred to the [redacted] pipe utilized for the initial HDD, requiring additional pipe to be purchased, resulting in additional costs of $84,000.
    b. Additional material was procured for the jack and bore redesign, which included [redacted] casing to protect the carrier pipe from mechanical damage, resulting in a cost increase of $245,000.
2. Construction Contractor: Activities to address or mitigate conditions encountered during construction are detailed in Section III. Part C, resulting in approximately $4,435,000 in change orders.
3. Construction Management & Support:
    a. Due to the scope change from HDD to Jack and Bore and the identification of bird nesting activities, the construction finish date was extended from November 2018 to November 2019.

b. The engineering firm provided Construction Manager support during development, construction, and closeout. These costs of $431,000 were recognized under Engineering and Design.

4. Environmental:
   a. Environmental monitoring was required for the project duration, which resulted in a $91,000 increase in costs when unforeseen rocky soil conditions required an extended construction schedule to execute the design changes.
   b. During construction, Least Bell's Vireo birds were identified nesting in small habitat patch near the project site. The Project Team implemented a 100-foot buffer around the habitat and setup a consultation with USFWS and CDFW, resulting in additional on-site monitoring in order to confirm when remobilization could occur, preventing impacts to the nesting birds.
5. Engineering & Design:
   a. The Project Team changed the scope from HDD to jack and bore with a [redacted] casing due to rocky soil conditions encountered during the HDD, which required updated design drawings, survey support, geotechnical analysis, and close out support.
   b. The Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs of $288,000 were recognized under Engineering and Design.
   c. The Engineering and Design firms completed activities originally identified as Construction Management & Support in the initial estimate while the actual costs of $431,000 were recognized under Engineering and Design.
6. Project Management & Services: The engineering firm provided Project Manager and Project Engineer support during development, construction, and closeout. These costs of $288,000 were recognized under Engineering and Design.
7. ROW & Permits: Due to the scope change from HDD to jack and bore, the TRE for the project was extended from November 2018 to November 2019, resulting in a cost increase of $5,000.

E. Disallowance

For this replacement project, SoCalGas identified 1 foot of pipe as being installed after 1955 and lacking records that provide the minimum information necessary to demonstrate compliance with then-applicable industry standards or regulatory strength testing and recordkeeping requirements. Of the pipeline that was replaced, 1 foot of Phase 1A pipe is disallowed. Therefore, a $342 reduction to ratebase was calculated by multiplying 0.0002 miles of pipe by $1,709,257 per mile, which was SoCalGas and SDG&E's system average cost of pressure testing at the time the pipeline was returned to service.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 404 Section 4A Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 0.831 miles of pipeline through the installation of 0.400 miles of new pipeline and the abandonment of 0.371 miles of parallel pipeline. The total loaded cost of the Project is $18,676,954.

SoCalGas executed this project prudently by engaging in scope validation efforts that reduced project mileage, performing early and detailed risk identification and mitigation, and by responding to unanticipated field conditions. With this project, SoCalGas also made Line 404 fully piggable.

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts.

End of Line 404 Section 4A Replacement Project Final Report

I. LINE 404-406 SOMIS STATION REPLACEMENT PROJECT

A. Background and Summary

Line 404 is an [redacted] diameter transmission line and Line 406 is a [redacted] diameter transmission line that run in parallel for approximately 55 miles through Ventura County and Los Angeles County, including the Cities of Ventura, Camarillo, Moorpark, Thousand Oaks, and Los Angeles, terminating in the Encino neighborhood in the City of Los Angeles. The pipelines are primarily routed across Class 3 locations. This report describes the activities associated with Line 404-406 Somis Station Replacement Project which is located within the existing Somis Station. Through this Project, SoCalGas enhanced the safety of its natural gas transmission system by replacing 411 feet of Category (CAT) Criteria 4 pipe, and by enabling the rapid detection of a significant change in pipeline pressure and remote isolation and depressurization of Lines 404 and 406 in the event of a pipeline rupture. The Project consists of the removal of pipeline that was replaced by 716 feet of pipeline, the replacement of crossover lines between Lines 404 and 406, valve enhancements made to two new mainline valves (MLVs), the installation of a pressure limiting station, the automation of four valves in the pressure limiting station, the removal of a condensate collection system, and the installation of new power equipment, new communication equipment, and the necessary automation equipment at the site. The total loaded cost of the Project is $9,388,053.

This Project's costs were shared by PSEP and the Operating District. PSEP funded the activities that remediated the CAT Criteria 4 and the activities that provided system isolation through the installation and automation of the new valves. The Operating District funded the costs related to the removal of a filter separator and the installation of a new pig launcher and receiver. The specific attributes of this Project are detailed in Table 1 below.

Table 1: General Project Information

Line 404 Pipeline Replacement	
Location	Somis
Project Type	Replacement
Length	360 feet
Location	Somis
Class	3
MAOP *(confidential)*	[redacted]
Pipe Vintage	1951
Construction Start	08/13/2018
Construction Finish	03/25/2019
Valve Commissioning Date	05/23/2019
Original Pipe Diameter *(confidential)*	[redacted]
New Diameter *(confidential)*	[redacted]
Original SMYS[1] *(confidential)*	[redacted]
New SMYS *(confidential)*	[redacted]

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

Line 404 Valve Upgrades	
Valve Number	404-20.80-18
Valve Type	New – Ball
Actuator	New
Actuator Above-/Below-Grade	Above-Grade
ASV	Yes
RCV	Yes
Valve Number	404-20.80-5
Valve Type	New – Ball
Actuator	New
Actuator Above-/Below-Grade	Above-Grade
ASV	No
RCV	Yes
Valve Number	404-20.80-6
Valve Type	New – Ball
Actuator	New
Actuator Above-/Below-Grade	Above-Grade
ASV	No
RCV	Yes
Valve Number	404-20.80-7
Valve Type	New – Ball
Actuator	New
Actuator Above-/Below-Grade	Above-Grade
ASV	No
RCV	Yes
Valve Number	404-20.80-8
Valve Type	New – Ball
Actuator	New
Actuator Above-/Below-Grade	Above-Grade
ASV	No
RCV	Yes

Line 406 Pipeline Replacement			
Project Type	Replacement		
Length	356 feet		
Location	Somis		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1951		
Construction Start	08/13/2018		
Construction Finish	03/25/2019		
Valve Commissioning Date	05/23/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Line 406 Valve Upgrades			
Valve Number	406-19.39-0		
Valve Type	New – Ball		
Actuator	New		
Actuator Above-/Below-Grade	Above-Grade		
ASV	Yes		
RCV	Yes		
Site Upgrades			
Vault	No		
Power	Upgraded – Utility		
Communication	Upgraded – Radio		
SCADA Panel	New		
Equipment Shelter	New		
Fencing	Existing		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	9,388,053	-	9,388,053
Disallowed Costs	-	-	-

[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Line 404	0.034 mi.	0 mi.	0.004 mi.	0.030 mi.	0.068 mi.
	177 ft.	0 ft.	23 ft.	160 ft.	360 ft.
Line 406	0.044 mi.	0 mi.	0.015 mi.	0.008 mi.	0.067 mi.
	233 ft.	1 ft.	80 ft.	42 ft.	356 ft.
Final Mileage	0.078 mi.	0 mi.	0.020 mi.	0.038 mi.	0.136 mi.
	411 ft.	1 ft.	103 ft.	202 ft.	716 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[5] This conceptual scope identified MLV 404-20.80-0 for automation to enable remote isolation to a portion of Line 404. Prior to initiating execution of the Project in 2018, SoCalGas reviewed existing pipeline records, performed a detailed system flow analysis to validate the scope of the Project, and identified six additional valves for enhancement to provide the planned isolation. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas and SDG&E identified Line 404 as a Phase 1A Hydrotest Project comprised of 24.450 miles of Category 4 Criteria pipe and 13.350 miles of Accelerated pipe. SoCalGas and SDG&E identified Line 406 as a Phase 1A Hydrotest Project comprised of 7.862 miles of Category 4 Criteria pipe and 12.837 miles of Accelerated pipe. SoCalGas and SDG&E also identified MLV 404-20.80-0 for automation to achieve the objective of rapid system isolation.

[3] Accelerated mileage include Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of Line 404 by 18.874 miles and Line 406 by 7.344 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project was designed to complete the shut-in of Line 404 and Line 406 in two phases to isolate only one pipeline at a time to maintain system capacity.
   b. Existing pipe and valves would be replaced and not abandoned in place due to the limited workspace at the Project site.
   c. The Project Team decided to permanently remove the existing condensate system as recommended by SoCalGas Engineering.
   d. Accelerated and Incidental mileage was included for constructability.
4. Final Project Scope: The final project scope consists of a 716 foot Replacement that consisted of the removal and replacement of CAT 4 Criteria pipe, crossover lines between Line 404 and Line 406, the removal of a preexisting condensate system, and the automation of six valves that included the installation of three new MLVs, the installation of a new pressure limiting station, the installation of six new actuators, the installation of new communications equipment, the installation of new power equipment, and the installation of the necessary automation equipment at the project site.

Table 3: Final Valve Automation Scope

Final Project Scope					
Line	Mile	Valve #	Valve Size (*confidential*)	Installation Type	Function
404	404-20.80	18	[redacted]	NV	ASV/RCV
404	404-20.80	5	[redacted]	NV	RCV
404	404-20.80	6	[redacted]	NV	RCV
404	404-20.80	7	[redacted]	NV	RCV
404	404-20.80	8	[redacted]	NV	RCV
406	406-19.39	0	[redacted]	NV	ASV/RCV

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 404-406 Somis Station and confirmed the project design should commence as a Replacement Project.

Segments of less than 1,000 feet are identified for replacement under the approved PSEP Decision Tree because, for short segments of pipe, the logistical costs associated with pressure testing (for example, permitting, construction, water handling, and service disruptions for a non-looped system) can approach or exceed the cost of replacement. In such circumstances, replacement affords a more cost-effective approach to achieving compliance with D.11-06-017 while providing equal safety enhancement benefits. Moreover, installation of the new segment can usually be performed while the existing service is maintained to customers, thereby avoiding service disruptions that may otherwise occur during pressure testing.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded both Line 404 and Line 406 cannot be shut-in at the same time to maintain overall system capacity. The Project was designed to complete the shut-in in two phases to isolate only one pipeline at a time.
2. Customer Impacts: There were no non-core customers served by the line within the shut-in limits. Service to core customers during shut-ins was maintained using CNG.
3. Community Impacts: No identified issues.
4. Piggability: Non-piggable.
5. Pipe Vintage: 1951.
6. Existing Pipe Attributes: Multiple pipe diameters and non-piggable plug valves.
7. Longseam Type: Electric Resistance Weld (ERW).
8. Longseam Repair History: No identified issues.

9. Condition of Coating: No identified issues.
10. History of Leaks: No identified issues.

C. Site Evaluation and Planning

SoCalGas initiated the planning process for the Line 404-406 Replacement Project by performing a pre-design site walk to determine the existing conditions and assess any potential impact on the design. Key factors that influenced the engineering and design of this project are as follows:

1. Site Description: This site is an existing SoCalGas facility in an agricultural and industrial area in unincorporated Ventura County.
2. Land Issues: During the pre-design site walk, the Project Team noted that the existing power and communications equipment would need to be redesigned in order to accommodate the new equipment.
3. DOT Class: This Project site is in a Class 3 location.
4. Power Source: The Project site had existing utility power. The existing utility power was modified to accommodate the new equipment and to satisfy the requirements from the local electric utility.
5. Communication Technology: The Project site had existing radio communications. The radio communications equipment was redesigned to accommodate the new equipment.

D. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded both Line 404 and Line 406 cannot be shut-in at the same time to

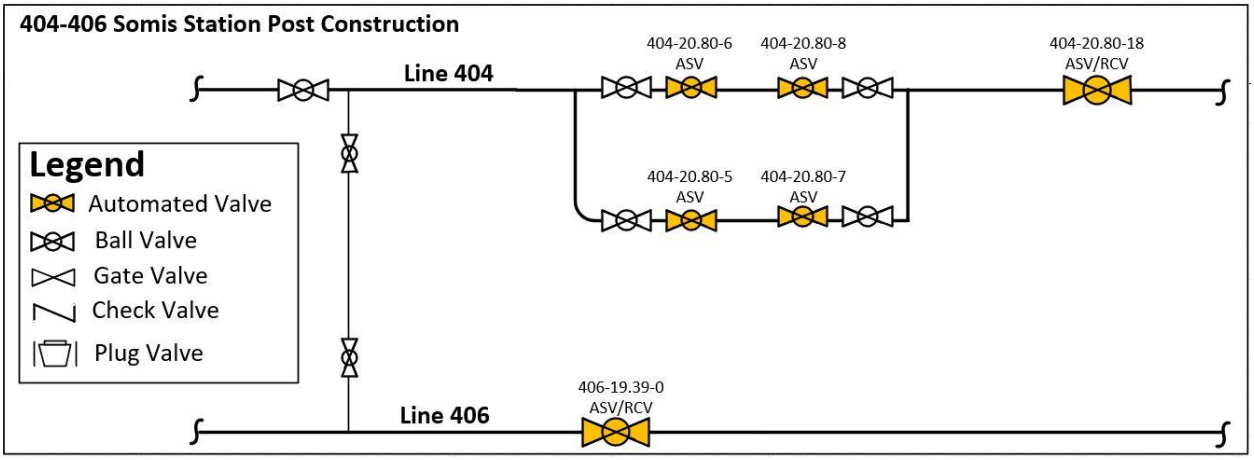
maintain system capacity. The Project was designed to complete the shut-in in two phases to isolate only one pipeline at a time.

2. Customer Impacts: There were no non-core customers served by the line within the shut-in limits. Service to core customers was maintained by utilizing CNG during the shut-ins.
3. Community Impacts: No identified issues.
4. Constructability:
   a. Existing pipe and valves would be permanently removed and not abandoned in place due to the limited workspace at the Project site.
   b. The Project Team decided to permanently remove the existing condensate system as recommended by Gas Engineering.
5. Valve Details:
   a. 404-20.80-18: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
   b. 404-20.80-5: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
   c. 404-20.80-6: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
   d. 404-20.80-7: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
   e. 404-20.80-8: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
   f. 406-19.39-0: The preexisting valve was a manually operated Class 400 ball valve, which was replaced by the Project Team.
6. Actuator Details:
   a. 404-20.80-18: The was no preexisting actuator. The Project Team installed a new actuator.
   b. 404-20.80-5: The was no preexisting actuator. The Project Team installed a new actuator.

c. 404-20.80-6: The was no preexisting actuator. The Project Team installed a new actuator.
d. 404-20.80-7: The was no preexisting actuator. The Project Team installed a new actuator.
e. 404-20.80-8: The was no preexisting actuator. The Project Team installed a new actuator.
f. 406-19.39-0: The was no preexisting actuator. The Project Team installed a new actuator.

7. Schedule Coordination: The Project Team coordinated the shut-in with the PSEP Line 404 Section 4A Replacement Project.
8. Known Substructures: The Project Team confirmed known substructures against recent as-builts from the PSEP Line 404 Section 4&5 Hydrotest Project.
9. Permit Conditions:
   a. The Project Team obtained an encroachment permit from Caltrans for traffic control along Highway 118.
   b. The Project Team obtained an encroachment permit from Ventura County for the CNG trailer placed along the roadway.
10. Land Use:
   a. The Project Team coordinated with the local electric utility to relocate a power pole to install a segment of new pipe.
   b. The Project Team obtained a laydown yard adjacent to the Project site from an oil pipeline company.
11. Environmental: The Project Team identified multiple existing pipeline components that would require proper management for their re-use or disposal. The potential contaminants of concern consist of polychlorinated biphenyls (PCBs), asbestos fibers in some fabricated materials, and heavy metals in most paint coatings.
12. Tie-In: The Project Team determined that Line 406 could not be isolated until the tie-in of PSEP Line 404 Section 4A Replacement Project was complete.

Figure 1: Schematic of Line 404-406 Somis Station Replacement Project



E. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a mechanical and electrical construction contractor. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the construction contractors prepared and submitted their bid. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas Preliminary Mechanical Construction Cost Estimate *(confidential)*: SoCalGas' preliminary cost estimate for construction was [redacted].
2. Mechanical Construction Contractor's Bid *(confidential)*: The Construction Contractor's cost estimate was [redacted], which was [redacted] SoCalGas' preliminary cost estimate for construction.
3. SoCalGas' Preliminary Electrical Contractor Estimate *(confidential)*: SoCalGas' preliminary cost estimate for the electrical contractor was [redacted].
4. Electrical Contractor's Estimate *(confidential)*: The Electrical Contractor's estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	08/13/2018
Construction Completion Date	03/25/2019
NOP Date	01/30/2019
Valve Commissioning Date	05/23/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $456,000 in change orders.

1. Schedule Delay: Due to conditions encountered during construction, the duration of construction was extended by approximately 17 weeks. Additional field support costs were incurred to support the completion of this project.
2. Constructability Issues: During the tie-in for Line 406, the Project Team identified that a crossover valve between Line 404 and Line 406 did not fully close, and this did not allow for full isolation of the crossover. The Project Team replaced this valve. The replacement of the valve required additional hand digging excavation, removal of the valve, fabrication, assisting with the nitrogen pressure test of the replacement valve, tie-in, coating, and backfill.

Figure 2: Applying Cathodic Protection Wrap

Figure 3: Bolting up Blind Flange

Figure 4: Installation of Isolation Cap

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline and valves into service, transportation and disposal of hydrotested water and hazardous material, and site demobilization. During this stage, SoCalGas successfully performed site acceptance testing, and conducted point-to-point verification with Gas Control for the newly automated valves, and transferred ownership of the new equipment to Field Operations. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work. The site was commissioned on May 23, 2019, as summarized in Table 3.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: This project was coordinated with the PSEP Line 404 Section 4A Replacement Project so that the schedules could overlap as resources were shared by both Projects.
2. Future Maintenance: The installation of a new condensate collection system at the station was removed from the project scope allowing for more efficient maintenance and operations.
3. Known Substructures: The Project Team confirmed known substructures against recent as-builts from the PSEP Line 404 Section 4&5 Hydrotest Project. Cost savings resulted from eliminating the need to complete an additional basemap survey and potholing.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $7,061,246. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $9,388,053.

Table 4: Estimated and Actual Direct Costs and Variances[6],[7]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	671,952	688,116	16,164
Materials	951,056	1,182,952	231,896
Mechanical Construction Contractor	2,599,313	2,434,196	(165,117)
Electrical Construction Contractor	267,951	82,888	(185,063)
Construction Management & Support	533,749	454,134	(79,615)
Environmental	221,748	412,311	190,563
Engineering & Design	818,838	1,274,403	455,565
Project Management & Services	241,213	283,639	42,426
ROW & Permits	7,540	15,669	8,129
GMA	747,886	889,693	141,807
Total Direct Costs	**7,061,246**	**7,718,001**	**656,755**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[8],[9]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,081,709	1,245,273	163,564
AFUDC	1,365,143	366,921	(998,222)
Property Taxes	306,889	57,859	(249,030)
Total Indirect Costs	**2,753,741**	**1,670,052**	**(1,083,689)**
Total Direct Costs	**7,061,246**	**7,718,001**	**656,755**
Total Loaded Costs	**9,814,987**	**9,388,053**	**(426,934)**

[6] Values may not add to total due to rounding.
[7] Values in table represent PSEP costs only.
[8] Values may not add to total due to rounding.
[9] Values in table represent PSEP costs only

The Actual Full-Time Equivalents[10] (FTEs) for this Project are 1.65.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 404-406 Somis Station Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $656,755. This variance can be attributed to several factors including: The project initially assumed a 120-amp SCADA panel in the drawing set instead of the required 100-amp panel and a new SCADA had to be purchased; during tie-in, issues with a 10-inch valve sealing required a new valve to be installed; approximately 1,200 yards of dirt required additional sifting and off-site hauling due to debris; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

[10] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

E. Disallowance

The scope of the Line 404-406 Somis Station Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 404-406 Somis Station Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 716 feet of pipeline, automated six valves, and replaced a pressure regulator system in Somis. The total loaded cost of the Project is $9,388,053.

SoCalGas executed this project prudently by engaging in scope validation efforts that reduced project mileage, performing early and detailed risk identification and mitigation, and by responding to unanticipated field conditions.

SoCalGas engaged in prudent cost avoidance efforts by developing and executing an efficient design to complete the safety enhancement work as soon as practicable.

End of Line 404-406 Somis Station Replacement Project Final Report

I. LINE 2006 REPLACEMENT PROJECT

A. Background and Summary

Line 2006 is a [redacted] diameter transmission line that runs approximately five miles along heavily trafficked arterial streets, through residential neighborhoods and commercial areas within the City of Los Angeles, ending in the City of Carson. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Line 2006 Replacement Project, which consists of the replacement of 497 feet of pipeline and one mainline valve (MLV) along South Central Avenue and within SoCalGas' Victoria Station. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $5,405,852.

