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Amended August 12, 2022

2022 SB 1371  
**COMPLIANCE PLAN**



**Summary of Amendments to SoCalGas' 2022 Natural Gas Leak Abatement Compliance Plan (August 2022)**

The table below summarizes the changes made to SoCalGas' 2022 Leak Abatement Amended Compliance Plan, submitted in August 2022:

<b>Chapter</b>	<b>Page Number</b>	<b>Change Made</b>
Intro	3	Updated calculated emission reductions, cost effectiveness factors, and emission reduction discussion based on May 2022 approval from RASA
1	15	Updated emission reduction estimates and cost effectiveness calculations
2	23	Updated emission reduction estimates and cost effectiveness calculations
11	65	Corrected typos
12	68	Corrected typos
13	71	Corrected typos
14	76	Corrected typos
15	83	Corrected typos
16	87	Corrected typos
21	98	Corrected typos
23	104	Corrected typos
24	106	Corrected typos
Att 24A	139	Corrected typos

## **Introduction**

SoCalGas submits this Amended Biennial Compliance Plan on August 12, 2022 (Compliance Plan) as part of the Natural Gas Leak Abatement Program (NGLAP or Program). Implementation of the activities for each measure will begin after Compliance Plan and associated forecasts for cost recovery as presented in Advice Letter (AL) 5950 are approved, with expected implementation in years 2023 and 2024.

Forecasts presented for cost recovery associated with the measures proposed in this Compliance Plan are for activities that are incremental to safety and specific to the emission reduction goals of Decision (D.) 19-08-020. SoCalGas currently has policies and procedures in place to meet environmental and safety regulations implemented by various agencies, including, but not limited to, the Pipeline and Hazardous Materials Safety Administration (PHMSA), Occupational Safety and Health Administration (OSHA), California Air Resources Board (CARB), Environmental Protection Agency (EPA), Local Air Pollution Control Districts, and California's Department of Conservation's Geological Energy Management Division (CalGEM). Some of these policies overlap with Senate Bill (SB) 1371 requirements, which is addressed in the relevant chapters herein.

In May 2022, California Public Utilities Commission (CPUC) and CARB approved 2015 baseline adjustment for SoCalGas. Therefore, SoCalGas is providing a supplementary introduction to reflect the baseline's adjustments.

### **Emission Reductions from Official 2015 Baseline**

The approved 2015 adjusted emissions inventory baseline for SoCalGas' system is 1,797,141 MCF. This value includes the 2015 baseline adjustments that were approved in May 2022. Annual estimated emission reductions resulting from activities proposed in this Compliance Plan from 2023 – 2030 are currently estimated at 992,099 MCF. Therefore, the overall emissions in 2030 are estimated to be 805,042 MCF, a 55% reduction from the adjusted baseline. The emission models are based on modeling of May 2022 approved reporting metrics and assumptions listed below in Table 1.

Table 1 below, Major Efforts to Reduce Emissions, summarizes SoCalGas' proposed major activities and estimated emission reductions proposed in the 2022 Compliance Plan based on the 2015 adjusted baseline.

**Table 1: Major Efforts to Reduce Emissions (2015 Official Baseline) – SoCalGas**

<b>Chapter</b>	<b>2024 Emission Reduction, MCF</b>	<b>2025 Emission Reduction, MCF</b>	<b>2030 Emission Reduction, MCF</b>	<b>Standard Cost Effectiveness (\$/MCF), (2023-2030)</b>	<b>Net Cost Effectiveness (\$/MCF), (2023-2030)</b>
Chapter 1 - Leak Inventory Reduction	455,485	492,946	492,946	74	52
Chapter 4 - Large Leak Prioritization					
Chapter 2 – Increased Leak Survey	267,760	267,760	267,760	28	6
Chapter 3 - Blowdown Reduction Activities	188,232	188,232	188,232	41	19
Chapter 5 - Damage Prevention Algorithm and Proactive Intervention	11,562	11,562	11,562	357	334
Chapter 14 - Aerial Monitoring	31,599	31,599	31,599	619	597
<b>Summary</b>	<b>954,638</b>	<b>992,099</b>	<b>992,099</b>		
<b>Percentage Reduction from 2015 Baseline</b>	<b>53%</b>	<b>55%</b>	<b>55%</b>		

*\*Emission reductions and the cost effectiveness values for Chapter 1 - Leak Inventory Reduction include the emission reductions from Large Leak Prioritization due to the shared expenditure and overlapping activities (See Chapter 4 for details)*

## Emission Reduction Estimation Assumptions

- For the 2015 values, SoCalGas is applying the company-specific emissions factors to estimate the 2015 Pipeline Leaks for Distribution Main & Service system category using the best 2015 available data
- SoCalGas is using Company-Specific emission factors for Pipeline Leaks for Distribution Main & Service system category for 2024, 2025, and 2030
- SoCalGas is applying the 2020 dataset values, which utilizes leaker-based emission estimation methodology, for component leaks and component emission for the Distribution M&R Stations system category for the 2015 values. CPUC and CARB approved this methodology in May 2022
- SoCalGas is using leaker-based emission factors for component leaks and component emission for the Distribution M&R Stations system category for 2024, 2025, and 2030. CPUC and CARB approved this methodology in May 2022
- SoCalGas is using the corrected inventory count for the Transmission M&R Stations system category as it was updated in subsequent data requests to the 2020 Annual Emission Reports for 2024, 2025, and 2030 emission estimations. CPUC and CARB approved this approach in May 2022
- For the 2015 values, SoCalGas is applying the Company-Specific leaker-based emissions factors to estimate the 2015 MSA emissions using the 2016 dataset, since it is the best available data. CPUC and CARB approved this methodology in May 2022
- SoCalGas is applying the Company-Specific leaker-based emissions factors to estimate MSA emissions for 2024, 2025, and 2030. This approach was approved by relevant agencies in May 2022
- SoCalGas is utilizing the 2018 dataset to estimate Components Emissions and Components Leaks emission of the Transmission Compressor Stations System Category as proposed by SoCalGas to the relevant agency in October 2021. CPUC and CARB approved this approach in May 2022
- SoCalGas is utilizing the 2018 dataset to estimate Components Emissions and Components Leaks emission of the Underground Storage System Category as proposed by SoCalGas to the relevant agency in October 2021. CPUC and CARB approved this approach in May 2022
- The 2030 emissions reflect forecasted emission reductions as proposed in this Compliance Plan. In the areas where emission reductions were not forecasted, emissions are estimated to remain leveled with 2020 dataset emissions. Certain exceptions were made in instances where 2020 had outliers in the dataset, and in those cases, emissions were forecasted to remain leveled with the 2015 baseline such as the Transmission Damage incidents in 2020

Emission models used to forecast reductions will have some degree of variation and the final reduction may be higher or lower in practice. Based on information and technologies currently available, SoCalGas is proposing to implement measures that maximize cost-effective emission reductions as reasonably as possible and then maintain the reduced emission levels through 2030. SoCalGas awaits the results of the program evaluation scheduled for the end of 2022, SoCalGas anticipates adjusting re-evaluation projects submitted in the 2024 Compliance Plan as a result of program evaluation.

As proposed research projects and pilots are completed, more accurate modeling may become available for activities, such as the Research & Development (R&D) studies in Transmission M&R Stations, estimating emissions from transmission pipeline leaks, and continuous improvement in estimating emissions associated with above and below ground leak inspection and repair. In addition, as pilots are concluded, more accurate forecast calculations may be possible and new technologies may become commercially available to further reduce emissions beyond what is currently forecasted.

In addition to the emission reductions forecasted to be reduced from SoCalGas' system, SoCalGas is proposing to use emerging technologies and data analytics to reduce post-meter (customer) emissions, further discussed in Chapter 14 (Aerial Monitoring) in the post-meter emissions section. These reductions are not currently reflected in SoCalGas' Annual Emissions Report but these activities support the state's climate goals and the spirit of Senate Bill 1371.

## Calculating Cost Effectiveness

SoCalGas implemented most cost-effective measures early on in the Emissions Strategy Program's (ESP) implementation to achieve the maximum emission reductions in the shortest period of time, relatively, future initiatives may be less cost effective and hence demonstrate lower emissions reductions.

Historical Standard Cost Effectiveness:

$$\frac{(RRR - \text{Cost Benefits})_{2018-2020}}{\text{Emissions Reductions}_{2018-2020}}$$

Pursuant to D.19-08-020, SoCalGas also calculates cost effectiveness with avoided Cap & Trade costs, and social cost of methane as follows:

Historical Cost Effectiveness with avoided Cap & Trade Costs:

$$\frac{(RRR - \text{Cost Benefits} - \text{Avoided Cap \& Trade Costs})_{2018-2020}}{\text{Emissions Reductions}_{2018-2020}}$$

Historical Cost Effectiveness with avoided Social Cost of Methane and Cap & Trade Costs:

$$\frac{(RRR - \text{Cost Benefits} - \text{Avoided Cap \& Trade Costs} - \text{Social Cost of Methane})_{2018-2020}}{\text{Emissions Reductions}_{2018-2020}}$$

Future Standard Cost Effectiveness:

$$\frac{(AARR - \text{Cost Benefits})_{2023-2030}}{\text{Emissions Reductions}_{2023-2030}}$$

Pursuant to D.19-08-020, SoCalGas also calculates cost effectiveness with avoided Cap & Trade costs, and social cost of methane as follows:

Future Cost Effectiveness with avoided Cap & Trade Costs:

$$\frac{(AARR - \text{Cost Benefits} - \text{Avoided Cap \& Trade Costs})_{2023-2030}}{\text{Emissions Reductions}_{2023-2030}}$$

Future Cost Effectiveness with avoided Social Cost of Methane and Cap & Trade Costs:

$$\frac{(AARR - \text{Cost Benefits} - \text{Avoided Cap \& Trade Costs} - \text{Social Cost of Methane})_{2023-2030}}{\text{Emissions Reductions}_{2023-2030}}$$

## Common Assumptions for Cost Estimates

Below are the common assumptions SoCalGas made when building cost estimates for the measures described in this Compliance Plan:

1. AARR = Average annual revenue requirement, calculated by dividing the cumulative revenue requirement for each measure by the useful life of the measure or asset
2. RRR = Realized revenue requirement. It should be noted that AARR and RRR will not match up by definition. Using an “average” does not account for the “realized” due to actual timing of when costs hit and the magnitude and mix of O&M and capital spending. As such, the corresponding AARR and RRR will result in variances
3. Full-Time Equivalents (FTEs) are internal company employees whose costs are known as “Labor.” The salary of these FTEs is assumed to be \$100,000 in direct annual costs, unless noted otherwise. Contractors are included in “Non-Labor” costs
4. Vehicle costs for employees are included in the loaders for employees and, therefore, are not shown as a specific line item, unless noted otherwise
5. Cost estimates were created in December 2021 dollars and loaded with December 2021 loading factors. Actual loaders vary month to month and may generate a variability in actual spending
6. When measures benefit both SoCalGas and San Diego Gas & Electric (SDG&E), unless otherwise noted, the costs are split 91% SoCalGas and 9% SDG&E. This percentage split is based on the ratio of emissions reported by each utility, as reported in the 2016 Emissions Inventory (reported in 2017)
7. Per written correspondence with Acting Project and Program Supervisor in the Risk Assessment and Safety Analytics (RASA) Sector of the Safety Policy Division at the CPUC on January 4, 2022 regarding cost effectiveness values for the 2022 Compliance Plan, SoCalGas has kept the cost benefit factors the same values as used in the 2020 Compliance Plan. This will allow for a like-for-like comparison of cost effectiveness values across Compliance Plans. An analysis was performed of the potential cost benefit changes showed that the potential change in cost benefit values would be negligible and would not cause a notable change in cost effectiveness values. The cost benefit values are as follows:
  - a. The social cost of methane used was \$21/MCF, as noted on page 16 of D.19-08-020 for the year 2020 at a 3% discount rate
  - b. The cost-benefit of the reduced cost of gas was evaluated at the forecasted average annual Weighted Average Cost of Gas (WACOG) published in the 2018 California Gas Report, converted to cost per MCF using a BTU conversion factor of 1.0343 MCF/MMBtu, resulting in a cost-benefit of \$2.42/MCF
  - c. Cap & Trade costs are \$20.82/MTCO<sub>2e</sub>, assuming December 2022 vintage prices, based on a 5-day average of trading days January 6 – 10, 2020. This futures data was acquired from the International Exchange. Converting from MTCO<sub>2e</sub> to MCF results in a cost-benefit of \$13.61/MCF
8. Loaded chapter costs include a 10% contingency, as noted in the SoCalGas Advice Letter and each chapter cost summary section

### SoCalGas Table of Concordance

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### SoCalGas Acronym Library

Acronym	Definition
49 CFR 192	PHMSA Regulation - Transportation Of Natural And Other Gas By Pipeline: Minimum Federal Safety Standards
811	National call-before-you-dig phone number
AARR	Average annual revenue requirement
ACOR	Atmospheric Corrosion
AG	Above Ground
AL	Advice Letter
AMD	Advanced Meter Detection
AMI	Advanced Meter Initiative
AMM	Aerial Methane Mapping/ Aerial Monitoring
AOC	Abnormal Operating Conditions
API	American Petroleum Institute
BP	Best Practice
BTU	British thermal unit
CalGEM	California Geological Energy Management Division
CARB	California Air Resources Board
CCSLB	California Contractor State License Board
CF	Cubic feet
CFH	Cubic feet per hour
CIS	Customer Information System
CPDR	Company Property Damage Report
CPUC	California Public Utilities Commission
CT	Construction Technician
DIMP	Distribution Integrity Management Program
DP	Differential Pressure
DPIR	Detecto Pak-Infrared
EDAPO	Engineering Data Analytics and Performance Optimization
EF	Emission Factor
EPA	Environmental Protection Agency
FTE	Full Time Equivalent; Employee
G.O. 112F	State General Order Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems
GIS	Geographic Information System
GML	Gas Mapping LiDAR™
GRC	General Rate Case

<b>Acronym</b>	<b>Definition</b>
GS	Gas Standard
HB	High Bleed
HESD	Historizing Emission Sensor Data
LDAR	Leak Detection and Repair
LiDAR	Light Detection and Ranging
LNG	Liquified Natural Gas
M&I	Maintenance and Inspection
M&R	Measurement and Regulation
MCF	Thousand cubic feet
MDMS	Meter Data Management system
MMBtu	Million British thermal units
MSCF/MCF	Thousand standard cubic feet
MSP	Material Specification Properties
MTCO <sub>2e</sub>	Metric tons of Carbon Dioxide equivalent
MTU	Meter transmission unit
NGLAP	Natural Gas Leak Abatement Program
NSOTA	Non-State-of-the-Art
O&M	Operations & Maintenance
PAPA	Pipeline Associations for Public Awareness
PHMSA	Pipeline and Hazardous Materials Safety Administration
PMC	Planned Meter Change
psig	Pounds per square inch
QA	Quality Assurance
QC	Quality Control
R/V	Read/Verify
RD&D	Research, Development, & Demonstration
RMLD	Remote Methane Leak Detector
RRR	Realized Revenue Requirement
SAP	System Analysis Program
SCF	Standard Cubic Feet
SED	Safety and Enforcement Division
SIMP	Storage Integrity Management Program
SOTA	State-of-the-Art
WACOG	Weighted Average Cost of Gas
ZEVAC	Zero Emission Vacuum and Compressor

<b>Acronym</b>	<b>Definition</b>
GS	Gas Standard
HB	High Bleed
HESD	Historizing Emission Sensor Data
LDAR	Leak Detection and Repair
LiDAR	Light Detection and Ranging
LNG	Liquified Natural Gas
M&I	Maintenance and Inspection
M&R	Measurement and Regulation
MCF	Thousand cubic feet
MDMS	Meter Data Management system
MMBtu	Million British thermal units
MSCF/MCF	Thousand standard cubic feet
MSP	Material Specification Properties
MTCO <sub>2e</sub>	Metric tons of Carbon Dioxide equivalent
MTU	Meter transmission unit
NGLAP	Natural Gas Leak Abatement Program
NSOTA	Non-State-of-the-Art
O&M	Operations & Maintenance
PAPA	Pipeline Associations for Public Awareness
PHMSA	Pipeline and Hazardous Materials Safety Administration
PMC	Planned Meter Change
psig	Pounds per square inch
QA	Quality assurance
QC	Quality Control
R/V	Read/Verify
RD&D	Research, Development, & Demonstration
RMLD	Remote Methane Leak Detector
RRR	Realized Revenue Requirement
SAP	System Analysis Program
SCF	Standard cubic feet
SED	Safety and Enforcement Division
SIMP	Storage Integrity Management Program
SOTA	State-of-the-Art
WACOG	Weighted Average Cost of Gas
ZEVAC	Zero Emission Vacuum and Compressor