Table 1: General Project Information

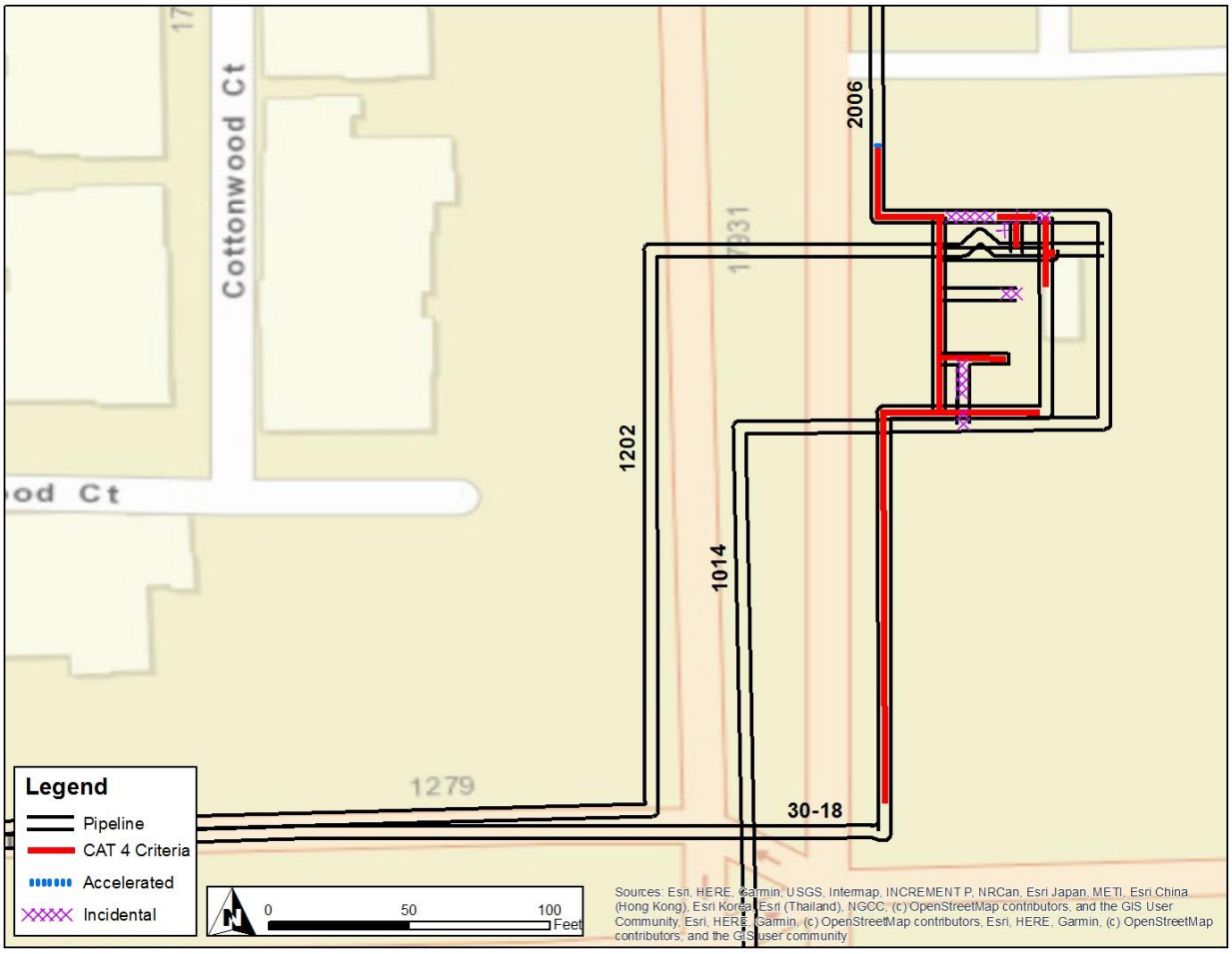
Project Name	Line 2006		
Project Type	Replacement		
Length	497 feet		
Location	City of Carson		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1954		
Construction Start	09/16/2019		
Construction Finish	12/20/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	[redacted]		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	5,405,852		5,405,852
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Line 2006 Replacement Project

Figure 2: Overview Map of Line 2006 Replacement Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[2]	Incidental	New	Total[3]
Final Mileage	0.050 mi.	0.011 mi.	0.020 mi.	0.013 mi.	0.094 mi.
	263 ft.	57 ft.	106 ft.	71 ft.	497 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2019, SoCalGas and SDG&E reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas and SDG&E further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas and SDG&E did not identify Line 2006 in the 2011 PSEP filing.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas and SDG&E identified 0.064 miles of Category 4 Criteria pipe and added this as a PSEP Phase 1A project.
3. Engineering, Design, and Constructability:
   a. The Project replaced one MLV.
   b. Accelerated and Incidental mileage was included to realize efficiencies and enhance project constructability.

[2] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

4. Final Project Scope: The final project scope consists of a 497 foot Replacement. The Accelerated mileage consists of 57 feet of Phase 2B pipe, and 106 feet of incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 2006 and confirmed the project design should commence as a Replacement Project.

Segments of less than 1,000 feet are identified for replacement under the approved PSEP Decision Tree because, for short segments of pipe, the logistical costs associated with pressure testing (for example, permitting, construction, water handling, and service disruptions for a non-looped system) can approach or exceed the cost of replacement. In such circumstances, replacement affords a more cost-effective approach to achieving compliance with D.11-06-017 while providing equal safety enhancement benefits. Moreover, installation of the new segment can usually be performed while the existing service is maintained to customers, thereby avoiding service disruptions that may otherwise occur during pressure testing.

Through this Decision Tree analysis, SoCalGas identified replacement as the more prudent option. Key considerations that support SoCalGas' determination to replace this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the pipeline could be shut-in with manageable customer impacts.
2. Customer Impacts: The Project Team identified one customer that would be supported utilizing CNG and one customer will have a coordinated outage.
3. Piggability: Piggable.
4. Pipe Vintage: 1954.
5. Existing Pipe Attributes: No identified issues.
6. Longseam Type: Unknown.

7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the pipeline could be shut-in with manageable customer impacts.
2. Customer Impact: The Project Team prevented service disruptions to one customer by utilizing CNG. The Project Team scheduled the shut-in to coordinate with another customer's planned outage.
3. Community Impacts: The Project Team identified significant traffic impacts along South Central Avenue and East Victoria Street.
4. Tie-In: The Project Team determined that the tie-in could only occur during the weekend to minimize community impact. Closure of the northbound lanes of a major arterial street and the eastbound turning lane of a major arterial street occurred during tie-in activities.
5. Substructures: Based on potholing data, the Project Team confirmed substructures within the excavation locations.
6. Permit Conditions:
   a. The City of Carson required encroachment and excavation permits.
   b. The City of Compton required encroachment and traffic control permits.
7. Land Use: The Project obtained a temporary right of entry (TRE) for a laydown yard.
8. Environmental: The Project Team anticipated abatement activities for asbestos containing materials (ACMs) and lead paint.

9. Valves: The Project Team replaced one MLV.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	09/16/2019
Construction Completion Date	12/20/2019
NOP Date	11/21/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $233,000 in change orders.

1. Tie-In: The Project Team excavated an unidentified concrete telecom vault within the tie-in location at the entrance of the station. The Project Team would relocate the tie-

in to avoid this vault. Relocation of the tie-in resulted in additional demolition and replacement of the concrete driveway, a block wall, curb, gutter, and fence.

2. Constructability Issues: The Project Team encountered a layer of slurry ranging from three feet to six feet deep with a 3-inch conduit within the slurry at the intersection of Victoria Street and South Central Avenue. This resulted in the need for additional labor and equipment to remove the slurry.

Figure 3: Newly Coated Pipeline

Figure 4: Workspace Along South Central Avenue

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotested water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project.

1. Scope Change: The Project Team reduced the total number of tests from seven to five.
2. Future Maintenance: The Project Team included the installation of [redacted] blowdown pipe that will allow for the pipeline to be isolated for future maintenance.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $5,868,741. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $5,405,852.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	479,881	423,271	(56,610)
Materials	290,382	358,802	68,420
Construction Contractor	3,138,393	2,464,650	(673,743)
Construction Management & Support	391,582	162,388	(229,194)
Environmental	45,987	129,659	83,672
Engineering & Design	218,713	666,767	448,054
Project Management & Services	592,382	291,238	(301,144)
ROW & Permits	32,473	23,927	(8,546)
GMA	678,948	157,943	(521,005)
Total Direct Costs	**5,868,741**	**4,678,645**	**(1,190,096)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	812,881	675,254	(137,627)
AFUDC	158,464	41,459	(117,005)
Property Taxes	45,805	10,495	(35,310)
Total Indirect Costs	**1,017,150**	**727,207**	**(289,943)**
Total Direct Costs	**5,868,741**	**4,678,645**	**(1,190,096)**
Total Loaded Costs	**6,885,891**	**5,405,852**	**(1,480,039)**

The Actual Full-Time Equivalents[7] (FTEs) for this Project are 1.65.

[5] Values may not add to total due to rounding.
[6] Ibid.
[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 2006-P1A Replacement Project, Actual Direct Costs were less than the preliminary estimate by $1,190,096. This variance can be attributed to a variety of factors including: detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors, resulting in the preliminary cost estimate not fully capturing the final scope of work; the Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction incorporated these adjustments and refinements, reflecting a detailed design and decreased overall project costs; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

The scope of Line 2006-P1A Replacement Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of its integrated natural gas transmission system by prudently executing the Line 2006 Replacement Project. Through this Replacement Project, SoCalGas successfully replaced 497 feet of pipeline and replaced one MLV. The total loaded cost of the Project is $5,405,852.

SoCalGas executed this project prudently through completing the tie-in on a weekend to reduce community impact and replaced pipe in a location with multiple substructure crossings.

SoCalGas engaged in prudent cost avoidance efforts by decreasing the number of pressure tests from seven to five, mitigating unanticipated field conditions such as unknown substructures, and coordinating tie-in procedures to avoid community impacts. SoCalGas safely completed construction along a major arterial road and replaced the pipe to complete the safety enhancement project as soon as practicable.

End of Line 2006 Replacement Project Final Report

I. STORAGE - GOLETA PROJECT

A. Background and Summary

The Storage – Goleta Project consists of the hydrotest of 0.286 miles of pipe with diameters ranging from [redacted] to [redacted] at the SoCalGas Goleta Storage Facility, located in Goleta. The Project is within Class 1 and Class 3 locations near residential neighborhoods, agricultural land and commercial developments. Due to the complexity of the piping system within the storage facility, the Project was divided into two different test phases located throughout the storage facility. Phase 1 consisted of the pressure testing of 475 feet of withdrawal piping and Phase 2 consisted of the pressure testing of 0.197 miles of injection piping. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $7,674,211.

Final Report for Storage - Goleta Project

Table 1: General Project Information

Project Name	Storage – Goleta Phase 1		
Project Type	Hydrotest		
Length	475 feet		
Location	Goleta		
Class	1 and 3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1948		
Construction Start	04/22/2019		
Construction Finish	05/23/2019		
Original Pipe Diameter *(confidential)*	Multiple Diameters		
New Diameter *(confidential)*	N/A		
Original SMYS[1] *(confidential)*	Multiple SMYS values		
New SMYS *(confidential)*	N/A		
Project Name	**Storage – Goleta Phase 2**		
Project Type	Hydrotest		
Length	0.197 miles		
Location	Goleta		
Class	1 and 3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1948		
Construction Start	10/21/2019		
Construction Finish	12/18/2019		
Original Pipe Diameter *(confidential)*	Multiple Diameters		
New Diameter *(confidential)*	N/A		
Original SMYS[2] *(confidential)*	Multiple SMYS values		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,597,316	6,076,895	7,674,211
Disallowed Costs	4,102	1,421,479	1,425,581

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.
[2] Ibid.

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated	Incidental	Total[3]
Phase 1	0.063 mi.	0.011 mi.	0.015 mi.	0.090 mi.
	335 ft.	59 ft.	81 ft.	475 ft.
Phase 2	0.131 mi.	0.054 mi.	0.012 mi.	0.197 mi.
	692 ft.	284 ft.	64 ft.	1040 ft.
Total Final Mileage	0.123 mi.	0.065 mi.	0.027 mi.	0.286 mi.
	1,027 ft.	343 ft.	145 ft.	1,515 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2019, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified the Storage – Goleta Project as a Phase 1A Hydrotest Project comprised of 0.913 miles of Category 4 Criteria pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 0.720 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project was designed to be completed in two phases in order to satisfy system needs. During Phase 1, the Project Team isolated, and pressure tested the piping. During Phase 2, the Project Team isolated, and pressure tested the piping.

[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. The Project Team included Accelerated and Incidental mileage for constructability purposes.

4. Final Project Scope: The final project scope consists of a 0.286 mile Hydrotest. The Accelerated mileage consists of 18 feet of Phase 1B pipe, 112 feet of Phase 2A pipe, 213 feet of Phase 2B pipe, and there was 145 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Storage – Goleta and confirmed the project design should commence as a Hydrotest Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas complete a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compare the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified pressure testing as the more prudent option. Key considerations that support SoCalGas' determination to pressure test this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the shut-ins should occur in two phases to prevent disruptions to the system.
2. Customer Impacts: No identified issues.
3. Community Impacts: No identified issues.
4. Piggability: Non-piggable.
5. Pipe Vintage: Multiple vintages.
6. Existing Pipe Attributes: Multiple pipe diameters.

7. Longseam Type: Seamless.
8. Longseam Repair History: No identified issues.
9. Condition of Coating: No identified issues.
10. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, and conducted survey activities, of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded to complete the shut-ins in two phases one to isolate the withdrawn piping and in a second phase isolation the injection piping.
2. Customer Impacts: No identified issues.
3. Community Impacts: No identified issues.
4. Known Substructures: All work will be completed on aboveground piping.
5. Permit Conditions: There were no special permits or permit restrictions for this project. All project work was completed within existing SoCalGas property.
6. Land Use: The Project Team used the existing SoCalGas facility as a laydown yard.
7. Environmental: The Project Team planned for abatement activities for possible asbestos containing materials (ACMs) and lead based paint.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, SoCalGas entered into a competitive bidding process to select a construction contractor. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when SoCalGas entered into a competitive bidding process. SoCalGas awarded the construction contract to the bidder that best met the selection criteria for this project.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Bid (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Storage – Goleta Phase 1	
Construction Start Date	04/22/2019
Construction Completion Date	05/23/2019
NOP Date	05/23/2019
Storage – Goleta Phase 2	
Construction Start Date	10/21/2019
Construction Completion Date	12/18/2019
NOP Date	11/12/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $331,000 in change orders.

1. Work Hours: SoCalGas limited the days that the Project Team could perform the shut-in. The Construction Contractor changed the construction schedule to 14 hour days for seven days a week to complete construction within the shut-in window.
2. Equipment Needs: The Construction Contractor initially planned to utilize torches to cut the pipe inside the facility. During construction the pipe inside the facility was cold cut.

Figure 1: Welding of Pipe and Reducer Flange

Figure 2: Completed Weld of Pipe and Reducer Flange

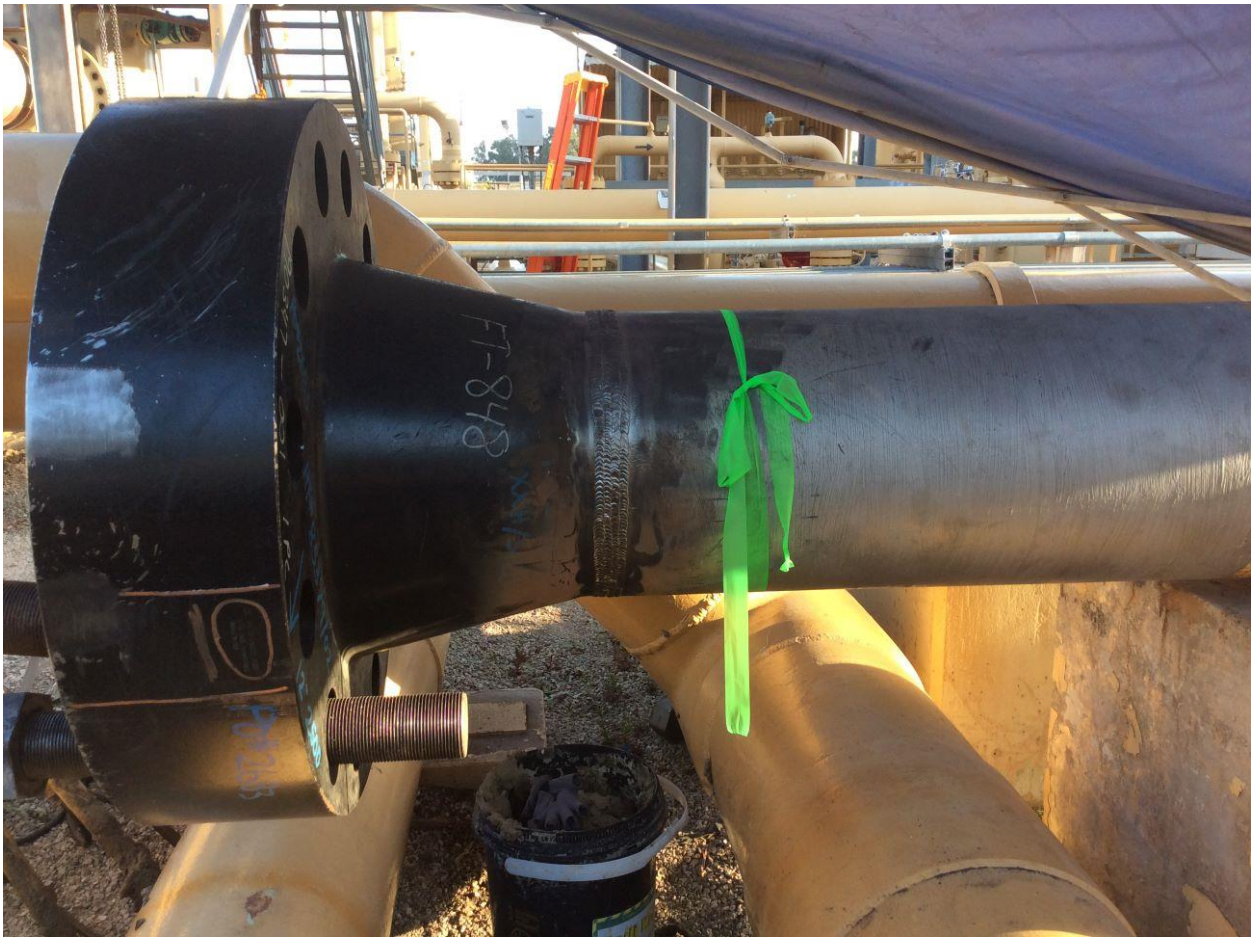


Figure 3: Flanges Being Prepared Prior to Hydrotest

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotested water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. The Project completed all construction activities within existing SoGalGas property.

B. Cost Estimate

Based on the preliminary design, once the preliminary project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $3,067,646. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project, based on initial design plans.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $7,674,211 accordance with Company overhead allocation policies.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	249,356	593,063	343,707
Materials	362,705	684,138	321,433
Construction Contractor	1,162,152	2,934,657	1,772,505
Construction Management & Support	477,363	663,078	185,715
Environmental	63,250	450,974	387,724
Engineering & Design	145,550	405,321	259,771
Project Management & Services	298,361	579,817	281,456
ROW & Permits	-	-	-
GMA	308,909	524,783	215,874
Total Direct Costs	**3,067,646**	**6,835,830**	**3,768,184**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	512,630	796,308	283,678
AFUDC	14,806	34,150	19,344
Property Taxes	3,307	7,923	4,616
Total Indirect Costs	**530,743**	**838,381**	**307,638**
Total Direct Costs	**3,067,646**	**6,835,830**	**3,768,184**
Total Loaded Costs	**3,598,389**	**7,674,211**	**4,075,822**

The Actual Full-Time Equivalents[7] (FTEs) for this Project are 1.03.

[5] Values may not add to total due to rounding.
[6] Ibid.
[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Storage – Goleta Project, Actual Direct Costs exceeded the preliminary estimate by $3,768,184. This variance is attributable to a variety of factors including:

1. Company Labor:
    a. Due to the complexity of the piping configuration within the station, multiple site visits and engineering drawing revisions were required during the design phase of the project to accurately identify and confirm project components and configuration as available design drawings for this vintage pipe were limited in detail and resulted in an approximate $255,000 cost increase.
    b. Daily working hour extensions were required during construction to complete the project while the station was shut-in for maintenance resulting in an overall cost increase of approximately $39,000.