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 15: Distribution Leak Surveys</b>
Utilities should conduct leak surveys of the gas distribution system every three (3) years, not to exceed 39 months, in areas where General Order (G.O.) 112-F, or its successors, requires surveying every five (5) years. In lieu of a system-wide three-year leak survey cycle, utilities may propose and justify in their Compliance Plan filings, subject to Commission approval, a risk-assessment based, more cost-effective methodology for conducting gas distribution pipeline leak surveys at a less frequent interval. However, utilities shall always meet the minimum requirements of G.O. 112-F, and its successors.
<b>Best Practice 16: Special Leak Surveys</b>
Utilities shall conduct special leak surveys, possibly at a more frequent interval than required by G.O. 112-F (or its successors) or BP 15, for specific areas of their transmission and distribution pipeline systems with known risks for natural gas leakage. Special leak surveys may focus on specific pipeline materials known to be susceptible to leaks or other known pipeline integrity risks, such as geological conditions. Special leak surveys shall be coordinated with transmission and distribution integrity management programs (TIMP/DIMP) and other utility safety programs. Utilities shall file in their Compliance Plan proposed special leak surveys for known risks and proposed methodologies for identifying additional special leak surveys based on risk assessments (including predictive and/or historical trends analysis). As surveys are conducted over time, utilities shall report as part of their Compliance Plans, details about leakage trends. Predictive analysis may be defined differently for differing companies based on company size and trends.
<b>Best Practice 20a: Quantification</b>
Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.
<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.

Over the years, SoCalGas accumulated an inventory of non-hazardous leaks. Prior to the SB 1371 Natural Gas Leak Abatement Rulemaking (R.)15-01-008, SoCalGas made efforts to reduce its inventory. In 2017, SoCalGas created a project team that focused on leak inventory reduction efforts and hired leakage-focused crews to gain efficiency through leak repair repetition. The project team tracked the costs of leak repairs, field crew productivity, and communicated the leak inventory efforts to municipalities for awareness. The reduction effort was further carried out by prioritizing and performing replacements on main segments identified to have both historical leakage as well as multiple leaks repaired. Additionally, this effort also focused on repairing leaks based on detection year and targeted the oldest leaks first.

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

Leak repair timeframes are required to meet safety standards prescribed in 49 CFR Part 192.

In October 2018, Resolution G-3538 approved SoCalGas' 2018 Amended Compliance Plan to expand the project management team and hire incremental leakage crews to expedite leak repair and reduce the Code 3 steel leak inventory to less than three years by June 15, 2020.

To support these efforts, in 2018, SoCalGas staffed 36 field leakage personnel, two (2) Field Supervisors, six (6) Leakage Clerks, and four (4) Planning Associates. This staff is in addition to the previously hired Project Management Team, which included four (4) management employees and 36 field leakage personnel, for a total of 88 employees dedicated to reducing the non-hazardous leak inventory. SoCalGas purchased vehicles and tools for the incremental employees, and the incremental staff completed required training.

In 2020, SoCalGas worked diligently to reduce its extensive non-hazardous inventory to 36 months. By June 15, 2020, SoCalGas achieved this goal and continued working to further reduce its inventory. By December 31, 2020, SoCalGas reduced its inventory to a milestone of 32 months.

In 2021, SoCalGas focused on a new goal of reducing its inventory to 24 months that required mitigating 1,979 leaks by December 31, 2021. These efforts involved 88 dedicated employees working extensively to obtain permits, conduct planning and schedules. These efforts are continuing in 2022; SoCalGas is on track to reduce its inventory to 15 months by the end of December 2022. At the end of 2022, all coded below ground leaks will have the same repair schedule of 15 months that includes Code 2 and 3 plastic and Code 3 steel leaks.

There are some situations where leaks in the Code 3 inventory are exceptionally costly or complex to repair due to permitting, size, and scope of main alterations/replacements for certain leaks, right-of-way issues, and/or city moratoriums. Pursuant to Decision (D.)17-06-015 and Best Practice (BP) 21, SoCalGas requests reasonable exceptions for these certain repairs that might not meet the inventory reduction goal due to the circumstances described in this paragraph.

**Emission Reductions Achieved:**

The published 2015 baseline for Distribution Pipeline Graded Leak emissions was 428,854 MCF in the 2020 Compliance Plan. However, to estimate emissions from buried mains and services more accurately, in May 2022 SoCalGas was approved to begin using an updated emission factor of 0.1084 MCF/day from the previous emission factor in the 2020 Compliance Plan of 0.109 MCF/day. SoCalGas applied the adjusted 2015 baseline leak inventories of 576,261 MCF for emission reductions calculations. The emissions calculated in this chapter include known and unknown leaks compared to the 2020 baseline of 428,854 MCF which did not.

The emission reductions forecasted to be achieved in the 2020 Amended Compliance Plan was 164,292 MCF by the end of 2022. As part of the 2020 Compliance Plan, SoCalGas shifted Unprotected Steel pipelines from a three (3) year survey cycle to an annual cycle. Additionally, Pre-1986 Aldyl-A pipe was accelerated from five (5) year and three (3) year leak survey to an annual survey cycle, funded through the Distribution Integrity Management Program (DIMP).

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**Chapter 1: Leak Inventory Reduction**

This caused more known graded leaks to be found, resulting in a 177,912 MCF reduction of emissions. Due to the timing of the 2018 Decision, the increased staff, training, and planning capabilities were not ramped up until 2020 and SoCalGas was not able to begin reducing the leak inventory until 2020. SoCalGas reached a 36-month inventory by June 15, 2020. Later that same year, SoCalGas was able to reduce the leak inventory from 36 months to 32 months.

The baseline to be used in the 2022 Compliance Plan filing is 576,261 MCF. This baseline considers known and unknown leak emissions. The decision was made as a result of increasing survey cycles, along with a leaker-based emission factors, enabling SoCalGas to identify emissions from a majority of unknown leaks. This makes the 2020 and 2021 reported emissions slightly higher. Emission reductions were calculated using the 2015 baseline and subtracting it from the 2020 Distribution Main and Services System Category in Appendix four (4) of the Annual Emissions report. Historical emissions reductions below include total emission reductions, including initiatives outside of the Leak Abatement Program

**Historical Emission Reductions (MCF)**

2018	2019	2020*
N/A	N/A	245,572

\*Includes emissions from Leaker-Based study

**Cost Effectiveness Evaluation on Historic Work:**

The achieved cost effectiveness below is higher than forecasted in the 2020 Compliance Plan due to (1) high upfront costs for this program, and (2) minimal time spent reducing leaks in 2018 – 2020 resulting from a long project ramp-up period. Many costs for leak inventory are front loaded, such as vehicles for the crews, new tools, hiring costs, and training of the new field personnel. The cost effectiveness for this effort is expected to lower significantly over time as the initial upfront investment is spread out over multiple years and forecasted emission reductions are expected to increase significantly from 2021 - 2030. Additionally, the total emissions reductions achieved from leak inventory reduction efforts are larger than the figure used in the below cost effectiveness calculation due to separate leak inventory reduction efforts from programs such as DIMP.

**Historical Standard Cost Effectiveness (\$/MCF)**

Projected in 2020 Compliance Plan	Actual Cost Effectiveness
\$78	\$124

**Part 2. Proposed New or Continuing Measure**

If a 15-month inventory is achieved in 2022, starting in 2023 SoCalGas will accelerate all coded Non-Hazardous leaks for repair. This means that all Code 2 and 3 plastic and Code 3 steel will have the same mitigation repair timeframes of 15 months. SoCalGas proposes further reducing its Code 3 steel leak inventory along with its Code 2 and 3 plastic to 12 months by the end of 2023 and to six (6) months by the end of 2024.

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**Chapter 1: Leak Inventory Reduction**

In the previous Compliance Plans, SoCalGas focused only on Code 3 steel leaks but, moving forward, mitigation schedules will include Code 2 and 3 plastic along with Code 3 steel leaks.

Achieving a leak inventory of less than 6 months would be challenging due to permitting, paving moratoriums in various municipalities, size and scope of repairs or replacements, and other external factors. If a 6-month inventory is achieved and sustainable before the end of this compliance period, SoCalGas will propose to continue to expand the leak inventory reduction measure to achieve an even more aggressive leak repair goal for Code 3 steel leaks, Code 3 plastic, and Code 2 leaks to an average of a 3 month inventory in the 2024 Compliance Plan.

In addition to leak inventory reduction, SoCalGas proposes to continue funding incremental leak repairs on all leaks (for all Codes) detected due to increased leak survey and Aerial Methane Mapping, as discussed in the Aerial Methane Mapping and Increased Leak Survey chapters.

In addition to the previously hired employees, SoCalGas proposes expanding the Project Management Team by two (2) incremental management employees, one (1) operations field supervisor and 18 incremental distribution FTEs, which will expand the distribution work force to provide more oversight, strategy, and execution to achieve the goals for this Compliance Plan. Additional tools and vehicles will need to be purchased to accommodate the expanded work force. No operational changes are necessary for this compliance period beyond continuing the inventory reduction work to meet the more aggressive proposed goals.

As SoCalGas continues to reduce its leak inventory year over year, it will face the challenge of improving job scheduling and permitting administration processes. To solve this challenge, SoCalGas is proposing a department responsible for the effort to create transparent communication and project administration. SoCalGas request funds to build a City Notification Department (CND). This newly created department will be an initiative in 2022 that will be expanded in 2023 and 2024. As the leak repair mitigation schedules for coded leaks reduce, SoCalGas faces the challenge of having to obtain permits quickly while informing municipalities of scope changes, traffic control plans, repair schedules, and project close out. The primary focus of this department will be to communicate with municipal agencies regarding distribution work and scope changes for planned jobs while looking to seek ways to create programmatic permits for leaks needing accelerated repair to reduce emissions. The department will consist of one (1) Manager, one (1) Office Specialist, one (1) Construction Manager, one (1) Construction Lead, and five (5) field employees. The City Notification Department, when fully staffed, will be able to coordinate 16,000 projects a year.

SoCalGas' Gas Standard 223.0125 *Below Ground Leakage Coding and Mitigation Schedule* was previously updated to reflect the 3 year leak repair requirements. The standard was further revised to meet a 24-month repair frame for all Code 3 steel leaks in 2021. Moving forward, SoCalGas will not be revising the leak inventory standard for the remaining 15-, 12-, and 6-month repair timeframe goals as extenuating circumstances to mitigate leaks may push SoCalGas to be out of compliance with state safety regulations as the reduction goals become more aggressive. Moving forward, leak inventory reductions goals will be referenced in published Compliance Plans and noted in company standards for reference as a driving force to continue to reduce methane emissions.