2. Materials:
    a. In preparation for construction, the project team purchased additional material including valves, flanges and fittings to accommodate field limitations and necessary modifications for the hydrotests. Given the limited shut-in window, additional material was ordered to proactively address unknown conditions and ensure compatibility with existing components, which could not be identified until the pipeline was disassembled. Furthermore, additional material was acquired in the event the existing pipeline being hydrotested experienced a failure.
3. Construction Contractor:
    a. Sequencing this Project to be completed during maintenance operations minimized the shut-in window for the project, requiring an additional mobilization and extending working hours detailed below:
        i. The Project Team initially planned to complete both hydrotests in one phase. However, to maintain system reliability and complete the project during scheduled maintenance periods, it was completed in two phases. Prior to the start of the Phase 2 hydrotest, the Construction Contractor provided an additional construction estimate which increased the project cost by approximately $919,000.
        ii. To facilitate a safe work environment, a second nitrogen truck was required to adequately purge the pipeline before commencing work, which resulted in an approximate additional cost of $29,000.
        iii. Additional Construction Contractor support was required to paint the fabricated pieces to avoid rust during the timeframe between hydrotests and provide storage containers for the fabricated pieces. This resulted in an increase to the Construction Contractor costs by approximately $46,000.

iv. The Project Team increased working hours to accomplish each hydrotest within the prescribed timeframe. The Construction Contractor worked 14-hour days, 7 days a week, resulting in a cost increase of approximately $256,000 over the initial estimate.

4. Construction Management & Support:
    a. The Project team sequenced construction activities to be completed during maintenance operations to meet system requirements. This minimized the shut-in window for the project, resulting in an additional mobilization and extended working hours which increased costs by approximately $177,000.
    b. Engineering firms provided Construction Management & Support which was recognized in Engineering & Design, approximately $187,000 for Field Engineer and inspector support.
    c. Additional field personnel, including oversight and inspection by a dedicated Field Services Engineer, was required during construction to consolidate complete construction records, document tracking, and material tracking. These services resulted in an approximate cost increase of $17,000.
5. Environmental:
    a. Environmental stakeholders worked extended working hours to support each hydrotest in Phase 1 and Phase 2 within the maintenance outage to meet system requirements, increasing environmental costs by approximately $117,000.
    b. Abatement support overtime hours were required to maintain the construction schedule and cost approximately $19,000.
6. Engineering & Design:
    a. The Engineering firm spent more time than originally anticipated on material closeout due to the multiple mobilizations requiring additional tracking of necessary project information and materials. This effort resulted an approximately $29,000 increase in Engineering & Design costs.

b. Engineering & Design firms completed activities identified as Construction Management Support, approximately $187,000 for Field Engineer and inspector support.
c. The Engineering & Design firm completed activities identified as Project Management & Services for project controls and scheduling services throughout the project for approximately $16,000.

7. Project Management & Services:
   a. The two hydrotest mobilizations and extended working hours to coordinate with Storage maintenance schedules increased the Project Management and Services costs by approximately $183,000.
   b. The Engineering and Design firm completed activities identified as Project Management & Services for project controls and scheduling necessary throughout the project, approximately $16,000.

E. Disallowance

For this hydrotest project, SoCalGas and SDG&E identified a total of 340 feet of pipe as installed post-1955 and lacking pressure test records that provide the minimum information to demonstrate compliance with industry standards or then-applicable strength testing and recordkeeping requirements. Of the 0.276 miles of pipeline that was pressure tested, 341 feet (23%) of test mileage was disallowed, therefore $1,421,479 of total project O&M costs are disallowed from recovery. In addition, of the pipeline that was replaced, 13 feet of Phase 1A pipe is disallowed. Therefore, a $4,102 reduction was made to ratebase calculated by determining the replacement mileage and multiplying the amount by $1,709,257 per mile, which was SoCalGas' and SDG&E's system average cost of pressure testing.

V. CONCLUSION

SoCalGas enhanced the safety of its natural gas system by prudently executing the Storage - Goleta Project. Through this Project, SoCalGas hydrotested hydrotest of 0.286 miles of pipe. The total loaded cost of the Project is $7,674,211.

SoCalGas executed this project prudently through minimizing customer impacts and improving safety by executing this Project in two different test phases for the hydrotesting of withdrawal pipelines with an MAOP of [redacted] and the hydrotesting of injection pipelines with an MAOP of [redacted].

SoCalGas engaged in prudent cost avoidance efforts to complete this safety enhancement at a reasonable cost by carefully planning and coordinating engineering and construction activities to maximize efficiencies and reduce customer and community impacts, engaging in reasonable efforts to promote competitive and market based rates for contractor services and materials, and using a reasonable amount of company and contractor resources to complete this safety enhancement as soon as practicable.

End of Storage - Goleta Project Final Report

I. SUPPLY LINE 33-121 HYDROTEST PROJECT

A. Background and Summary

Supply Line 33-121 is a predominantly [redacted] diameter transmission line that runs approximately 0.5 miles along Sepulveda Boulevard, a major arterial road, from Valley Meadow Road and Royal Woods Road through residential neighborhoods in Encino. The pipeline is primarily routed across a Class 3 location. This report describes the activities associated with Supply Line 33-121 Hydrotest Project which consists of the hydrotest of 0.478 miles of pipeline. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $4,589,291.

Table 1: General Project Information

Project Name	**Supply Line 33-121**		
Project Type	Hydrotest		
Length	0.478 miles		
Location	Encino		
Class	3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1950		
Construction Start	01/08/2018		
Construction Finish	03/03/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[1] *(confidential)*	[redacted]		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	-	4,589,291	4,589,291
Disallowed Costs	-	-	-

[1] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Supply Line 33-121 Hydrotest Project

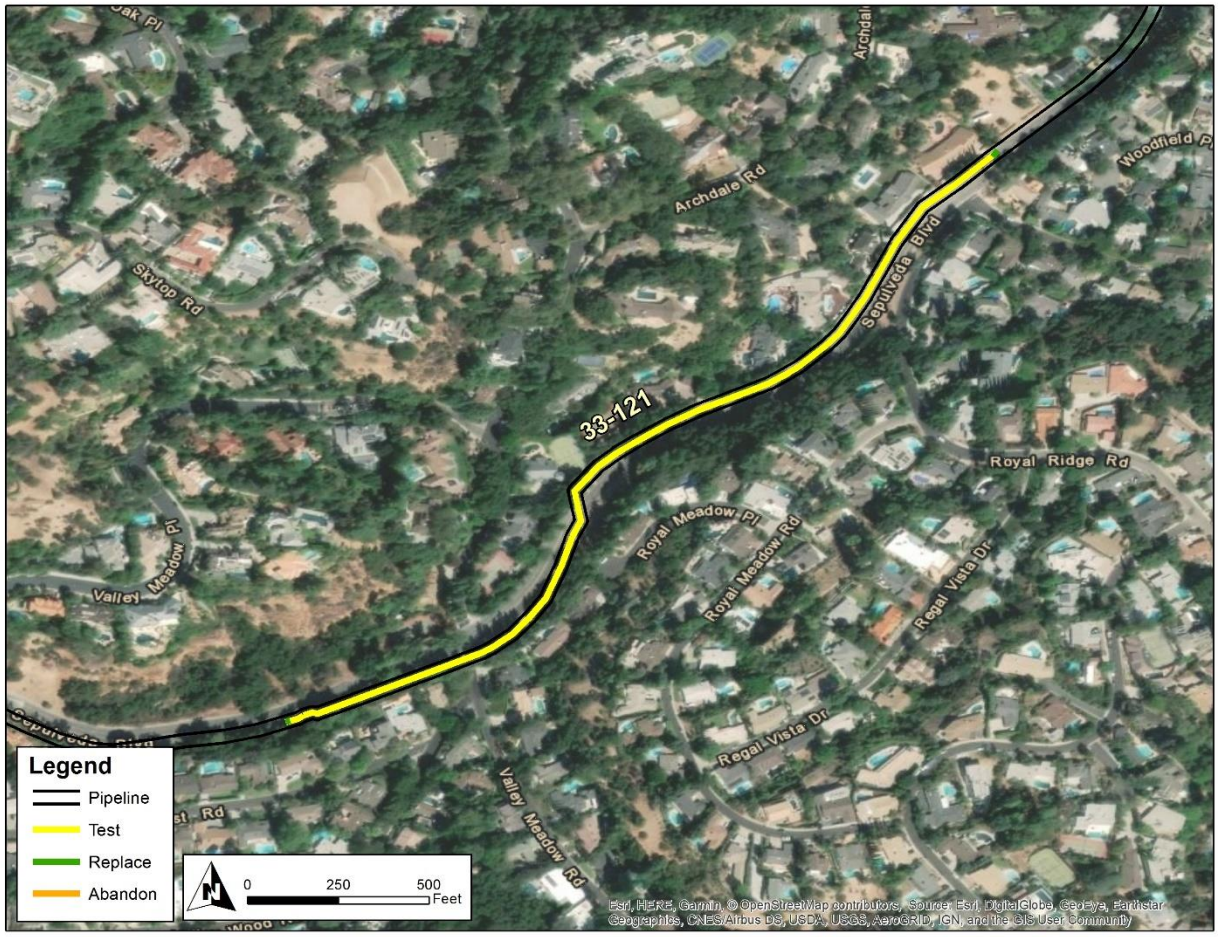


Figure 2: Overview Map of Supply Line 33-121 Hydrotest Project

II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[2]	Incidental	Total[3]
Final Mileage	0.164 mi.	0.005 mi.	0.309 mi.	0.478 mi.
	865 ft.	24 ft.	1,633 ft.	2,522 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[4] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Supply Line 33-121 as a Phase 1A Replacement and Hydrotest Project comprised of 0.609 miles of Category 4 Criteria pipe and 0.001 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 0.445 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team determined that due to the complexity of gas handling and traffic control, a hydrotest would be more cost effective and cause less impact to residents and traffic.

[2] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[3] Values may not add to total due to rounding.
[4] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

b. Accelerated and Incidental mileage were included because of constructability issues of nearby utilities, working area, and traffic control. The northern end of the test segment was extended by approximately 0.292 miles to utilize undeveloped land as a laydown yard and work area

4. Final Project Scope: The final project scope consists of a 0.478 mile Hydrotest. The Accelerated mileage consists of 24 feet of Phase 2B pipe, and 0.309 miles of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 33-121 and initially confirmed the project design should commence as a Replacement Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completed a preliminary review, to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compared the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

As scope development continued, SoCalGas conducted a Test versus Replace (TVR) analysis that analyzed the hydrotest scenario and concluded that Supply Line 33-121 could be hydrotested in one continuous hydrotest, resulting in manageable disruptions to the community, and that a single hydrotest was the most cost-effective option, thereby changing the recommendation to hydrotest the line.

Key considerations that support SoCalGas' determination to hydrotest this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the pipeline could be shut-in.
2. Customer Impacts: No customer impacts.
3. Community Impacts: The Project is located along Sepulveda Boulevard, a major arterial road with heavy traffic. Construction activities would cause major traffic delays in this area.
4. Piggability: Non-piggable.
5. Pipe Vintage: 1950.
6. Existing Pipe Attributes: Non-piggable stopple fitting.
7. Longseam Type: Unknown.
8. Longseam Repair History: No identified issues.
9. Condition of Coating: No identified issues.
10. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed an RER analysis and concluded the line could be shut in.
2. Customer Impact: Per the RER, there are no high pressure services tapped off Supply Line 33-121. Supply Line 33-121 provides sole source feed to a regulator station that was backfed.
3. Community Impact: The Project is located along Sepulveda Boulevard, a major arterial road with heavy traffic. The hydrotest was extended approximately 0.292 miles north due to the limitation in work area, traffic impact, and to provide undeveloped land as a laydown yard and work area.

4. Substructures: No substructures were identified within the excavation areas.
5. Permit Conditions:
   a. The Project Team obtained permits from the City of Los Angeles for excavation and traffic control.
   b. K-rail was required to enhance safety for workers due to the high speed of traffic along Sepulveda Boulevard.
6. Land Use: The Project shared a laydown yard with the PSEP Supply Line 43-121 Projects.
7. Environmental: Water cannot be discharged directly to storm drain system. Water storage tanks were used, and the water was hauled away after the hydrotest.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], that was [redacted] than SoCalGas preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	01/08/2018
Construction Completion Date	03/03/2018
NOP Date	02/15/2018

C. Changes During Construction

SoCalGas successfully mitigated conditions during construction in a manner that minimized potential impacts on project scope, cost, and schedule. As a result, these conditions did not result in any notable change orders.

Figure 3: Installing Test Head

Figure 4: Prepping for Slurry and Backfill

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. A specific example of a cost avoidance action taken on this Project was a shared laydown yard with the PSEP Supply Line 43-121 Replacement Projects.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $6,296,163. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $4,589,291.

Table 4: Estimated and Actual Direct Costs and Variances[5]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	703,711	293,658	(410,053)
Materials	81,368	233,134	151,766
Construction Contractor	1,769,205	834,004	(935,201)
Construction Management & Support	904,307	442,061	(462,246)
Environmental	244,084	176,363	(67,721)
Engineering & Design	857,285	1,250,600	393,315
Project Management & Services	926,936	238,875	(688,061)
ROW & Permits	240,305	181,358	(58,947)
GMA	568,963	525,081	(43,882)
Total Direct Costs	**6,296,163**	**4,175,134**	**(2,121,030)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[6]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,191,912	414,158	(777,754)
AFUDC	-	-	-
Property Taxes	-	-	-
Total Indirect Costs	**1,191,912**	**414,158**	**(777,754)**
Total Direct Costs	**6,296,163**	**4,175,134**	**(2,121,030)**
Total Loaded Costs	**7,488,076**	**4,589,291**	**(2,898,784)**

The Actual Full-Time Equivalents[7] (FTEs) for this Project are 1.03.

[5] Values may not add to total due to rounding.
[6] Ibid.
[7] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 33-121 Hydrotest Project, Actual Direct Costs were less than the preliminary estimate by $2,121,030. This variance is attributable to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate; increased construction contractor productivity allowed for construction to be completed in approximately 40 days instead of the originally estimated 53 days, resulting in lower construction and project management costs; the Project Team was able to complete construction without impacting customer service, removing costs for CNG/LNG support that were included in the preliminary estimate; and groundwater treatment and arborist monitoring included in the preliminary estimate were not required for project completion.

E. Disallowance

The scope of the Line 33-121 Hydrotest Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 33-121 Hydrotest Project. Through this Hydrotest Project, SoCalGas successfully hydrotested 0.478 miles of pipeline in the City of Los Angeles. The total loaded cost of the Project is $4,589,291.

SoCalGas executed this project prudently through minimizing community impacts and improving safety by executing this Project as a hydrotest rather than a replacement project.

SoCalGas engaged in prudent cost avoidance efforts by sharing the laydown yard with Supply Line 43-121 Replacement Projects.

End of Supply Line 33-121 Hydrotest Project Final Report

I. LINE 2000-D HYDROTEST PROJECT

A. Background and Summary

Line 2000 is a predominantly [redacted] diameter transmission line that runs approximately 225 miles from the California/Arizona border in Blythe to the Los Angeles Basin. The pipeline is primarily routed across a Class 1 location. This report describes the activities associated with the Line 2000-D Hydrotest Project that consists of three separate hydrotests that totaled approximately three miles and repairs associated with a hydrotest failure due to small liquidation cracks[1]. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $10,336,753.

SoCalGas separated the Line 2000 Phase 1A Project into five separate projects: Line 2000-A[2], Line 2000-C[3], Line 2000-D, Line 2000-West[4], and Line 2000-West Santa Fe Springs Station[5] for project manageability purposes and due to unique characteristics related to non-contiguous portions of the pipeline.

[1] The results of a metallurgical analysis indicate that the leak occurred at the inner diameter (ID) surface breaking liquidation cracks in the weld metal that were pre-existing.
[2] Line 2000-A Hydrotest Project was submitted for reasonableness review in A.14-12-016 and authorized in D.16-12-063.
[3] Line 2000-C was filed for reasonableness review in A.18-11-010 and authorized in D.20-08-034.
[4] 2000-West Sections 1,2, and 3 were filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004.
[5] Line 2000-West Santa Fe Springs was filed for reasonableness review in A.18-11-010 and authorized in D.20-08-034.

Table 1: General Project Information

Project Name	Line 2000-D		
Project Type	Hydrotest		
Length	3.184 miles		
Location	Whitewater, Palm Springs, Cabazon, Beaumont, Banning		
Class	1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1947		
Construction Start	09/25/2017		
Construction Finish	06/01/2018		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[6] *(confidential)*	[redacted]		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,664,724	7,672,029	10,336,753
Disallowed Costs	-	-	-

[6] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview Map of Line 2000 Phase 1A Projects

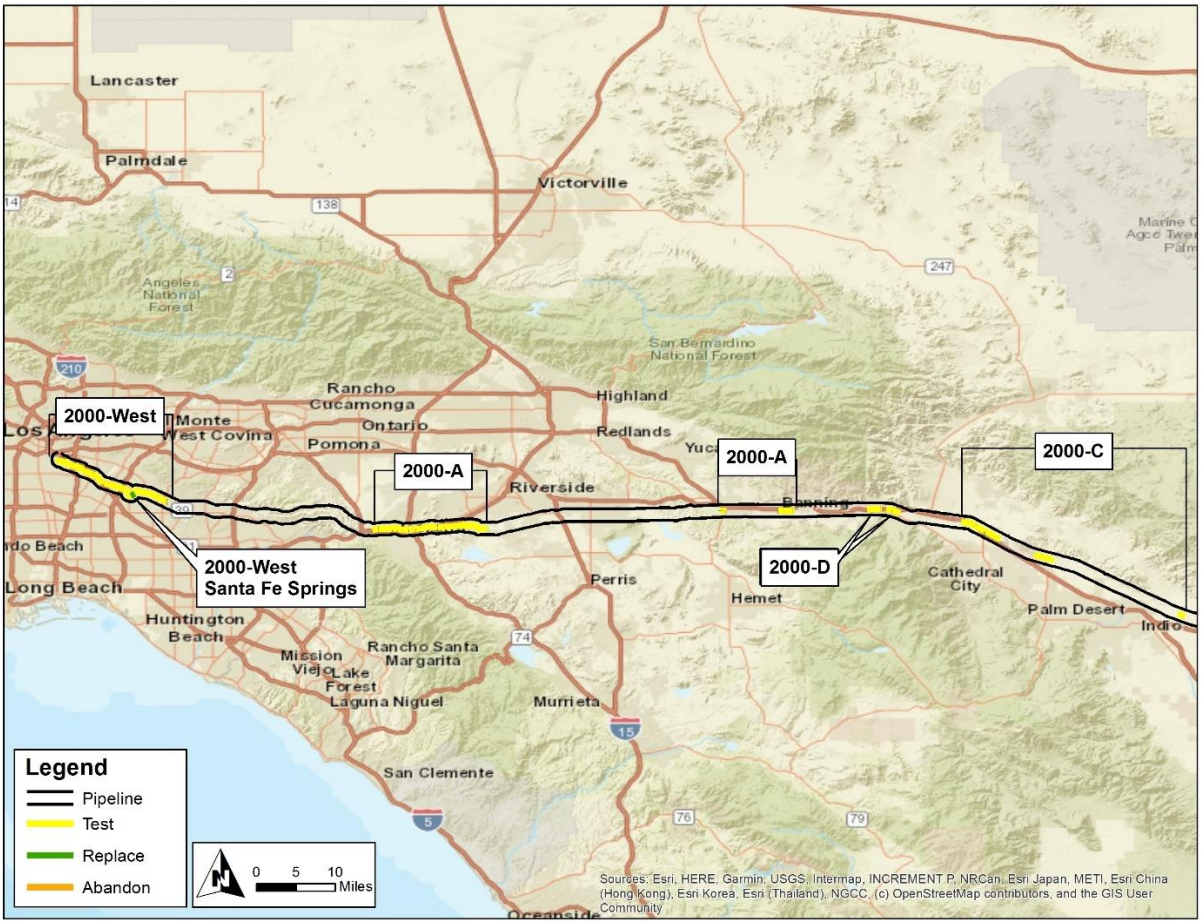


Figure 2: Satellite Image of Line 2000-D Hydrotest Project

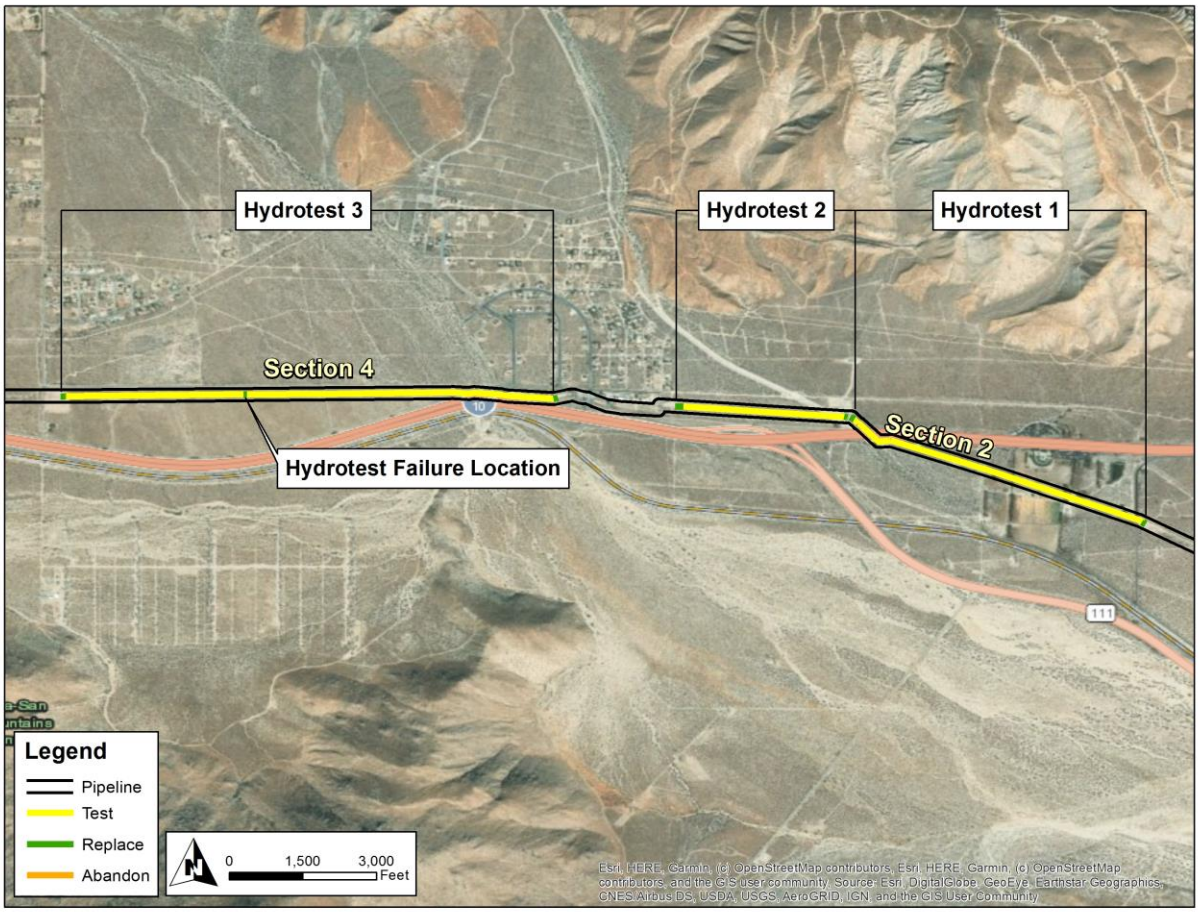
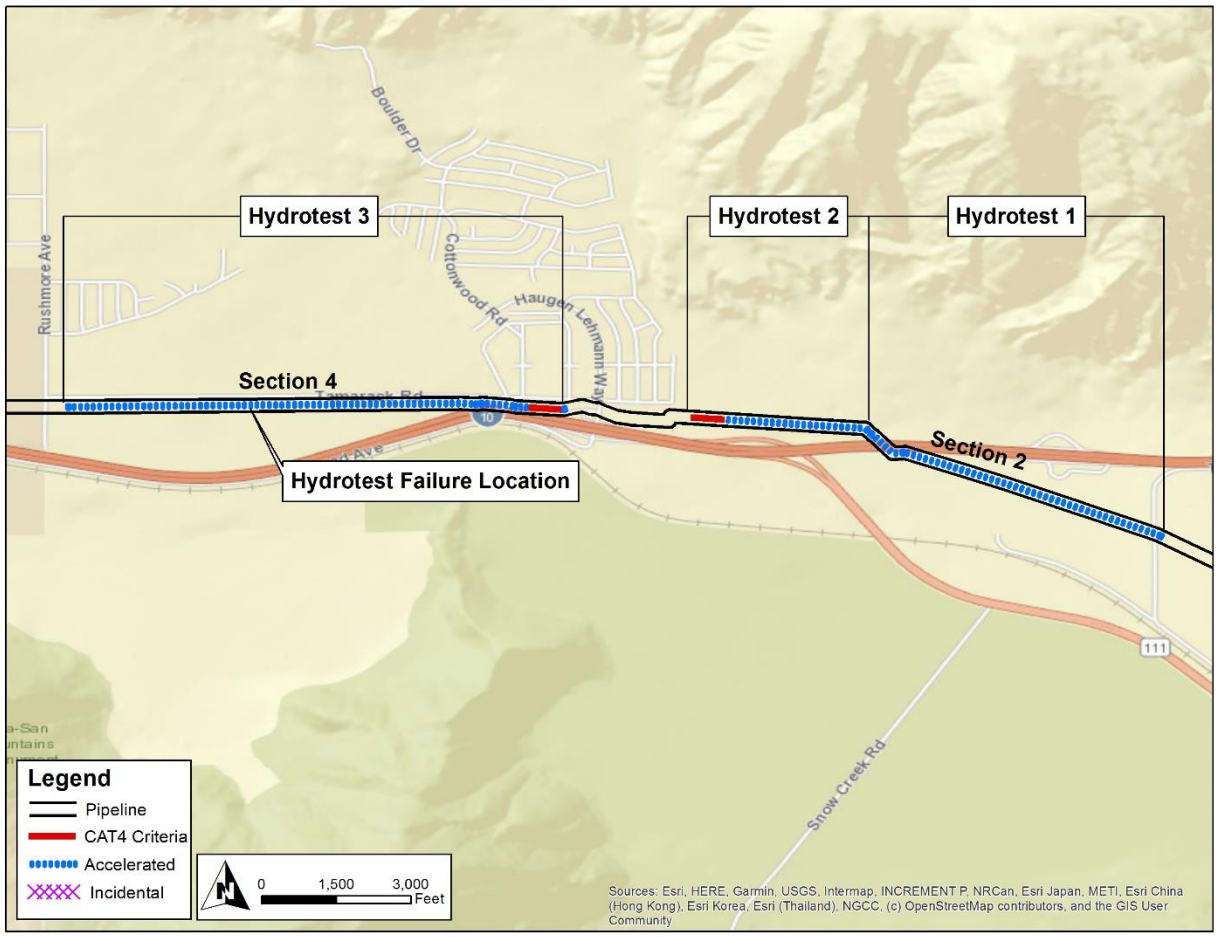


Figure 3: Overview Map of Line 2000-D Hydrotest Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[7]	Incidental	New	Total[8]
Final Mileage	0.668 mi.	2.511 mi.	0.006 mi.	0 mi.	3.184 mi.
	3,527 ft.	13,257 ft.	30 ft.	0 ft.	16,814 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[9] Prior to initiating execution of the Project in 2018, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Line 2000 as a Phase 1A Hydrotest Project comprised of 55.027 miles of Category 4 Criteria pipe and 62.574 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Line 2000-D Project, SoCalGas successfully reduced the scope of the 2000-D Project by 0.605 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. Section 2 contained two hydrotests in order to isolate a station during hydrotesting activities.
   b. New pipe was included for a test head replacement segment in Section 4.

[7] Accelerated mileage includes Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[8] Values may not add to total due to rounding.
[9] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

c. Accelerated mileage was included because of proximity to water source, water storage space, hydrotest break locations, and to reduce future construction costs.
d. Incidental mileage was included for constructability.

4. Final Project Scope: The final project scope consists of three separate hydrotests that total 3.184 miles. The Accelerated mileage consists of 2.246 miles of Phase 2A pipe, 0.265 miles of Phase 2B pipe, and 30 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 2000-D and confirmed the project design should commence as a Hydrotest Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified pressure testing as the more prudent option. Key considerations that support SoCalGas' determination to pressure test this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in with minimal customer impact.
2. Customer Impacts: Per the RER, existing customer taps could be supported with bridled feeds from adjacent pipelines and one customer required CNG support.
3. Piggability: Piggable.
4. Pipe Vintage: 1947.

5. Existing Attributes: Previous In-Line Inspections identified anomalies that were outside of the risk required for remediation by PSEP prior to hydrotesting.
6. Longseam Type: Submerged Arc Weld (SAW).
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded the line could be shut-in with minimal customer impact.
2. Customer Impacts: Per the RER, existing customer taps could be supported with bridled feeds from adjacent pipelines and one customer required CNG support.
3. Community Impact: No identified issues.
4. Schedule Coordination: The Project Team coordinated construction schedules with the Operating District to start construction following the completion of an In-Line Inspection (ILI) on the nearby SoCalGas Line 4000 because Line 2000 and Line 4000 cannot be out of service at the same time.
5. Substructures: Potholing confirmed no substructures were within the excavation locations.
6. Permit Conditions:
    a. The Project Team obtained encroachment and traffic control permits for water sourcing and work areas from City of Banning.
    b. The Project Team obtained encroachment and traffic control permits for water sourcing and work areas from County of Riverside.

7. Land Use: The Project obtained a temporary right of entry for a laydown yard and negotiated multiple work space agreements.
8. Environmental: Typical abatement activities for locations of pipe removal.

D. Scope Changes

SoCalGas and did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	09/25/2017
Construction Completion Date	06/01/2018
NOP Date	05/24/2018

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in a credit of approximately $967,000.

1. Land Rights/Acquisition: Due to ongoing discussions with the Morongo Tribes regarding expiring right of way (ROW) agreements, the Project Team deferred two of

the planned hydrotests. The Project Team planned for five hydrotest sections and completed three due to the expiring ROW agreements.

2. Other:
   a. During the hydrotest of Section 4, there was a gradual loss of pressure, indicating a leak. The Project Team requested that the Construction Contractor assist with locating the leak. The leak location was identified by using a helium and nitrogen combination. The Construction Contractor subsequently removed the segment of affected pipe and installed approximately 60 feet of new [redacted] pipe.
   b. After the leak was repaired, the test section was successfully rehydrotested. The additional hydrotesting activities included reinstallation of test heads, filling the line, hydrotesting, pigging, and dewatering the segment of pipe when finished.

Figure 4: Liquid Nitrogen Truck and Equipment Used For Leak Detection

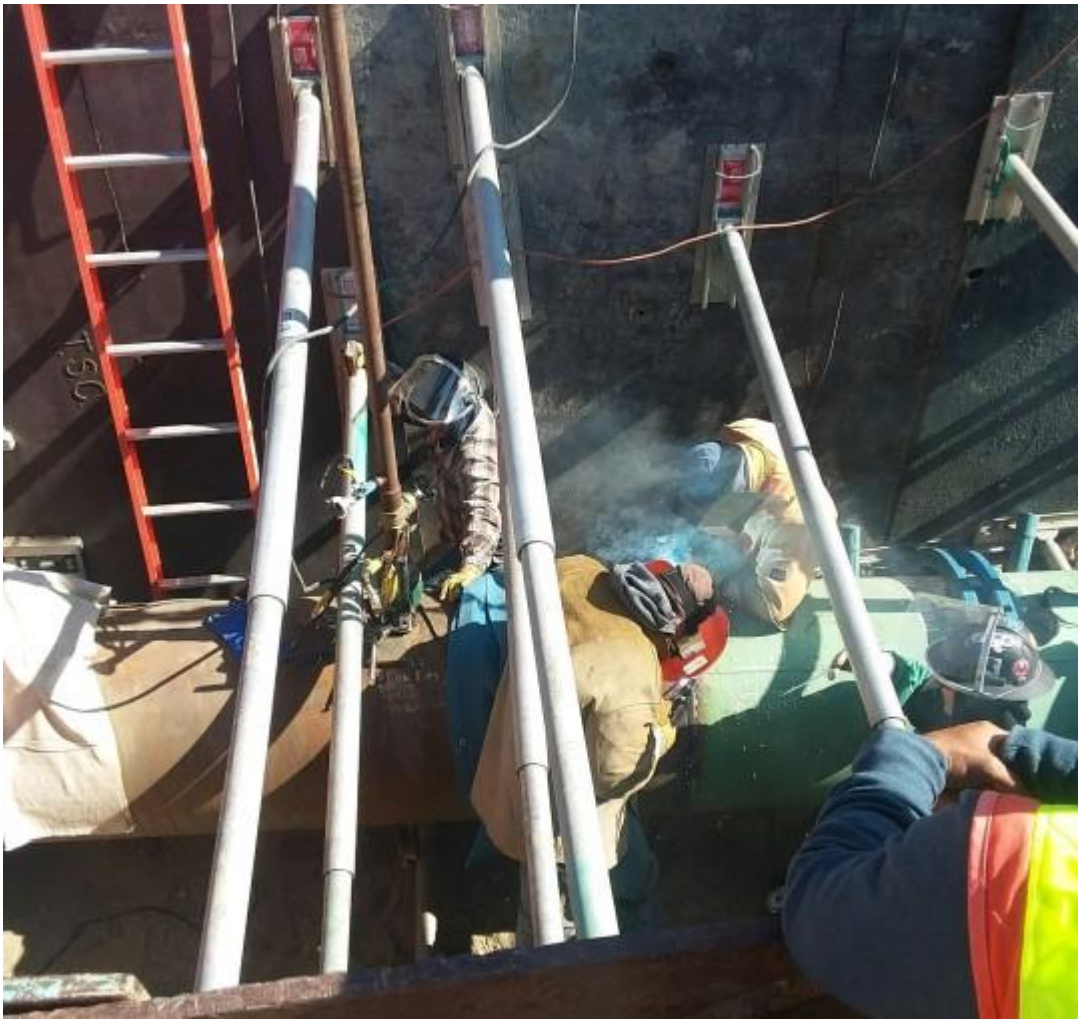
Figure 5: Helium Truck Used For Leak Detection

Figure 6: Helium Leak Detection

Figure 7: Leak Detection Bubbles Used to Locate Leak

Figure 8: Excavated Leak Location

Figure 9: Tie-in Activities



D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Materials: The Project utilized pre-tested pipe for tie-in segments, pre-fabricated test heads, and isolation caps.
2. Water Management: Following the hydrotest failure, the water was treated on-site and reused.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $12,314,847. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in

accordance with Company overhead allocation policies. The total loaded cost of the Project is $10,336,753.

Table 4: Estimated and Actual Direct Costs and Variances[10]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	680,677	544,268	(136,409)
Materials	255,534	174,094	(81,440)
Construction Contractor	4,701,107	3,377,280	(1,323,827)
Construction Management & Support	497,217	754,961	257,744
Environmental	1,973,394	856,499	(1,116,895)
Engineering & Design	1,444,389	2,181,909	737,520
Project Management & Services	1,098,388	143,156	(955,232)
ROW & Permits	410,416	240,525	(169,891)
GMA	1,253,725	1,027,278	(226,447)
Total Direct Costs	**12,314,847**	**9,299,971**	**(3,014,876)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[11]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,000,082	995,378	(4,704)
AFUDC	248,264	34,598	(213,666)
Property Taxes	57,668	6,807	(50,861)
Total Indirect Costs	**1,306,014**	**1,036,782**	**(269,232)**
Total Direct Costs	**12,314,847**	**9,299,971**	**(3,014,876)**
Total Loaded Costs	**13,620,861**	**10,336,753**	**(3,284,108)**

The Actual Full-Time Equivalents[12] (FTEs) for this Project are 1.25.

[10] Values may not add to total due to rounding.
[11] Ibid
[12] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of Line 2000-D Hydrotest Project, Actual Direct Costs were less than the preliminary estimate by $3,014,876. This variance can be attributed to a variety of factors including: the project estimate initially planned for the Project Team to conduct hydrotests in five individual test sections, however due to ongoing discussions with the Morongo Tribes regarding the expiring right-of-way (ROW) agreements, two of the hydrotests were removed from the project scope, resulting in a significant decrease in construction and project management costs; the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design; the Contractor Land support activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under ROW & Permits.

E. Disallowance

The scope of the Line 2000-D Hydrotest Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 2000-D Hydrotest Project. Not only did SoCalGas enhance the safety of their integrated natural gas transmission system by prudently executing the Line 2000-D Hydrotest Project, but more importantly, exposed a defect in the line while hydrotesting it in a safe and controlled environment, avoiding the potential of a rupture during normal operations. Through this Hydrotest Project, SoCalGas successfully identified and repaired a hydrotest leak resulting in the hydrotesting of 3.184 miles of pipeline between the cities of Whitewater and Banning. The total loaded cost of the Project is $10,336,753.

SoCalGas executed this project prudently through responding to unanticipated field conditions and mitigated unknown irregularities in the pipe, such that all final pressure tests were completed successfully.

SoCalGas engaged in prudent cost avoidance efforts by coordinating with other SoCalGas departments, prefabricating pipe materials, and reusing test heads to complete the safety enhancement work as soon as practicable.

End of Line 2000-D Hydrotest Project Final Report

I. LINE 2001 WEST-C DESERT HYDROTEST PROJECT

A. Background and Summary

Line 2001 West is a [redacted] diameter transmission line that runs approximately 146 miles east of Indio to the City of Rosemead. The pipeline is primarily routed across a Class 1 location. This report describes the activities associated with Line 2001 West-C Desert Hydrotest Project, which consists of the hydrotest of 16.803 miles of pipeline through three separate hydrotests and repairs associated with a hydrotest failure. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $13,190,908.

SoCalGas separated the Line 2001 Phase 1A Project into four separate Phase 1A projects: Line 2001 West-A[1] (Sections 15 and 16), Line 2001 West-B[2] (Sections 10, 11, 14, 17, 18, and 19), Line 2001 West-C[3] (Desert), and Line 2001 West-D (Whitewater). This report summarizes activity and actual costs related to Line 2001 West-C Desert Hydrotest Project only.

[1] Line 2001 West-A Sections 15 and 16 were filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004.
[2] Line 2001 West-B Sections 10, 11, and 14 were filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004. Line 2001 West-B Sections 17, 18, and 19 were filed for reasonableness review in A.18-11-010 and authorized in D.20-08-034.
[3] Line 2001 West-C Desert Hydrotest Project is being submitted for reasonableness review concurrently with Line 2001 West-D Whitewater.

Table 1: General Project Information

Project Name	Line 2001 West-C Desert Hydrotest		
Project Type	Hydrotest		
Length	16.803 miles		
Location	Coachella, Indio, Cathedral City, and Thousand Palms		
Class	1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1953		
Construction Start	02/19/2019		
Construction Finish	08/30/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[4] *(confidential)*	[redacted]		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	2,064,688	11,126,220	13,190,908
Disallowed Costs	-	-	-

[4] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview of Line 2001 West Projects