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

Project Milestones:

- Achieved 24-month leak inventory: December 2021
- Updated Gas Standard with 24-month repair timeframe requirement: January 2022
- Hire incremental project management employees: Estimated by December 2022
- Hire and train incremental field personnel: Estimated by December 2022
- Achieve 15-month leak inventory: Estimated by December 2022
- Hire City Notification Department personnel: Estimated by June 2023
  - One (1) incremental Manager (CND)
  - One (1) incremental Specialist (CND)
  - One (1) incremental Construction Manager (CND)
  - Five (5) incremental field employees (CND)
- Achieve 12-month leak inventory: Estimated by December 2023
- Achieve 6-month leak inventory: Estimated by December 2024
- Achieve 3-month leak inventory: Estimated by December 2025

**Part 3. Abatement Estimates**

SoCalGas estimated that the emission reductions achieved by reducing the leak inventory repair timeframe to three (3) months will result in a total emission reduction of 288,498 MCF from the 2015 baseline of 576,261 MCF. The incremental reductions forecasted during the 2022 Compliance period by reducing the Code 3 steel leak inventory from 15 months to 12 months are estimated at 27,040 MCF and from 12 months to six (6) months are estimated at 81,124 MCF. In conjunction with the reduced leak inventory, the Large Leak Prioritization (LLP) process can be attributed to 18% of the total leak inventory for accelerated leak repair, resulting from the Decision Tree method as described in Chapter 4. The emissions from LLP will be included in the first two years in the table below. These emission reductions will be demonstrated in the Distribution Mains and Services System Category in Appendix four (4) of the Annual Emissions report.

The emission reduction estimate was forecasted by applying the emission factor of 0.1084 MCF/day to the SoCalGas 2021 Annual Emissions Report in Appendix 4 and using a shorter time to repair leaks.

Along with reducing emissions, SoCalGas also presented at the 2021 winter workshop regarding switching from a Population-Based emission factor to a Leaker-Based emission factor for known leaks which will result in emission reductions of 204,448 MCF per year. The emissions from known leaks utilizing a Leak-Based emission factor will be included in the emissions table below along with the cost effectiveness calculation of this this chapter. Chapter 2 of this compliance plan will go into additional details regarding changing the Population-Based emission factor using Company-Specific leaker-based emission factors.

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

**Forecast of Emission Reductions from Updated Baseline of 576,261 (MCF)\*\***

2023	2024	2025	2026	2027	2028	2029	2030
411,371*	455,485*	492,946	492,946	492,946	492,946	492,946	492,946

\*Emission reductions from Chapter 4 are included

\*\*Includes reductions from updated Leaker-Based Emission Factors

If a 3-month inventory is achieved and sustainable as mentioned above in Part 2, it will result in an estimated total emission reduction of 288,498 MCF from the 2015 baseline. Reducing the leak inventory further below a 6- or 3-month inventory is unlikely due to the constraints mentioned above. As a result, SoCalGas anticipates emission reductions from this activity will levelize after 2024.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Leak Inventory Main Leak Repairs	\$17,654,000	\$20,930,000	\$58,439,920
Existing Program Management Office	\$600,000	\$600,000	\$2,640,000
Existing Field Supervision (FOS)	\$400,000	\$500,000	\$1,980,000
Existing Work Order Control Lead	\$100,000	\$400,000	\$1,100,000
Existing Work Order Control clerks	\$400,000	\$100,000	\$1,100,000
Incremental FOS	\$100,000	-	\$220,000
Permit Team	\$681,818	\$681,818	\$3,000,000
<b>Total</b>	<b>\$19,935,818</b>	<b>\$23,211,818</b>	<b>\$68,479,920</b>

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Leak Inventory Service Replacements	\$5,550,588	\$6,938,235	\$17,998,316
Leak Inventory Main Replacements	\$4,509,120	\$5,636,400	\$15,840,079
Vehicles for Accelerated Leak Repair (Includes Tools)	\$2,929,500	-	\$3,544,695
<b>Total</b>	<b>\$12,989,208</b>	<b>\$12,574,635</b>	<b>\$37,383,090</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$133.8 million
<b>Average Annual Revenue Requirement</b>
\$36.7 million

Cost Assumptions:

- Each leakage crew can repair 12.5 leaks per month
- Current staff can mitigate up to 5,400 leaks per year
- Average O&M leak repair cost is \$3,500 per leak
- Average service replacement cost is \$10,000
- Average main replacement cost is \$80,000
- 76% of leaks can be repaired via leak repair methods
- 23% of leaks will require a service replacement
- 1% of leaks will require a main replacement
- 10% Contingency is included in the total loaded O&M and Capital cost
- Estimated costs for leak repairs are inclusive of incremental Code 1, 2, 3, and above ground leaks detected due to incremental survey as discussed in Chapter 14
- Estimated cost for leak repairs is inclusive of incremental large Code 1 and 2 leaks identified through Large Leak Prioritization as discussed in Chapter 4

**2022 SB 1371 Compliance Plan**  
**Chapter 1: Leak Inventory Reduction**

**Part 5. Cost Effectiveness/Benefits**

The historical cost effectiveness includes reduced emissions from switching from a population-based emission factor to leak-based emission factor as discussed in Part 3 of this chapter.

**Historical Achieved-Cost Effectiveness Calculations (2018-2020) (\$/MCF)**

<b>Standard Cost Effectiveness</b>	<b>With Cap and Trade Cost Benefits</b>	<b>Net Cost Effectiveness</b>
\$124	\$123	\$102

**Forecast of Cost Effectiveness Calculations (2023-2030) (\$/MCF)**

<b>Standard Cost Effectiveness</b>	<b>With Cap and Trade Cost Benefits</b>	<b>Net Cost Effectiveness</b>
\$74	\$73	\$52

**Part 6. Supplemental Information/Documentation**

Attachment 1A: Historical Project Schedule for Leak Inventory Reduction

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 15: Gas Distribution Leak Surveys</b>
Utilities should conduct leak surveys of the gas distribution system every 3 years, not to exceed 39 months, in areas where General Order (G.O.) 112-F, or its successors, requires surveying every five years. In lieu of a system-wide three-year leak survey cycle, utilities may propose and justify in their Compliance Plan filings, subject to Commission approval, a risk-assessment based, more cost-effective methodology for conducting gas distribution pipeline leak surveys at a less frequent interval. However, utilities shall always meet the minimum requirements of G.O. 112-F, and its successors.
<b>Best Practice 16: Special Leak Surveys</b>
Utilities shall conduct special leak surveys, possibly at a more frequent interval than required by G.O. 112-F (or its successors) or BP 15, for specific areas of their transmission and distribution pipeline systems with known risks for natural gas leakage. Special leak surveys may focus on specific pipeline materials known to be susceptible to leaks or other known pipeline integrity risks, such as geological conditions. Special leak surveys shall be coordinated with transmission and distribution integrity management programs (TIMP/DIMP) and other utility safety programs. Utilities shall file in their Compliance Plan proposed special leak surveys for known risks and proposed methodologies for identifying additional special leak surveys based on risk assessments (including predictive and/or historical trends analysis). As surveys are conducted over time, utilities shall report as part of their Compliance Plans, details about leakage trends. Predictive analysis may be defined differently for differing companies based on company size and trends.

Leak surveys on distribution lines have historically been performed for safety reasons according to the requirements under 49 CFR § 192.723. SoCalGas pipelines are typically leak surveyed at intervals of one (1), three (3), or five (5) years. The frequency of this survey is determined by the pipe material involved, i.e., plastic or steel, the operating pressure, whether the pipe is under cathodic protection, and the proximity of the pipe to various population densities. In 2018, SoCalGas increased the survey frequency for all Pre-1986 Aldyl-A pipe from 5-year to annual. This activity was funded by the Distribution Integrity Management Program (DIMP).

In the 2018 Compliance Plan, SoCalGas requested and was approved to accelerate unprotected steel pipe from three-year to annual leak survey cycles. To support these efforts, SoCalGas staffed the following dedicated employees:

- Thirteen (13) Construction Technicians
- Two (2) Field Operations Supervisors
- Two (2) Quality Assurance Employees

SoCalGas purchased vehicles and tools for the incremental employees, and all the incremental staff have completed required training. Increasing survey increased the number of leaks found. In 2018, SoCalGas staffed incremental leakage personnel to support incremental leak repair, as outlined in Chapter 1. Annual survey on unprotected steel began in January 2020.

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

Increasing leak survey for unprotected steel and Pre-1986 Aldyl-A resulted in fluctuations in monthly leak survey footage. To correct this issue, SoCalGas constructed a plan in 2019 to survey additional lines to reset the survey anniversary date and levelize the footage of survey performed each month to maintain a level workforce throughout the year. The effort to levelize the survey maps was completed in the first quarter of 2021 for all unprotected steel. The effort to levelize the Pre-1986 Aldyl-A pipe will continue through 2025.

In 2020, Gas Standard 223.0100 *Leakage Surveys* was updated to reflect the annual survey cycles for unprotected steel and Non-State-of-the-Art (NSOTA) plastic pipe.

Emission Reductions Achieved:

**Historical Emission Reductions (MCF)**

2018	2019	2020
39,903	59,466	59,466

The portion of emissions associated with Pre-1986 Aldyl-A in the 2015 baseline for Distribution Pipeline Leak Emissions was 84,909 MCF. Emission reductions achieved in 2018 after 1 year of annual survey performed on Pre-1986 Aldyl-A was 39,903 MCF, compared with the forecasted reduction of 16,749 MCF. The emission reductions for Pre-1986 Aldyl-A in 2019 was 59,466 MCF. The total emission reductions for Pre-1986 Aldyl-A and unprotected steel for 2020 was 120,879 MCF.

Cost Effectiveness Evaluation on Historic Work:

**Historical Standard Cost Effectiveness (\$/MCF)**

Projected in 2020 Compliance Plan	Actual Cost Effectiveness
\$26	\$33

Regarding the annual survey of Pre-1986 Aldyl-A, no costs were recorded to this program because this effort was funded through DIMP.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes to continue performing annual leak survey on unprotected steel and Pre-1986 Aldyl-A pipe in a continued effort to reduce methane emissions. For this Compliance Plan, SoCalGas is not reducing its leak survey beyond the one (1) and five (5)-year current cycles.

The activities proposed in this measure have been achieved with the existing project management team, leak surveyors, field supervisors, leakage clerks, and planning associates that were hired to meet the requirements of the 2018 Compliance Plan.

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

Due to the ongoing efforts to maintain leak surveys cycles and a consistent workforce, SoCalGas is requesting to hire two (2) incremental Training Field Instructors. Field instructors are required to implement formal and informal on-the-job training at base and jobsite locations for leak survey.