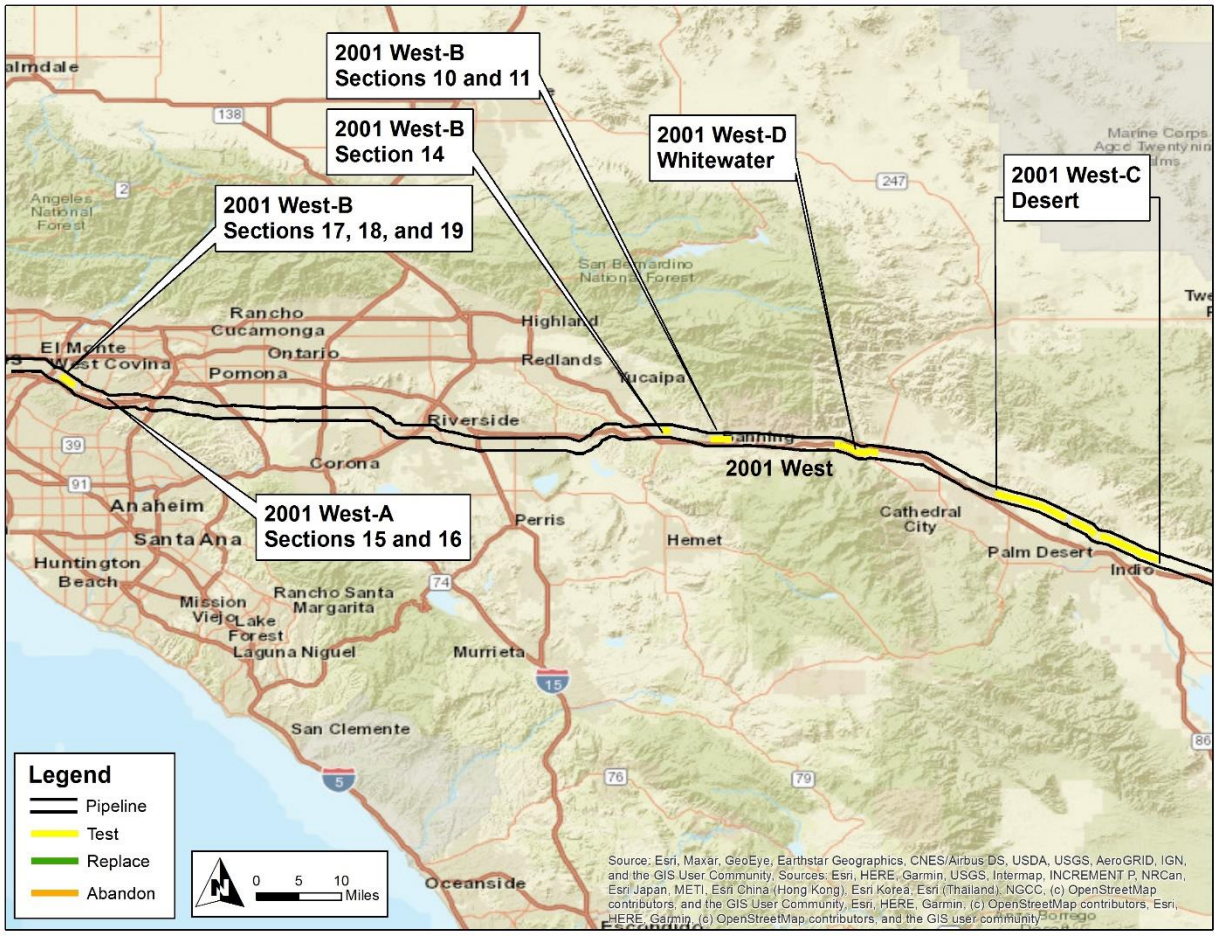
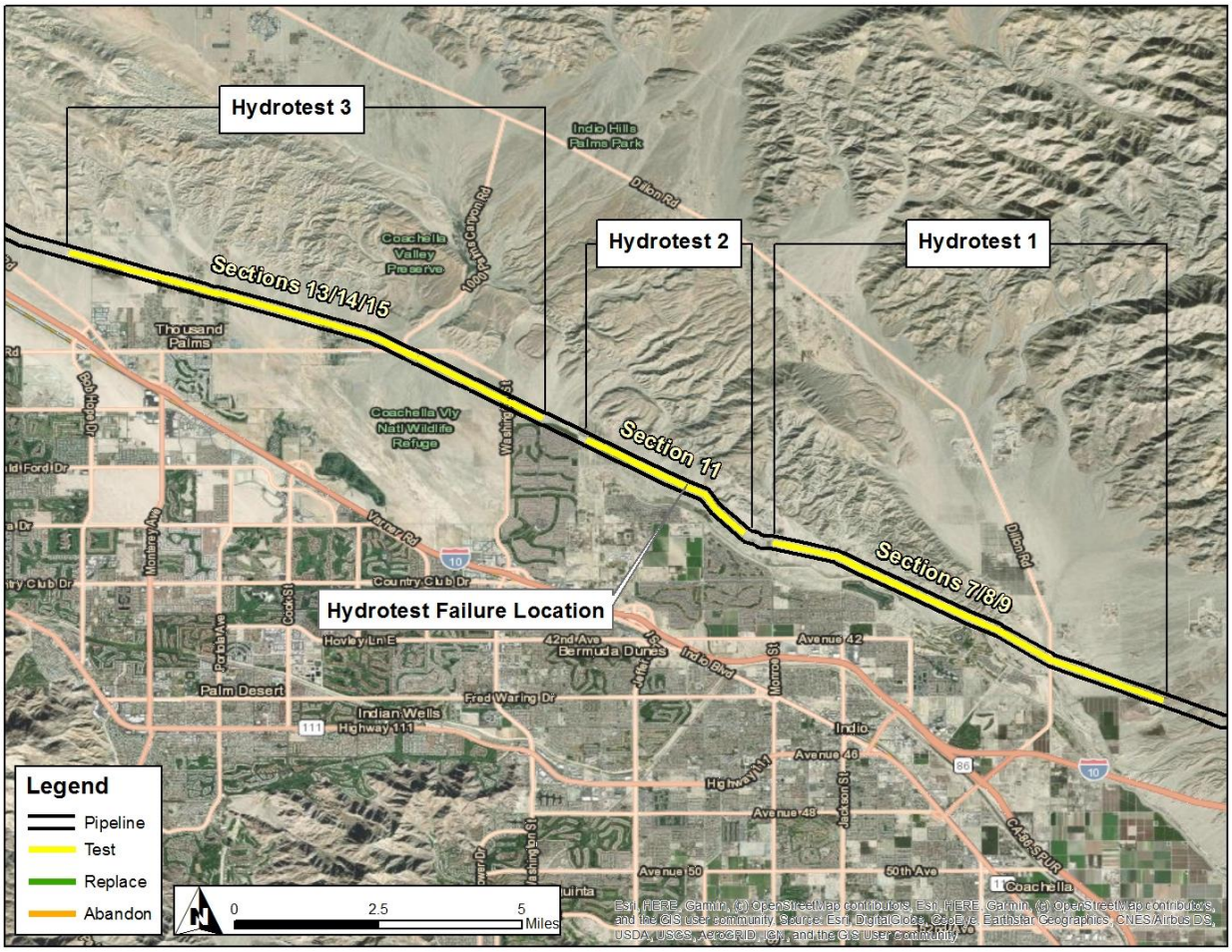
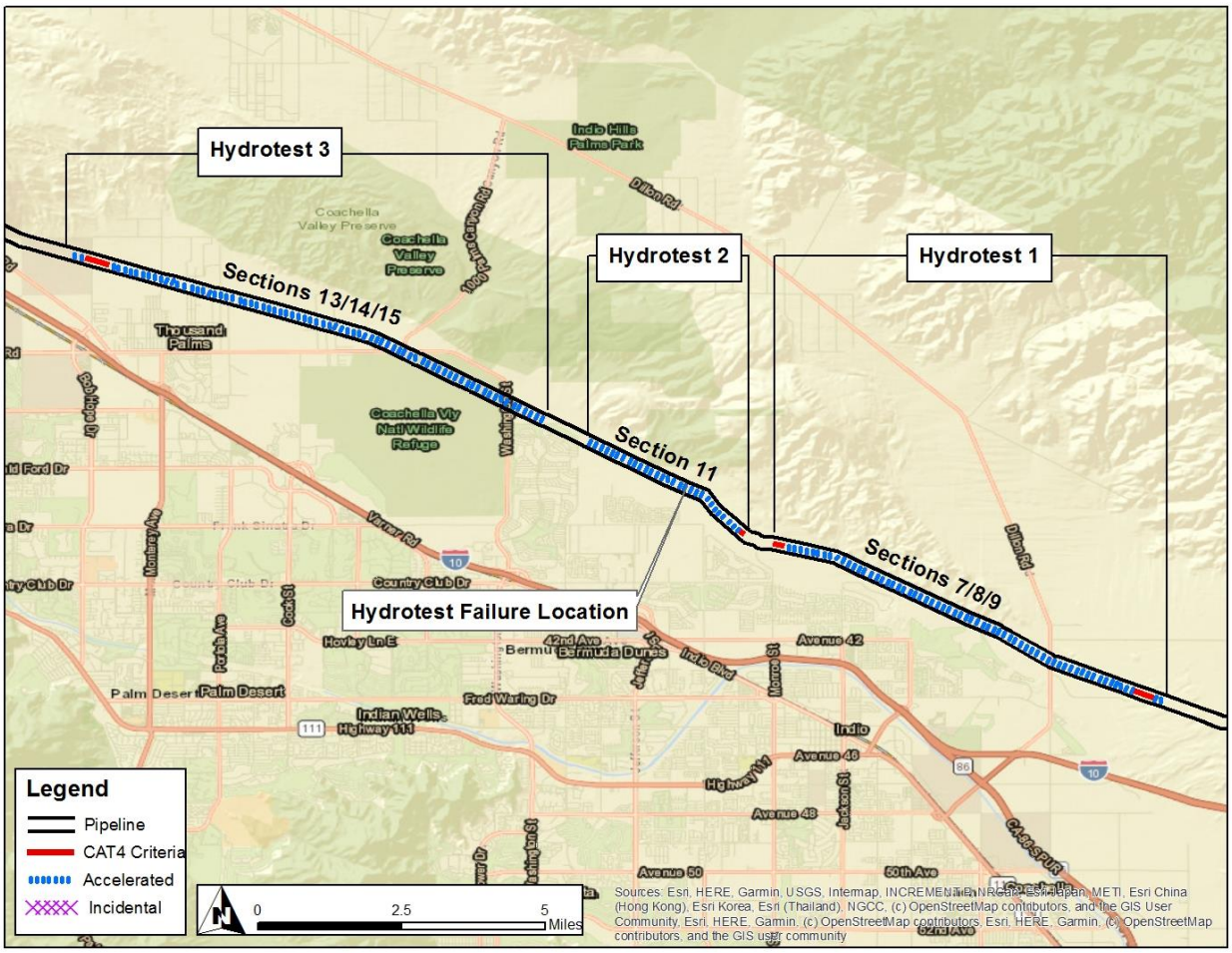


Figure 2: Satellite Image of Line 2001 West-C Desert Hydrotest Project[5]



[5] Hydrotest 3 was retested in three subsequent follow-up tests to identify the location of the test failure described below in III. Construction C. Changes During Construction.

Figure 3: Overview Map of Line 2001 West-C Desert Hydrotest Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[6]	Incidental	New	Total[7]
Final Mileage	0.947 mi.	15.832 mi.	0.018 mi.	0.007 mi.	16.803 mi.
	4,999 ft.	83,591 ft.	93 ft.	36 ft.	88,719 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[8] Prior to initiating execution of the Project in 2019, SoCalGas and SDG&E reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas and SDG&E identified Line 2001 West as a Phase 1A Hydrotest Project comprised of 15.809 miles of Category 4 Criteria pipe and 48.291 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas and SDG&E successfully reduced the scope of the Project by 11.172 miles of Category 4 Criteria pipe for all Project sections.
3. Engineering, Design, and Constructability:
   a. For constructability and project management purposes, SoCalGas divided the Category 4 Criteria pipe into four separate Phase 1A projects: Line 2001 West-A (Sections 15 and 16), Line 2001 West-B (Sections 10, 11, 14, 17, 18, and 19), and Line 2001 West-C (Desert) and Line 2001 West-D (Whitewater). This report

[6] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[7] Values may not add to total due to rounding.
[8] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

describes the activities associated with the Line 2001 West-C Desert Hydrotest Project.

b. The Project Team included Accelerated and Incidental mileage to avoid costs of future mobilizations, disruption to the community, and ease of obtaining access to existing water sources.

4. Final Project Scope: The final project scope consists of a 16.803 mile Hydrotest in three separate test sections. The Accelerated mileage consists of 15.832 miles of Phase 2A pipe and 93 feet of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 2001 West-C and confirmed the project design should commence as a Hydrotest Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified pressure testing as the more prudent option. Key considerations that support SoCalGas' determination to pressure test this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line could not be shut-in. The Project Team maintained service by utilizing bridle feeds from adjacent pipelines.
2. Customer Impacts: Per the RER, existing customer taps could be supported with bridled feeds from adjacent pipelines.

3. Piggability: Piggable.
4. Pipe Vintage: 1953.
5. Existing Pipe Attributes: The Project Team identified features along the pipeline where potential hydrotest failures may exist.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: As discussed above, the Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line could not be shut-in. The Project Team maintained service by utilizing bridle feeds from adjacent pipelines.
2. Customer Impact: Per the RER, existing customer taps were supported with bridled feeds from adjacent lines.
3. Community Impact: No identified issues.
4. Schedule Coordination: The Project Team coordinated construction schedules with the PSEP Line 2001 West-D Whitewater Hydrotest Project and scheduled both projects to share construction crews and coordinate the blowdown and isolation of the pipeline between the two projects.
5. Water Management: The Project Team open trenched a water fill line across Rio Del Sol Blvd that allowed hard piping from the water source to a lake tank. The lake tank provided water storage for two hydrotests. A second lake tank was procured for the third hydrotest.

6. Substructures: Potholing confirmed no substructures were within the excavation locations.
7. Permit Conditions:
   a. The Project Team obtained encroachment and traffic control permits from the City of Coachella for the water sourcing and work areas.
   b. The Project Team obtained an encroachment permit from the City of Palm Springs.
   c. The Project Team obtained an encroachment permit from Riverside County for workspace.
   d. The Project Team obtained a temporary right of entry (TRE) from the Bureau of Land Management.
8. Land Use: No identified issues.
9. Environmental:
   a. The Project Team planned for typical abatement activities at the hydrotest test break locations for coal tar wrap on the existing pipeline.
   b. The Project Team determined that bird surveying was required during nesting season if it coincided with the Project's construction schedule.
   c. The area where the Project is located was covered by SoCalGas' California Desert Conservation Area programmatic permits.
   d. The South Coast Air Quality Management District required a dust control plan.
   e. The Project Team treated and discharged the hydrotest water on site.

D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. The Project Team confirmed that the existing pipeline could be tested to 100% SMYS, this reduced the total number of tests from four to three, and added Accelerated mileage.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	02/19/2019
Construction Completion Date	08/30/2019
NOP Date	06/27/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $802,000 in change orders.

1. Hydrotest Failure (Hydrotest 3): Due to a loss of test pressure during Hydrotest 3, the Project Team deployed efforts to identify the location where the point of failure may have occurred. Efforts to locate the potential point of failure included the use of

Ground Penetrating Radar (GPR) for the data collection, analysis, and post processing for seven miles of pipeline. Efforts to identify the potential leak were unsuccessful; therefore, the Project Team split Hydrotest 3 into three individual hydrotests. By dividing the section into three new hydrotests, the Project Team sought to identify the source of the pressure test failure. However, none of the three retests resulted in a pressure test failure.

2. Hydrotest Failure (Hydrotest 2): Due to a loss of test pressure during Hydrotest 2, the Project Team deployed efforts to identify the location of the cause of the pressure test failure and rupture. The Project Team and Construction Contractor conducted additional activities that included:
   a. Implementation of the hydrotest failure mitigation plan.
   b. Additional abatement.
   c. Additional excavation.
   d. Replacement of ruptured pipe segment.
   e. Rehydrotest of the entire Hydrotest 2 pipe section after the replacement was completed.
   f. Additional backfill and restoration.

Figure 4: Lake Tank

Figure 5: Pre Tie-In Activities

Figure 6: Aerial View of Hydrotest 2 Failure and Rupture Mitigation

Figure 7: Hydrotest 2 Rupture Location

Figure 8: 6-inch Rupture of Hydrotest 2

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotested water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Scope Change: The Project Team reduced total number of tests from four to three while including additional Accelerated mileage.
2. Schedule Coordination: The Project Team coordinated construction to begin at the same time as Line 2001 West-D. This would provide cost savings by allowing the Project Team to utilize a single blowdown and isolation of the pipeline, as well as sharing construction crews and a laydown yard.
3. Water Management: The Project Team open trenched a water fill line across Rio Del Sol Blvd that allowed hard piping of our water source to a lake tank which was utilized for two hydrotests. This avoided transportation costs of approximately 1.8 million gallons of water two separate times.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $17,529,307. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $13,190,908.

Table 4: Estimated and Actual Direct Costs and Variances[9]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	636,197	676,363	40,166
Materials	194,900	307,710	112,810
Construction Contractor	7,552,882	4,033,287	(3,519,595)
Construction Management & Support	916,227	1,004,499	88,272
Environmental	3,288,633	2,494,918	(793,715)
Engineering & Design	1,407,796	1,911,271	503,475
Project Management & Services	872,510	113,783	(758,727)
ROW & Permits	672,994	303,441	(369,553)
GMA	1,987,168	1,068,757	(918,411)
Total Direct Costs	**17,529,307**	**11,914,029**	**(5,615,278)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[10]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,932,071	1,211,843	(720,228)
AFUDC	344,878	55,698	(289,180)
Property Taxes	75,753	9,339	(66,414)
Total Indirect Costs	**2,352,702**	**1,276,879**	**(1,075,823)**
Total Direct Costs	**17,529,307**	**11,914,029**	**(5,615,278)**
Total Loaded Costs	**19,882,009**	**13,190,908**	**(6,691,101)**

[9] Values may not add to total due to rounding.
[10] Ibid.

The Actual Full-Time Equivalents[11] (FTEs) for this Project are 1.28.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 2001 West-C Desert Hydrotest, Actual Direct Costs were less than the preliminary estimate by $5,615,278. This variance can be attributed to a variety of factors including: Detailed engineering, design, and planning activities led to enhancements in the Project design and addressed key engineering factors. As a result, The Target Price Estimate (TPE) developed by SoCalGas and the Construction Contractor before construction [redacted] the construction estimate to [redacted]; the Project Team determined during detailed design that the pipeline could be hydrotested to 100% SMYS, which decreased the number of test breaks and resulted in significant construction cost savings; the project shared isolation with the L2001W-D Project and utilized existing site facilities, resulting in significant cost savings; the Project Team optimized the work area of the project, utilizing only one laydown yard during construction instead of three as was originally planned; and the Engineering and Design firms

[11] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

The scope of the Line 2001 West-C Desert Hydrotest Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 2001 West-C Desert Hydrotest Project. Through this Hydrotest Project, SoCalGas successfully hydrotested 16.803 miles of pipeline in the Cities of Thousand Palms and Indio, and areas of the Coachella Valley Preserve. The total loaded cost of the Project is $13,190,908.

SoCalGas executed this project prudently by minimizing the impact on environmentally sensitive species, responding to numerous unanticipated field conditions, and mitigated unknown irregularities in the pipe, such that all final pressure tests were completed successfully.

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 2001 West-C Desert Hydrotest Project, but more importantly, exposed a defect in the line while hydrotesting it in a safe and controlled environment, avoiding the potential of a rupture during normal operations.

End of Line 2001 West-C Desert Hydrotest Project Final Report

I. LINE 2001 WEST-D WHITEWATER HYDROTEST PROJECT

A. Background and Summary

Line 2001 West is a [redacted] diameter transmission line that starts east of the City of Indio and runs approximately 146 miles to the City of Rosemead. The pipeline is primarily routed across a Class 1 location. This report describes the activities associated with Line 2001 West-D Whitewater Hydrotest Project, which consists of two hydrotests that totaled 4.360 miles. The Project Team addressed two features on the pipeline prior to the hydrotest. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $6,943,001.

SoCalGas separated the Line 2001 Phase 1A Project into four separate Phase 1A projects: Line 2001 West-A[1] (Sections 15 and 16), Line 2001 West-B[2] (Sections 10, 11, 14, 17, 18, and 19), Line 2001 West-C[3] (Desert), and Line 2001 West-D (Whitewater). This report summarizes the activities and costs related to Line 2001 West-D Whitewater Hydrotest Project.

[1] Line 2001 West-A Sections 15 and 16 were filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004.
[2] Line 2001 West-B Sections 10, 11, and 14 were filed for reasonableness review in A.16-09-005 and authorized in D.19-02-004. Line 2001 West-B Sections 17, 18, and 19 were filed for reasonableness review in A.18-11-010 and authorized in D.20-08-034.
[3] Line 2001 West-C Desert Hydrotest Project is being submitted for reasonableness review concurrently with Line 2001 West-D Whitewater.

Table 1: General Project Information

Project Name	Line 2001 West-D Whitewater Hydrotest		
Project Type	Hydrotest		
Length	4.360 miles		
Location	Whitewater		
Class	1		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1950		
Construction Start	02/19/2019		
Construction Finish	06/05/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[4] *(confidential)*	[redacted]		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,293,550	5,649,451	6,943,001
Disallowed Costs	-	-	-

[4] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview of Line 2001 West Projects

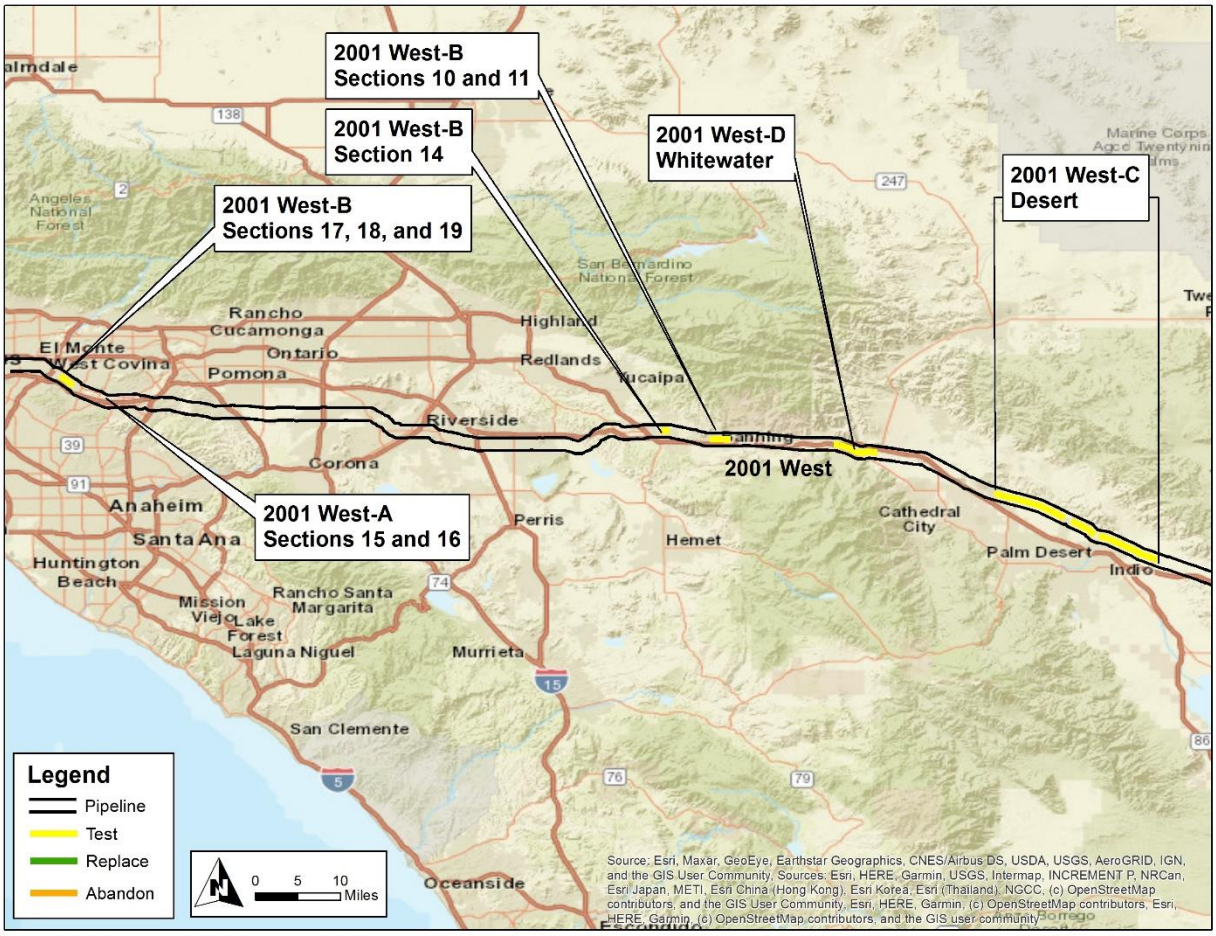
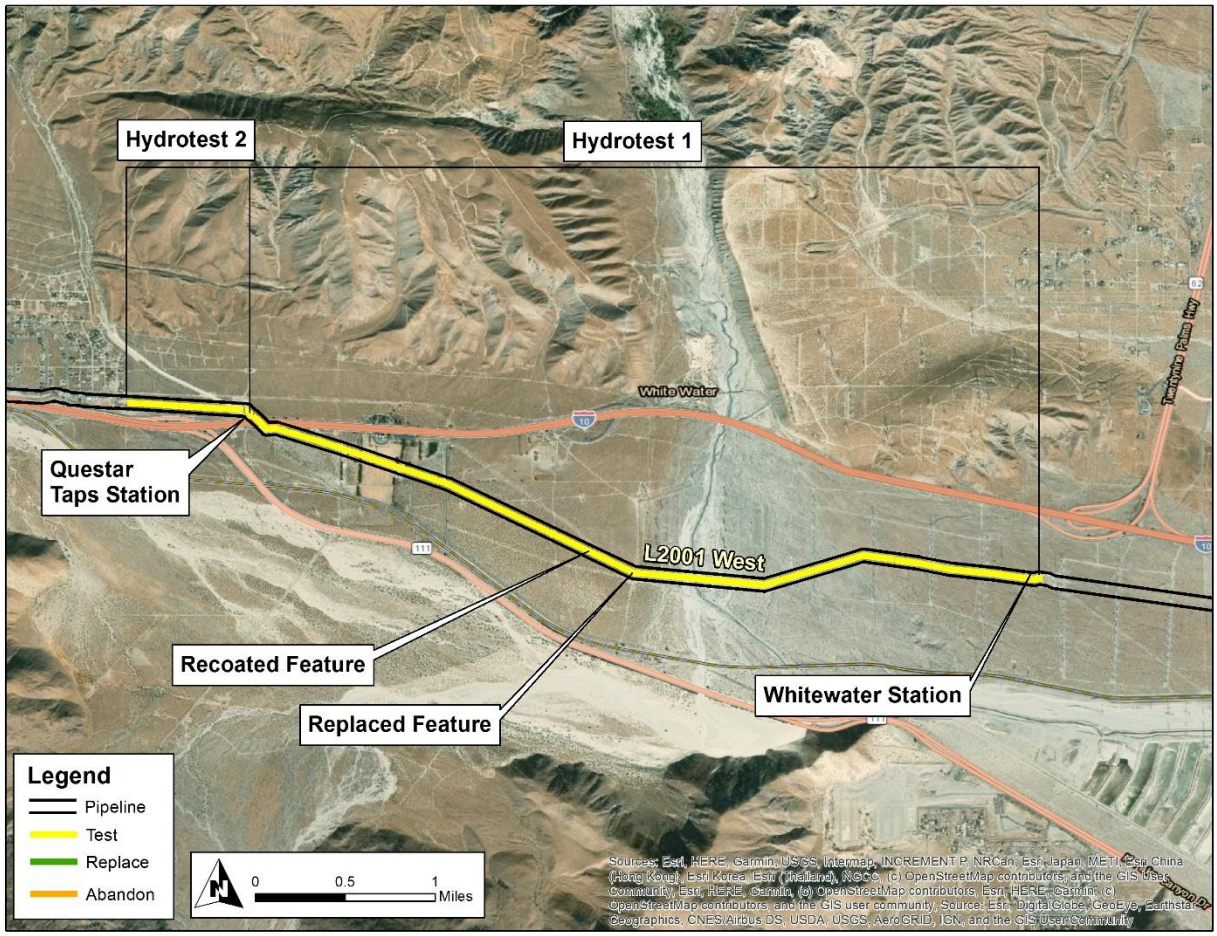
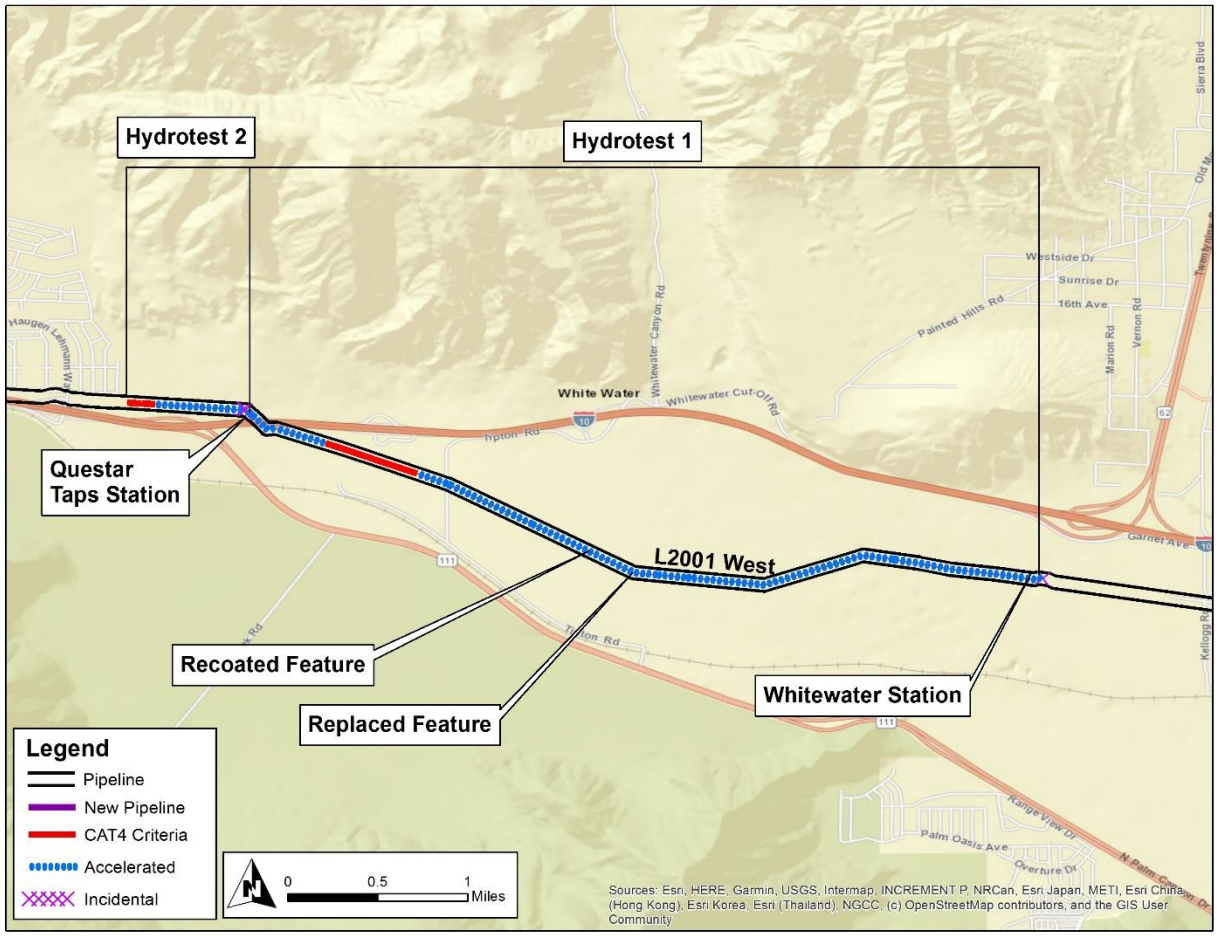


Figure 2: Satellite Image of Line 2001 West-D Whitewater Hydrotest Project



Final Report for Line 2001 West-D Whitewater Hydrotest Project

Figure 3: Overview Map of Line 2001 West-D Whitewater Hydrotest Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[5]	Incidental	New	Total[6]
Final Mileage	0.457 mi.	3.902 mi.	0 mi.	0 mi.	4.360 mi.
	2,413 ft.	20,602 ft.	1 ft.	2 ft.	23,018 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[7] Prior to initiating execution of the Project in 2019, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas and SDG&E identified Line 2001 West as a Phase 1A Hydrotest Project comprised of 15.809 miles of Category 4 Criteria pipe and 48.291 miles of Accelerated pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas and SDG&E successfully reduced the scope of the Project by 11.172 miles of Category 4 Criteria pipe for all Project sections.
3. Engineering, Design, and Constructability:
   a. For constructability and project management purposes, SoCalGas divided the Category 4 Criteria pipe into four separate Phase 1A projects Line 2001 West-A (Sections 15 and 16), Line 2001 West-B (Sections 10, 11, 14, 17, 18, and 19), and

[5] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[6] Values may not add to total due to rounding.
[7] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

Line 2001 West-C (Desert) and Line 2001 West-D (Whitewater). This report describes the activities associated with the Line 2001 West-D Hydrotest Project.

b. The Project Team determined that a single hydrotest was not feasible because the Questar Taps Station could not be tested through without requiring extensive isolation efforts. The Project Team separated the hydrotest into two test sections.

4. Final Project Scope: The final project scope consisted of two hydrotests that total 4.360 miles. The Accelerated mileage consists of 3.758 miles of Phase 2A pipe, 0.144 miles of Phase 2B pipe, and 1 foot of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 2001 West-D and confirmed the project design should commence as a Hydrotest Project.

For pipeline segments longer than 1,000 feet in length, under the approved PSEP Decision Tree, SoCalGas completes a preliminary review to determine whether SoCalGas can manage customer service impacts if the pipeline segment is taken out of service for a period of two to six weeks to complete pressure testing. Where mitigation of customer impacts to remove the line from service for pressure testing is feasible, SoCalGas compares the costs, constructability, risks, and benefits of pressure testing and replacement to determine whether pressure testing or replacement is the more prudent option.

Through this Decision Tree analysis, SoCalGas identified pressure testing as the more prudent option. Key considerations that support SoCalGas' determination to pressure test this segment include:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line could not be shut-in without service disruption to customers.
2. Customer Impacts: The Project Team utilized CNG to maintain service to one customer.

3. Piggability: Piggable.
4. Pipe Vintage: 1950.
5. Existing Pipe Attributes: The Project Team excavated and inspected two identified pipeline features prior to the hydrotest.
6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed a Request for Engineering Review (RER) analysis and concluded that the line could not be shut-in without service disruption to customers.
2. Customer Impact: The Project Team utilized CNG to maintain service to one customer.
3. Community Impact: The Project Team did not anticipate any notable impacts to the community during the project.
4. Constructability: The Project Team determined that a portion of the Questar Taps Station could not be tested without extensive isolation activities. The Project Team divided the hydrotest into two separate sections to avoid this portion of the station.
5. Schedule Coordination: The Project Team coordinated with the PSEP Line 2001 West-C Hydrotest Project and scheduled construction so that both projects could utilize the same construction crews. The Project Team scheduled the hydrotest so that both projects could blowdown and isolate these sections of Line 2001 West at the same time.

6. Substructures: The Project Team did not identify any existing substructures that affected the design and engineering of this project.
7. Permit Conditions:
   a. The Project Team obtained an encroachment permit from Riverside County.
   b. The Project Team provided The Bureau of Land Management (BLM) and the California Department of Fish and Wildlife (CDFW) with Letter of Findings.
8. Land Use: No identified issues.
9. Environmental:
   a. The Project Team obtained a dust control permit from the South Coast Air Quality Management District.
   b. The Project Team obtained permits from the California Desert Conservation Area (CDCA) and CDFW.
   c. The Project Team planned for coal tar wrap abatement activities at the test break locations.

D. Scope Changes

Through engineering, design, and planning activities, SoCalGas determined that changes in scope were appropriate to enhance the design of the Project and address engineering factors. As a result, the preliminary cost estimate does not fully reflect the final scope. The Project Team confirmed that the existing pipeline could be tested to 100% SMYS and included 2.912 of additional Phase 2 Accelerated mileage in the project design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. Following completion of the engineering, design, and planning activities described above, the Project Team directed the Performance Partner to prepare cost estimates based on a more detailed engineering design package, which included the updated design described in the discussion of notable Scope Changes above. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	02/19/2019
Construction Completion Date	06/05/2019
NOP Date	05/08/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $200,000 in change orders.

1. Field Design Changes: The Project Team directed the Construction Contractor to replace one segment of pipe along the pipeline. The Project Team also directed the

Construction Contractor to repair and recoat another segment of pipe along the pipeline.

Figure 4: Test Head Water Pipe

Figure 5: Test Head at the Whitewater Station

Figure 6: Water Storage Tanks at Test Break

Figure 7: Feature Repair and Recoating

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotested water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: The Project Team coordinated construction to begin at the same time as the PSEP Line 2001 West-C Hydrotest Project. This provided cost savings by allowing the Project Team to utilize a single blowdown to isolate this portion of the pipeline, the Project Team also shared construction crews between the two Projects.
2. Project Scope: The Project Team complete the pressure test at a 100% SMYS allowing additional mileage to be added to the Project. This provided cost savings by preventing the need for future construction activities.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $6,749,607. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $6,943,001.

Table 4: Estimated and Actual Direct Costs and Variances[8]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	551,047	343,144	(207,903)
Materials	143,764	159,573	15,809
Construction Contractor	2,253,332	1,922,329	(331,003)
Construction Management & Support	355,874	301,683	(54,191)
Environmental	668,207	719,957	51,750
Engineering & Design	1,256,152	1,382,407	126,255
Project Management & Services	554,747	324,825	(229,922)
ROW & Permits	184,539	112,582	(71,957)
GMA	781,945	646,892	(135,053)
Total Direct Costs	**6,749,607**	**5,913,391**	**(836,216)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[9]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	1,328,322	989,769	(338,553)
AFUDC	247,624	34,669	(212,955)
Property Taxes	54,534	5,171	(49,363)
Total Indirect Costs	**1,630,480**	**1,029,610**	**(600,870)**
Total Direct Costs	**6,749,607**	**5,913,391**	**(836,216)**
Total Loaded Costs	**8,380,087**	**6,943,001**	**(1,437,086)**

[8] Values may not add to total due to rounding.
[9] Ibid.

The Actual Full-Time Equivalent[10] (FTE) for this Project is 0.74.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 2001 West-D Whitewater Hydrotest Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $836,216. This variance can be attributed to several factors including: the Project Team was able to coordinate construction with another SoCalGas project, sharing Permits & ROW associated costs, construction crews, and coordinating one pipeline isolation; the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering & Design.

[10] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

E. Disallowance

The scope of the Line 2001 West-D Whitewater Hydrotest Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 2001 West-D Whitewater Hydrotest Project. Through this Hydrotest Project, SoCalGas successfully hydrotested 4.360 miles of pipeline in the City of Whitewater. The total loaded cost of the Project is $6,943,001.

SoCalGas executed this project prudently through inspecting and remediating pipeline features in the Project area, and by separating the Project into two hydrotests to avoid the Questar Taps Station that could not be hydrotested without extensive isolation efforts.

SoCalGas engaged in prudent cost avoidance efforts by coordinating shut-in and isolation with another hydrotest project, and sharing construction crews between the two projects.

End of Line 2001 West-D Whitewater Hydrotest Project Final Report

I. SUPPLY LINE 41-6000-2 ABANDONMENT PROJECT

A. Background and Summary

The Supply Line 41-6000-2 Abandonment Project consists of post-construction activities related to the Supply Line 41-6000-2 Replacement Project[1] that extended Line 6914. Line 6914 had to be operational and in service before Supply Line 41-6000-2 could be abandoned in order to maintain service to customers. Line 6914 is a [redacted] and [redacted] diameter pipeline that runs approximately 36 miles from El Centro to Calipatria. The pipeline traverse's flat terrain, through farmland, expansive networks of irrigation, and drainage canals. The Project is located in the Cities of Brawley, Calipatria, El Centro, Imperial, and Imperial County. The pipeline is primarily routed across a Class 1 location, and traverses some Class 2 and Class 3 locations. This report describes the activities associated with Supply Line 41-6000-2 Abandonment Project, which consists of the abandonment of 24.033 miles of pipeline, replacement of 0.239 miles and hydrotest of 995 feet of pipeline to tie over to adjacent pipelines, derate of 3.652 miles of existing pipelines[2], installation of three mainline valves (MLVs), installation of eight regulator stations, removal of seven regulator stations, and removal of five pipeline spans. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $35,970,429.

[1] Supply Line 41-6000-2 Replacement Project was submitted for reasonableness review in A.18-11-010 and authorized in D.20-08-034.
[2] Supply Line 41-141, Supply Line 41-6000-2, Supply Line 41-80.

Table 1: General Project Information

Project Name	Supply Line 41-6000-2 Abandonment		
Project Type	Abandonment		
Length	29.371 miles		
Location	Brawley, City of Imperial, Imperial County, City of Calipatria, City of El Centro		
Class	1, 2, and 3		
MAOP *(confidential)*	[redacted]		
Pipe Vintage	1948		
Construction Start	10/02/2017		
Construction Finish	03/08/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[3] *(confidential)*	[redacted]		
New SMYS *(confidential)*	N/A		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	35,970,429	-	35,970,429
Disallowed Costs	19,315	-	19,315

[3] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Overview of Supply Line 41-6000-2 Abandonment Project Sites

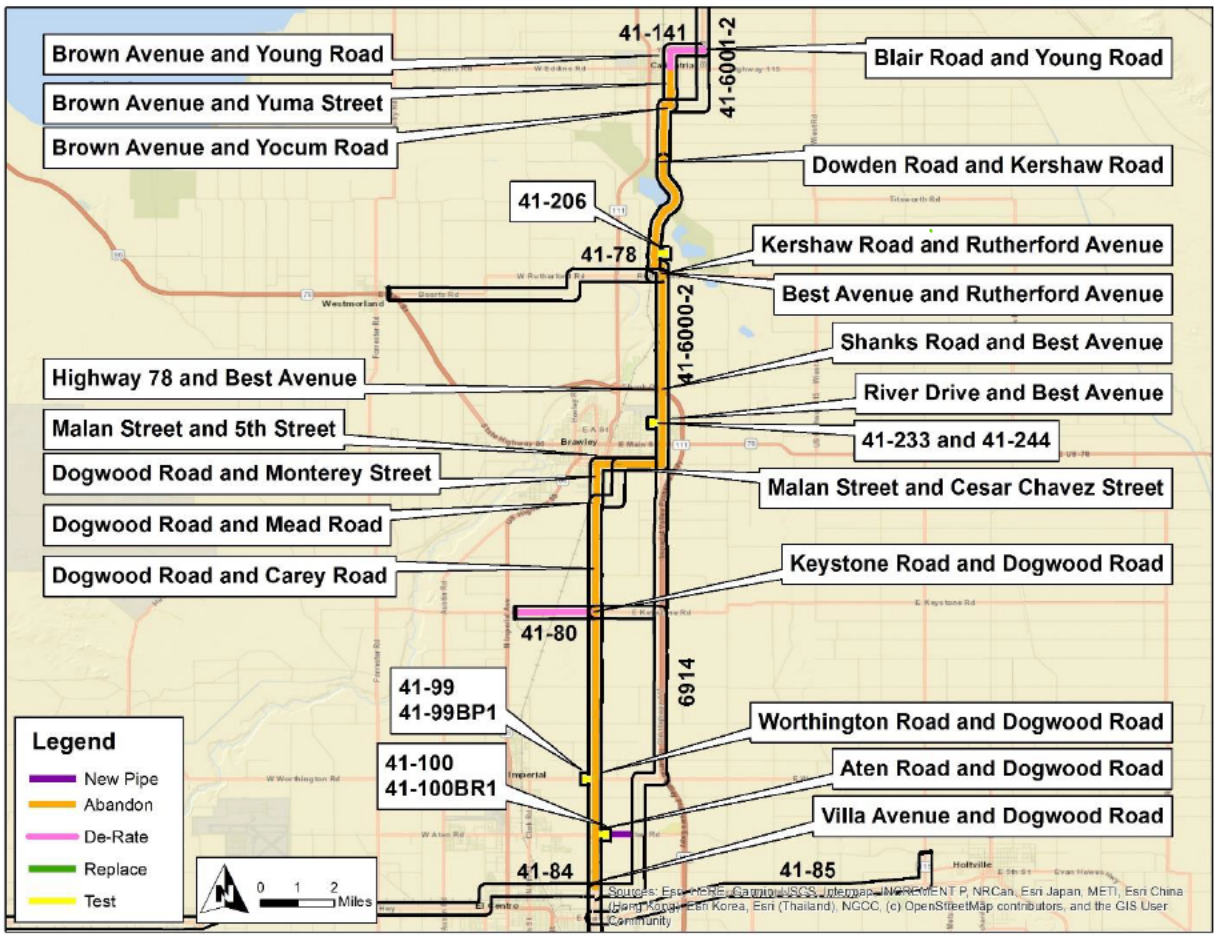


Figure 2: Satellite Map of Supply Line 41-6000-2 Abandonment Project

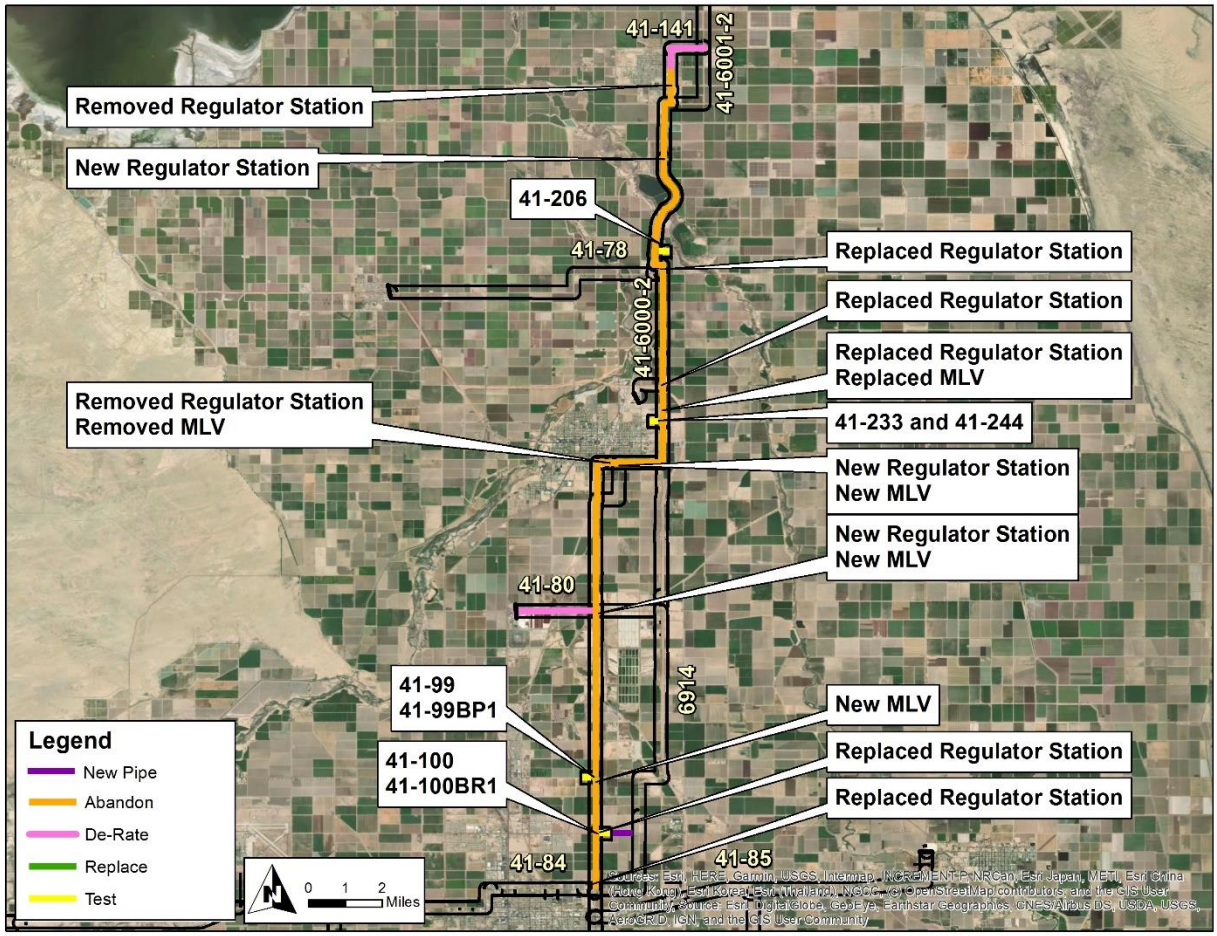
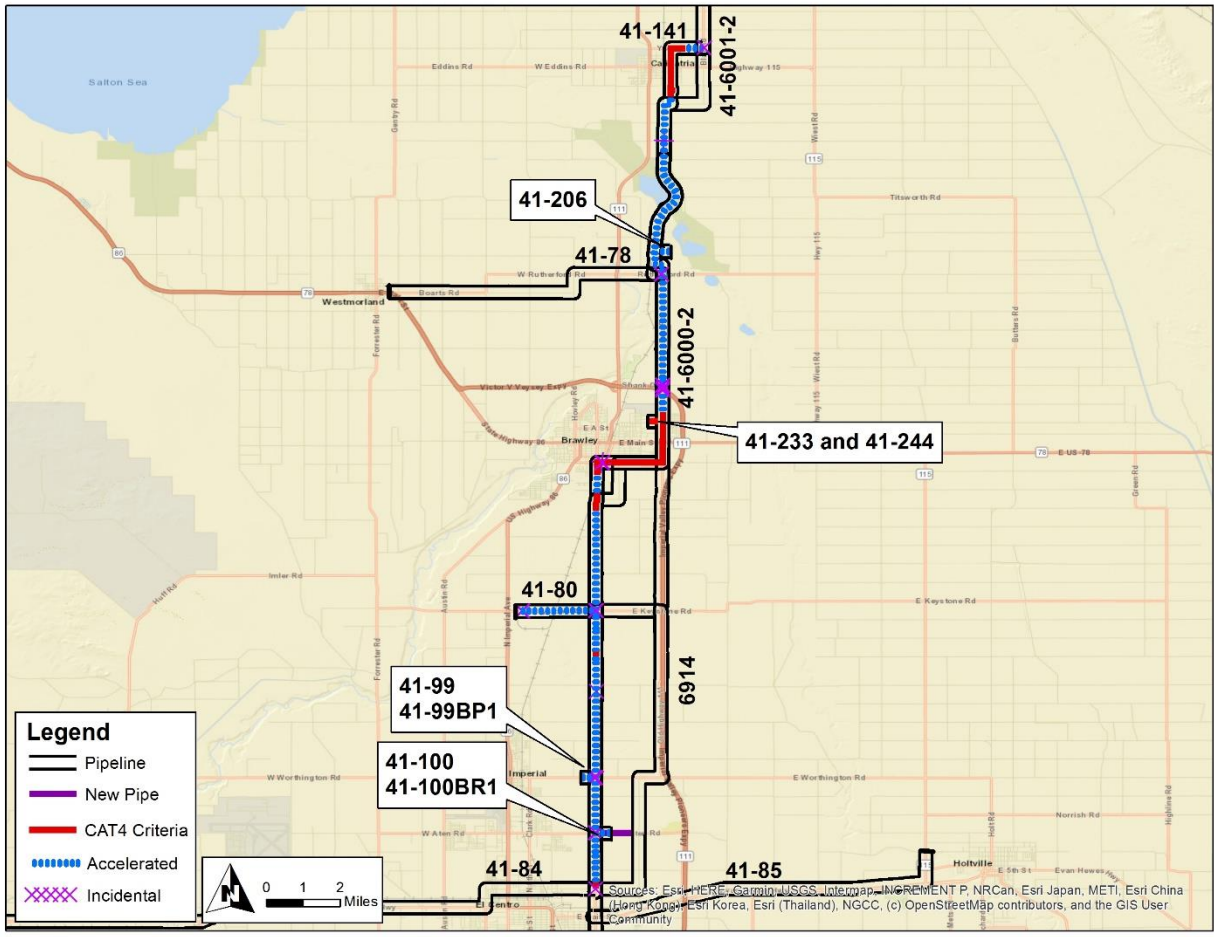


Figure 3: Overview Map of Supply Line 41-6000-2 Abandonment Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information[4]

	Criteria	Accelerated[5]	Incidental	New	Total[6]
Final Mileage	5.648 mi.	21.467 mi.	0.997 mi.	1.259 mi.	29.371 mi.
	29,821 ft.	113,346 ft.	5,265 ft.	6,649 ft.	155,081 ft.

SoCalGas presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[7] Prior to initiating execution of the Project in 2017, SoCalGas reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas and SDG&E identified Supply Line 41-6000-2 as a Phase 1A replacement project comprised of 11.373 Category 4 Criteria miles and 24.577 Accelerated miles, for a total of 35.950 miles.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas successfully reduced the scope of the Project by 5.679 miles of Category 4 Criteria pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team determined that the most prudent option to address the Criteria pipe on Supply Line 41-6000-2 was to abandon the line and continue serving customers via an extension of Line 6914. The new extension had to be operational

[4] Total mileage of the completed project differs from the mileage of the pipe addressed due to realignment of the pipeline route.
[5] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[6] Values may not add to total due to rounding.
[7] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.

before abandoning the existing pipeline in order to maintain customer service. The extension of Line 6914 was completed in November 2016.

b. For the derate, the Project Team lowered the pressure for 3.652 miles of pipeline to continue to provide customer service but at a reduced pressure by installing new regulator stations.

c. For the tie-overs, the Project Team identified seven Project sites that required construction activities to occur in order to complete the tie overs of existing customer taps to adjacent pipelines to maintain customer service and system reliability. Tie over activities included the installation of three mainline valves (MLVs), the installation of six regulator stations, and the removal of four regulator stations.

d. For the abandonment, the Project Team identified 13 Project sites that required construction activities to occur in order to complete the abandonment of Supply Line 41-6000-2. Abandonment activities included the removal of five existing pipeline spans, installation of two regulator stations, and the removal of three regulator stations.

e. Accelerated and Incidental mileage was included to realize efficiencies and to enhance project constructability.

4. Final Project Scope: The final project scope consists of the abandonment of 24.033 miles of pipeline, replacement of 0.239 miles and hydrotest of 995 feet of pipeline to tie over to adjacent pipelines, derate of 3.652 miles of existing pipelines, installation of three mainline valves (MLVs), installation of eight regulator stations, removal of seven regulator stations, and removal of five pipeline spans. The Accelerated mileage consists of 21.450 miles of Phase 2A pipe and 92 feet of Phase 2B pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Supply Line 41-6000-2 and confirmed that the extension of Line 6914 and abandonment of Supply Line 41-6000-2 was the best option to address the Criteria pipe.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records and potholing of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis: The Project Team completed an RER analysis that confirmed that Line 41-6000-2 could only be abandoned once all tie over activities to the Line 6914 extension were completed and the new pipeline extension was fully operational.
2. Customer Impact:
   a. Per the RER analysis, customer service was maintained utilizing CNG and pressure control fittings (PCFs). CNG was utilized to support two regulator stations and eight core customers. Two regulator stations and one core customer's service was maintained utilizing a PCF.
   b. The Project Team identified that most of the customers and regulator stations on these lines had dual taps or feeds, so there was minimal or no services impacts. There was impact to some of the electric generation (EG) loads (power plants) downstream of the system. The Project Team managed the impact by coordinating the shut-in with planned EG outages.
   c. In order to maintain uninterrupted customer service, conversion of six customers to a medium pressure from high pressure and the installation of 0.739 miles of distribution main was added to the Project scope.
3. Derate: The Project Team determined that Supply Line 41-80 and a segment of the northernmost end of 41-6000-2 could be derated to below 20% SMYS while still meeting customer service needs and maintaining system reliability. Two new regulator stations were needed to reduce the pressure.
4. Community Impact: The Project Team utilized traffic control at the construction sites.
5. Substructures:

a. Prior to construction, the Project Team confirmed optimal pipeline alignment and ensured that there were no major conflicts with underground structures. The Project Team performed potholing during construction to verify the results.
b. The Project Team altered the design of the new MLV assembly at Malan Street and Cesar Chavez Street site due to identified substructures. The Project Team designed a 12 foot deep bore and located the tie-in to avoid a storm drain.

6. Permit Conditions:
   a. Encroachment Permits were required from the City of Brawley, Imperial Irrigation District (IID), Imperial County, the City of Imperial, Union Pacific Railroad (UPRR), and Caltrans.
   b. Imperial County limited the closure of large segments of the roadway in order to stagger the closures. This impacted the construction schedule, but not the design.
7. Land Use: The Project Team obtained easements to complete Project activities.
8. Environmental: The majority of the Project was located within agricultural areas.
   a. The Project Team determined that Environmentally Sensitive Area (ESAs) were present and preconstruction surveys were conducted to confirm any potential impacts during construction. The Project Team determined that jurisdictional waters and special status species are potentially located in the project area. These environmental considerations were managed through project design to avoid disturbing these areas.
   b. The Project Team anticipated typical abatement activities for asbestos containing materials (ACMs) for removed pipe.
   c. The Project Team determined that dust control permits were required during construction.
   d. Several construction areas are nesting habitats for burrowing owls. The Project Team planned for environmental monitors to be on site during construction.
9. Constructability: To maintain service, the Project Team identified 19 Project sites where construction activities would occur. Activities include the addition of taps,

installation or replacement of regulator stations and MLVs, and the cutting and capping of old pipe. The project scope at each site was as follows:

a. Blair Road and Young Road: An existing high pressure transmission regulator station was converted to a medium pressure distribution regulator station to derate Supply Line 41-6000-2.

b. Brown Avenue and Young Road:
   i. Removal of one regulator station.
   ii. Tie-in of the existing [redacted] medium pressure steel pipe to the derated section of Supply Line 41-6000-2.

c. Brown Avenue and Yuma Street:
   i. The installation of a stopple to cap and abandon Supply Line 41-6000-2 to the south and derate a portion of the pipeline to the north.
   ii. The installation of a new [redacted] service line to the derated Supply Line 41-6000-2 to supply an existing customer.
   iii. The removal of an existing span along the abandoned Supply Line 41-6000-2 within IID easement.

d. Brown Avenue and Yocum Road: The removal of an existing span within IID easement along the abandoned Supply Line 41-6000-2.

e. Dowden Road and Kershaw Road: The installation of one regulator station to monitor and control the MAOP between Line 6921 and Supply Line 41-6001-2.

f. Kershaw Road and Rutherford Road: Replacement of one pre-existing regulator station.

g. Best Avenue and Rutherford Road:
   i. The removal of an existing span along the abandoned Supply Line 41-6000-2 within IID easement.
   ii. Installation of [redacted] plastic conduit pipe from an existing utility power pole to the south side of Rutherford Road to connect a cathodic protection wire to Supply Line 41-6001-2 and Line 6914.

h. Highway 78 and Best Avenue: Slurry fill the Caltrans Highway 78 crossing.

i. Shank Road and Best Avenue: Replacement of one pre-existing regulator station.

j. River Drive and Best Avenue: Replacement of one pre-existing regulator station and one valve.

k. Malan Street and 5th Street: The scope at this site consists of:
   i. Slurry fill of a railroad crossing.
   ii. Removal of one regulator station.
   iii. Removal of one MLV.

l. Malan Street and Cesar Chavez Street:
   i. The installation of one new MLV and bridle on Supply Line 41-6001-2.
   ii. The installation of one new regulator station.
   iii. The installation of approximately 180 feet of [redacted] pipe.
   iv. The installation of approximately 110 feet of new [redacted] pipe.
   v. The installation of approximately 100 feet of [redacted] pipe.

m. Dogwood Road and Monterey Street: Slurry fill of a railroad crossing.

n. Dogwood Road and Mead Road: Removal an existing span along the abandoned Supply Line 41-6000-2, that was located within the IID easement.

o. Dogwood Road and Carey Road: Removal of an existing span along the abandoned Supply Line 41-6000-2 within IID easement.

p. Keystone Road and Dogwood Road:
   i. Installation of [redacted] pipe utilizing a bore crossing under a channel within IID jurisdiction to provide service from Supply Line 41-6001-2 to Supply Line 41-80.
   ii. The installation of one new MLV and bridle on Supply Line 41-6001-2.
   iii. The installation of one new regulator station.

q. Worthington Road and Dogwood Road: The installation of one new MLV and bridle on Supply Line 41-6001-2.

r. Aten Road and Dogwood Road:
   i. Replacement of one pre-existing regulator station.
   ii. The installation of 0.993 miles of [redacted] pipe to connect to Line 6914.

s. Villa Avenue and Dogwood Road:

i. Stopple installation to cap and abandon Supply Line 41-6000-2 to the north.
ii. Removal and replacement of one regulator station.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design for Supply Line 41-6000-2 Abandonment. Following completion of the engineering, design, and planning activities described above, the Project Team evaluated the scope of the projects and determined that separate Construction Contractors for Tie Overs and Abandonment activities were needed to maintain the construction schedule. The Project Team also directed the Alliance Partner (Electrical Contractor) to prepare a cost estimate based on a more detailed design package. The Performance Partner was selected to execute Abandonment activities whereas the Construction Contractor selected to execute Tie Over activities was selected through a competitive bidding process with the construction contract was awarded to the bidder that best met the selection criteria for this project.

1. SoCalGas Preliminary Mechanical Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Mechanical Construction Contractors' Cost Estimate (confidential): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.
3. SoCalGas Preliminary Electrical Contractor's Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
4. Electrical Contractor's Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	10/02/2017
Construction Completion Date	03/08/2019
NOP Date	04/30/2018

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $4,196,000 in change orders.

1. Field Design Changes:

   a. The Project Team redesigned and extended the tie-in locations during construction at Blair Road and Young Road. The northern end of the station included additional excavation at Blair and Young was required to remove the existing [redacted] pipe, [redacted] valve, and pressure control fitting (PCF). The PCF was included to provide the shut-in of Blair Station; however, the PCF was incapable of isolating the station and unsuitable as repairs resulting in a refabrication of the north end of the station. The southern end of the station required additional excavation following the discovery of a wrinkle bend. The removal of the wrinkle bend resulted in a change in alignment and the relocation of the one valve.

   b. The Project Team redesigned and extended the tie-in locations during construction at Brown Avenue and Yuma Street. The design change included the installation of a [redacted] PCF, additional pressure test, and the installation of a medium pressure service.

2. Schedule Delay:

   a. Unplanned delays extended the Project schedule. Additional field support costs were incurred to support the completion of this project.

b. Unplanned delays extended the Project schedule. Additional shoring equipment costs were incurred to support the completion of this project.

3. Traffic: Extended traffic control support at Villa and Dogwood, Brown and Young, Keystone and Dogwood, and Blair and Young.
4. Field Design Changes: One regulator station was added to the Project at Dowden Road and Kershaw Road to monitor and control the MAOP between Line 6921 and Supply Line 41-6001-2.

Figure 7: Aerial View of New Regulator Station

Figure 8: New Tap Valve

Figure 9: Stringing of New [redacted] Pipe for Bore Along Aten Road

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project. Specific examples of cost avoidance actions taken on this project are:

1. Schedule Coordination: Project construction crew and laydown yard were shared with the PSEP Supply Line 41-6001-2 Replacement Project.
2. Future Maintenance: New MLVs were installed outside major roadways, eliminating traffic control for future maintenance activities.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $27,986,526. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $35,970,429.

Table 4: Total Estimated and Actual Direct Costs and Variances[8]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	1,645,807	1,812,670	166,863
Materials (Construction)	1,449,486	1,879,754	430,268
Mechanical Construction Contractor	12,567,295	13,027,692	460,397
Electrical Construction Contractor	250,287	166,615	(83,672)
Construction Management & Support	1,479,558	1,543,389	63,831
Environmental	1,688,084	1,552,858	(135,226)
Engineering & Design	3,639,336	6,787,422	3,148,086
Project Management & Services	1,691,928	737,346	(954,582)
ROW	696,212	251,203	(445,009)
GMA	2,878,533	3,271,883	393,350
Total Direct Costs	**27,986,526**	**31,030,832**	**3,044,306**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[9]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	2,595,908	4,161,973	1,566,065
AFUDC	1,539,320	665,616	(873,704)
Property Taxes	362,612	112,008	(250,604)
Total Indirect Costs	**4,497,840**	**4,939,597**	**441,757**
Total Direct Costs	**27,986,526**	**31,030,832**	**3,044,306**
Total Loaded Costs	**32,484,366**	**35,970,429**	**3,486,063**

The Actual Full-Time Equivalents[10] (FTEs) for this Project are 3.44.

[8] Values may not add to total due to rounding.
[9] Ibid.
[10] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Supply Line 41-6000-2 Abandonment Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs exceeded the preliminary estimate by $3,044,306. This variance can be attributed to several factors including: there were multiple design changes, as explained in Section III. Part C, at the abandonment sites during construction to address conditions encountered in the field, resulting in increased construction, engineering and design, project management, and material costs; and the Engineering and Design firms completed activities originally identified as Project Management & Services in the initial estimate while the actual costs were recognized under Engineering and Design.

E. Disallowance

For this replacement project, SoCalGas and SDG&E identified 60 feet of pipe as being installed after 1955 and lacking records that provide the minimum information necessary to demonstrate compliance with then-applicable industry standards or regulatory strength testing and recordkeeping requirements. Of the pipeline that was replaced, 60 feet of Phase 1A pipe is disallowed. Therefore, a $19,315 reduction to ratebase was calculated by multiplying 0.0113 miles of pipe by $1,709,257 per mile, which was SoCalGas and SDG&E's system average cost of pressure testing at the time the pipeline was returned to service.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Supply Line 41-6000-2 Abandonment Project. Through this Project, SoCalGas successfully addressed 29.371 miles of pipe in the City of Brawley, City of Calipatria, City of El Centro, City of Imperial, and Imperial County. The total loaded cost of the Project is $35,970,429.

SoCalGas executed this project prudently through the abandonment of 24.033 miles of Line 41-6000-2, replacement of 0.239 miles and hydrotest of 995 feet of pipeline to tie over to adjacent pipelines, derate of 3.652 miles of existing pipelines, installation three MLVs, installation of eight regulator stations, removal of seven regulator stations, and removal of five pipeline spans without disrupting customer service.

SoCalGas engaged in prudent cost avoidance efforts by sharing construction crews and a laydown yard with another PSEP project. SoCalGas would also install new MLVs in locations that are safer and easier to access for future maintenance.

End of Supply Line 41-6000-2 Abandonment Project Final Report

I. LINE 103 DERATE AND REPLACEMENT PROJECT

A. Background and Summary

Line 103 is a [redacted] diameter transmission line that runs approximately 9.303 miles through Kern County. The pipeline is primarily routed across a Class 1 location and traverses some Class 2 and 3 locations. This report describes the activities associated with Line 103 Derate and Replacement Project which consists of the derate of 9.303 miles of pipeline and replacement of approximately 40 feet of pipe within a single regulator station. The specific attributes of this Project are detailed in Table 1 below. The total loaded cost of the Project is $1,490,196.

Table 1: General Project Information

Project Name	Line 103 Derate and Replacement		
Project Type	Derate (40 foot Replacement)		
Length	9.303 miles		
Location	Kern County		
Class	1		
MAOP[1] *(confidential)*	[redacted]		
Pipe Vintage	1941		
Construction Start	05/21/2019		
Construction Finish	07/03/2019		
Original Pipe Diameter *(confidential)*	[redacted]		
New Diameter *(confidential)*	N/A		
Original SMYS[2] *(confidential)*	[redacted]		
New SMYS *(confidential)*	[redacted]		
Project Costs ($)	**Capital**	**O&M**	**Total**
Loaded Project Costs	1,490,196	-	1,490,196
Disallowed Costs	-	-	-

[1] MAOP represents the pre-construction MAOP.
[2] Highest percentage of Specified Minimum Yield Strength (SMYS) of Category 4 Criteria pipe.

B. Maps and Images

Figure 1: Satellite Image of Line 103 Derate Project

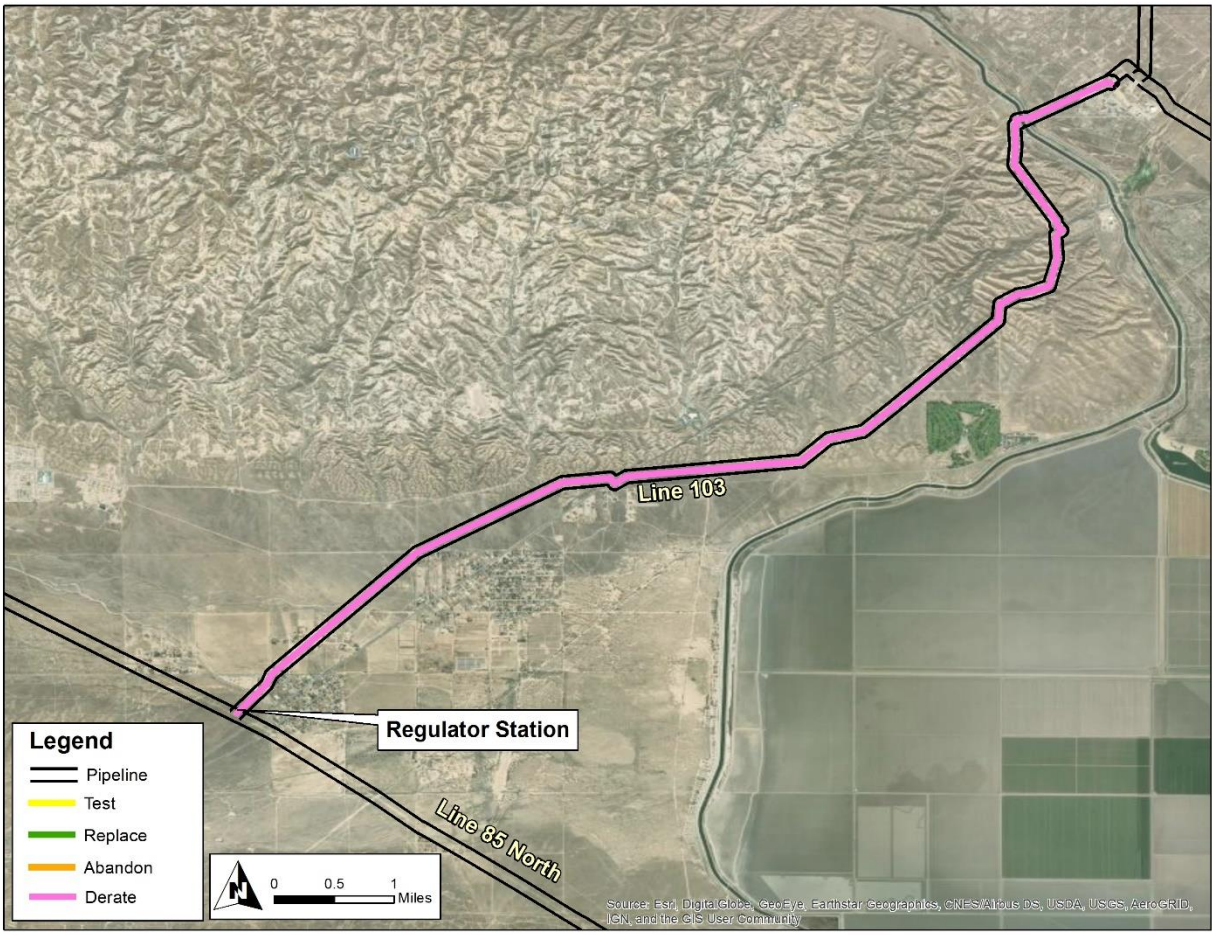
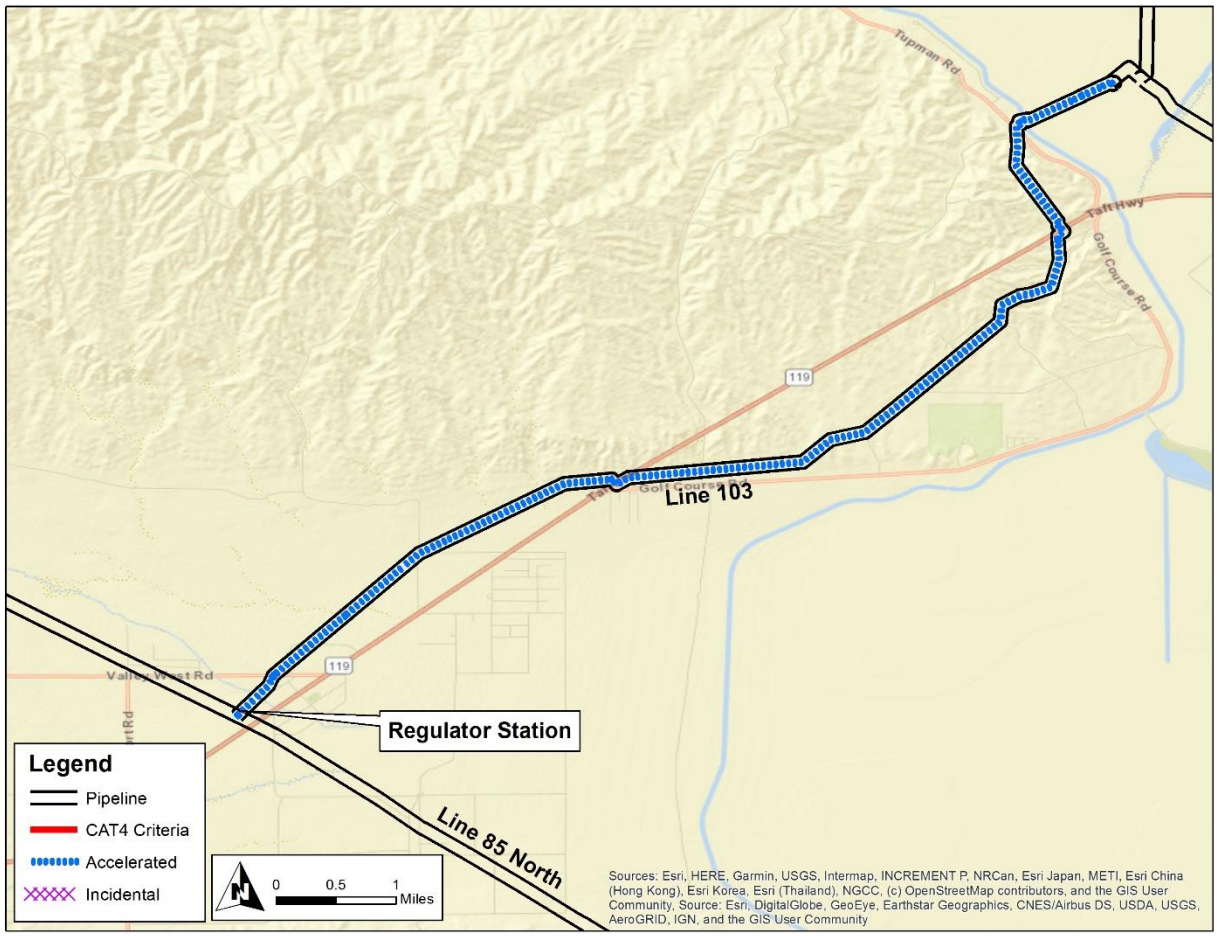


Figure 2: Overview Map of Line 103 Derate Project



II. ENGINEERING, DESIGN, AND PLANNING

A. Project Scope

Table 2: Mileage Information

	Criteria	Accelerated[3]	Incidental	New	Total[4]
Final Mileage	0 mi.	9.031mi.	0.253 mi.	0.019 mi.	9.303 mi.
	0 ft.	47,686 ft.	1,334 ft.	100 ft.	49,120 ft.

SoCalGas and SDG&E presented a conceptual project scope in workpapers supporting the 2011 PSEP filing.[5] Prior to initiating execution of the Project in 2019, SoCalGas & SDG&E reviewed existing pipeline records to validate the scope of the Project. During the Engineering, Design, and Planning phase, SoCalGas & SDG&E further refined the scope. This progression of the project scope is summarized as follows:

1. 2011 PSEP Filing: SoCalGas identified Line 103 as a Phase 1B[6] Project comprised of approximately 8.53 miles of pipe.
2. Scope Validation: Through scope validation activities, after the 2011 filing and before initiating execution of the Project, SoCalGas reclassified this project as a replacement and derate project made up of 8.769 miles of Phase 1B pipe.
3. Engineering, Design, and Constructability:
   a. The Project Team determined that the optimal method for addressing the Phase 1B PSEP pipe was to reduce the operating pressure of Line 103 because the system could operate at the lower pressure without an impact to customer service.

[3] Accelerated mileage includes Phase 1B and Phase 2 pipe. The Accelerated mileage was included to realize efficiencies and to enhance project constructability.
[4] Values may not add to total due to rounding.
[5] See Amended PSEP of SoCalGas and SDG&E, submitted December 2, 2011, in R.11-02-019 and subsequently transferred to A.11-11-002.
[6] As authorized in D. 14-06-007, PSEP's Phase 1B is the replacement or abandonment of non-piggable pre-1946 pipe in non-HCA areas.

b. In order to reduce the operating pressure, the Project Team identified the need to replace an existing regulator station to provide uninterrupted gas service and replace one customer tap with a [redacted] tap.

4. Final Project Scope: The final project scope consists of a 9.303 mile derate and the replacement of one regulator station, which included the replacement of 40 feet of pipe. The Accelerated mileage consists of 50 feet of Phase 2A pipe, 0.381 miles of Phase 2B, and 0.253 miles of Incidental pipe.

B. Decision Tree Analysis

SoCalGas performed a PSEP Decision Tree analysis of Line 103 and confirmed the project design should commence as a Replacement Project.

The Project Team conducted an engineering analysis and determined that neither replacement, hydrotest, nor abandonment of Line 103 was the most cost effective means of addressing the PSEP Phase 1B pipe. Based on the engineering evaluation, SoCalGas confirmed that Line 103 could be derated rather than abandoned, replaced, or hydrotested and maintain system capacity. However, in order to lower the operating pressure, the preexisting regulator station needed to be replaced. SoCalGas identified derating as the more prudent option. Key considerations that support SoCalGas' determination to derate this segment include:

1. Shut-In Analysis: The Project Team completed an RER analysis and concluded that the line could be derated to a lower operating pressure and maintain capacity requirements.
2. Customer Impacts: Per the RER, the Project Team was able to maintain service to customers without impact. One customer required outage coordination during pipeline isolation to replace an existing tap.
3. Piggability: Non-piggable.
4. Pipe Vintage: 1941.
5. Existing Pipe Attributes: Varying diameter changes from [redacted] to [redacted] pipe.

6. Longseam Type: Unknown.
7. Longseam Repair History: No identified issues.
8. Condition of Coating: No identified issues.
9. History of Leaks: No identified issues.

C. Engineering, Design, and Planning Factors

SoCalGas reviewed pipeline drawings and other information, contacted internal planning groups, communicated with external stakeholders, conducted survey activities, including reviewing public records of the area to confirm the presence of underground utilities and substructures, and completed a pre-design site walk. Key factors that influenced the engineering and design of the Project are as follows:

1. Shut-In Analysis:
   a. As discussed above, the Project Team completed an RER analysis and concluded that the line could be derated and maintain capacity requirements.
   b. Operating the pipeline at a reduced pressure required the replacement of an existing regulator station. The new regulator station provides the capability to operate the existing pipeline at medium pressure.
2. Customer Impacts: Per the RER, the Project Team was able to maintain service to customers without impact. One customer required outage coordination during pipeline isolation to replace an existing tap.
3. Community Impact: The Project had minimal community impact and traffic control was not needed because all construction work was conducted within SoCalGas property.
4. Substructures: No identified substructures within excavation locations.
5. Permit Conditions: No identified issues.
6. Land Use: The Project was completed within SoCalGas property.
7. Environmental:
   a. Full time biological monitoring was required due to nearby environmental resources.

b. Abatement activities were anticipated for lead paint and asbestos containing materials (ACMs) for removed pipe.

D. Scope Changes

SoCalGas did not make any notable scope changes during detailed design.

III. CONSTRUCTION

A. Construction Contractor Selection

The Project Team prepared an initial cost estimate based on the preliminary design. As indicated above, there were no notable changes in scope between the time when the Project Team prepared the preliminary cost estimate and when the Performance Partner prepared and submitted its Target Price Estimate. SoCalGas awarded the construction contract to the Performance Partner.

1. SoCalGas' Preliminary Construction Cost Estimate (*confidential*): SoCalGas' preliminary cost estimate for construction was [redacted].
2. Construction Contractor's Target Price Estimate (*confidential*): The Construction Contractor's cost estimate was [redacted], which was [redacted] than SoCalGas' preliminary cost estimate for construction.

B. Construction Schedule

Table 3: Construction Timeline

Construction Start Date	05/21/2019
Construction Completion Date	07/03/2019
NOP Date	06/20/2019

C. Changes During Construction

The conditions summarized below were encountered during construction. Activities to address or mitigate these conditions resulted in approximately $55,000 in change orders.

1. Schedule Delay: Unplanned delays extended the Project by approximately 10 days. Additional field support costs were incurred to support the completion of this project.
2. Material Delays: Materials arrived incomplete at start of construction causing a two day delay to the schedule for fabrication activities.

3. Field Design Changes: Additional pipe supports were required for above ground piping during customer tap installation.

Figure 3: Abatement Activities

Figure 4: Prefabricated Assembly for Regulator Station

Figure 5: Prefabricated Assembly for Customer Tap

D. Commissioning and Site Restoration

Commissioning activities include restoration of the site, final inspection and placement of the pipeline back into service, transportation and disposal of hydrotest water and hazardous material, and site demobilization. Closeout activities include development of final drawings, finalization of a reconciliation package, and updates to company recordkeeping systems to reflect the completed scope of work.

IV. PROJECT COSTS

A. Cost Avoidance Actions

SoCalGas exercised due diligence in the planning, design, and construction activities for this project to minimize or avoid costs when prudent to do so. As discussed above, the Project Team conducted a site visit to identify and incorporate discernible site conditions into the engineering, design, and planning of the Project in the most cost effective manner to remediate the PSEP pipe. The Project Team coordinated a planned shut-in window with a customer, removing the need to use CNG to keep the customer serviced during construction.

B. Cost Estimate

Based on the preliminary design, once the project scope was confirmed and engineering, design, and planning activities were underway, SoCalGas prepared an estimate of the Direct Costs of the Project in the amount of $1,475,181. The Project Team considered the conditions known at the time to prepare the preliminary Direct Cost estimate. This estimate reflects the projected Labor, Material, and Services costs anticipated to be incurred to execute the Project.

SoCalGas estimated Indirect Costs of the Project based on the estimated Direct Costs and other project-related variables.

C. Actual Direct and Indirect Costs

Actual Direct Costs reflect the Labor, Material, and Services costs incurred to execute the Project. Actual Indirect Costs reflect costs for incremental overhead loaders in accordance with Company overhead allocation policies. The total loaded cost of the Project is $1,490,196.

Table 4: Estimated and Actual Direct Costs and Variances[7]

Direct Costs ($)	Estimate	Actuals	Delta Over/(Under)
Company Labor	342,029	145,882	(196,147)
Materials	170,511	240,958	70,447
Construction Contractor	264,077	281,021	16,944
Construction Management & Support	119,000	52,901	(66,099)
Environmental	67,880	109,157	41,277
Engineering & Design	190,840	253,526	62,686
Project Management & Services	133,619	24,419	(109,200)
ROW & Permits	12,202	6,307	(5,895)
GMA	175,023	110,616	(64,407)
Total Direct Costs	**1,475,181**	**1,224,787**	**(250,394)**

Table 5: Estimated and Actual Indirect Costs, Total Costs, and Variances[8]

Indirect Costs/Total Costs ($)	Estimate	Actuals	Delta Over/(Under)
Overheads	489,108	229,969	(259,139)
AFUDC	342,258	30,158	(312,100)
Property Taxes	95,326	5,282	(90,044)
Total Indirect Costs	**926,692**	**265,409**	**(661,283)**
Total Direct Costs	**1,475,181**	**1,224,787**	**(250,394)**
Total Loaded Costs	**2,401,873**	**1,490,196**	**(911,677)**

The Actual Full-Time Equivalent[9] (FTE) for this Project is 0.35.

[7] Values may not add to total due to rounding.
[8] Ibid.
[9] Full-time equivalents (FTEs) are included in GRC forecasts to provide context to requested amounts for company labor. FTEs are calculated by measuring the number of hours charged over a given time period. For example, one FTE is equal to 40 hours per week, or typically 2,080 hours per year. The calculation of FTEs includes overtime hours. Therefore, if one employee works 60 hours per week, he or she would be recorded as 1.5 FTEs.

D. Cost Impacts

Consistent with one of the overarching objectives of PSEP to maximize the cost effectiveness of safety enhancement investments, SoCalGas effectively planned, designed, and completed construction activities for this project. Each pipeline project is unique in scope and inherently complex due to a variety of factors including terrain, environmental and permitting constraints, scope changes during detailed design, material cost fluctuations, regulatory changes, and more. These complexities can lead to variances between initial estimates and actual costs. Consistent with prudent management at the time, the Project Team successfully mitigated these variances whenever feasible through the implementation of effective project management practices, thorough planning, and continuous monitoring.

At the completion of the Line 103 Derate and Replacement Project, Actual Direct Costs came within the AACE Class 3 Total Installed Cost (TIC) accuracy range, adhering to the standard industry practices defined by the Association for the Advancement of Cost Engineering (AACE) International. The Actual Direct Costs were less than the preliminary estimate by $250,394. This variance can be attributed to several factors including: the project initially anticipated additional company labor support during the regulator station tie-in and derate, but less support was required for construction than expected; the project estimate assumed closeout would be completed internally, but it was supported by the engineering firm; and after further review of system capacity, it was determined that CNG/LNG support which was included in the preliminary estimate was no longer required.

E. Disallowance

The scope of the Line 103 Replacement and Derate Project did not include any pipe subject to disallowance under D.14-06-007 or D.15-12-020.

V. CONCLUSION

SoCalGas enhanced the safety of their integrated natural gas transmission system by prudently executing the Line 103 Derate and Replacement Project. Through this Replacement and Derate Project, SoCalGas successfully derated 9.303 miles of pipeline and replaced 40 feet of regulator station pipe in Kern County. The total loaded cost of the Project is $1,490,196.

SoCalGas engaged in prudent cost avoidance efforts by identifying that Line 103 could successfully be derated instead of replaced, while maintaining system capacity requirements.

End of Line 103 Derate and Replacement Project Final Report