2021 was the first year that both unprotected steel and Pre-1986 Aldyl-A were on the new one (1) year leak survey cycles. Due to the frequency of leak survey and the number of leaks that SoCalGas detects and mitigates, the data management for leak surveys will need to be improved. Currently, records for leak survey are manually input, causing delays and discrepancies within SoCalGas Geospatial Information System (GIS). To improve this process, SoCalGas is requesting funds for a Field Data Quality Improvement (FDQI) Project for leak surveys. This will enable the process to be fully automated and will increase the precision of leak surveys for quicker identification of leaks from damages and for locating and marking, which help reduce methane emissions. The FDQI program will require the following incremental employees to be hired:

- One (1) Project Manager
- Two (2) Tech Advisors
- Fifteen (15) Energy Technician Distribution (ETD)
- Two (2) Pipeline Planning Assistant
- One (1) Planning Associate
- One (1) Tech Advisor
- One (1) Gas GIS Specialist

Although SoCalGas will not be further increasing its pipeline survey cycles, it would like to expand the efforts of replacing Population-Based emission factors with Company-Specific Leaker-Based emission factors by using PHMSA category criteria for above ground leaks. Utilizing leak survey measurements will enable more accurate estimates of emissions for customer meters using the following four (4) categories:

- AG-Haz Leaks
- AG-Non Haz Leaks
- Unknown Leaks
- Non-Detected Leaks

Each of these categories will have its own emission factor based on the system-wide random sampling conducted by the RD&D team. SoCalGas is still in its infancy stage of the program and wishes to further expand the program, which may require system enhancements, and training 1,200 field employees.

The associated cost for the Company-Specific Leaker-Based Emission Factor development and the Field Data Quality Improvement project will be broken down in the cost estimations in Part 4 of this chapter.

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

Project Milestones:

- Shifting unprotected steel from 3 year to 1 year: By December 2020
- Levelized unprotected steel: By January 2021
- Levelized Pre-1986 Aldyl-A: By December 2025
- Field Data Improvement Project: By December 2024
- Implementation of Company specific emission factors (EFs) testing: By December 2024
- Aboveground Leaker-Based Emission Factors implementation: By December 2023

**Part 3. Abatement Estimates**

SoCalGas estimates that the emission reductions achieved by continuing leak survey cycles on unprotected steel and Pre-1986 Aldyl-A to annual survey cycles will result in a total emission reduction of 241,794 MCF by the end of this Compliance Period. These emissions will be reduced from the Pipeline Leaks Emission Source Category within the Distribution Mains and Services System Category. SoCalGas anticipates emission reductions from this activity will levelized after 2024, as opportunities for leak detection will diminish and unknown leaks from unsurveyed pipe will drop to zero. Due to the shifting of unprotected steel and Pre-1986 Aldyl-A, all the unknown leaks were then shifted to the known leaks category and are now subject to the leak inventory reduction policies.

Emission reduction estimates are based on Appendix 4 of the 2021 Annual Emissions Report using an updated emission factor of 0.1084 MCF/day from the previous emission factor of 0.109 MCF/Day reported in the 2020 Compliance Plan. Following the updated emission factors, a more frequent survey cycle was then applied to the new calculation to estimate emissions for unsurveyed leaks or unknown leaks, which drop to zero for annual survey pipe. The emissions below are for unprotected steel and Pre-1986 Aldyl-A pipe shifting from 3-year and 5-year to annual.

SoCalGas estimates that by switching from a Population-based emission factor to Company Specific Leaker-Based emission factor will result in a total emission reduction of 146,881 MCF in this compliance period using the unknown leaks category of the annual emissions report. The Company Specific Leaker-Based presentation was presented at the 2021 Winter Workshop.

**Forecast of Emission Reductions from Baseline (MCF)\***

2023	2024	2025	2026	2027	2028	2029	2030
267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760

\*Includes emission reductions from survey and Company Specific Leaker-Based emissions

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

Calculation Methodology:

The calculations used to estimate the emission reductions were completed by applying the following methodology used to estimate emissions from the distribution system in the Annual Emissions Report:

- Derive the annual system leak rates by materials and facilities
- Project emission reductions in future years during and after implementation of this measure

This methodology is based on the following assumptions:

- Leaks develop on the system at a linear rate over the entire leakage survey cycle
- O&M leaks are assumed to not have an impact on the emission reductions estimation
- All leaks are assumed to have been leaking since the beginning of the year at the full emission factor leak rate
- Known system leaks are allocated to the various leak survey cycles based on the annual system leak rate
- The number of unknown leaks is assumed to be zero because there are no unsurveyed areas for unprotected steel during a given year
- Taking the difference between 2017 and 2018 unknown emission leaks is used to determine the reductions for shifting Pre-1986 Aldyl-A the first year
- Taking the difference between 2019 and 2020 unknown emission leaks is used to determine the reductions for shifting unprotected steel its first year

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

**Part 4. Cost Estimates**

Cost estimates below include only costs associated with annual survey cycles on unprotected steel.

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Leak Survey Field Employees	\$1,098,337	\$1,098,337	\$4,801,001
Leak Survey Supervisors	\$202,400	\$202,400	\$885,808
Map Levelization Effort	\$323,600	\$323,600	\$1,416,712
Field Instructors - Leak Survey	\$220,000	\$220,000	\$928,400
CSF Training for Aboveground Leak Emission Factors	\$60,000	-	\$132,000
Project Manager	\$90,909	\$90,909	\$400,000
Tech Advisors	\$190,909	\$190,909	\$840,000
ETDs	\$581,818	\$872,727	\$3,200,000
PPA (Sketcher)	\$58,182	\$116,364	\$384,000
PA (Point of Contact)	-	\$67,273	\$148,000
Gas GIS Specialist	\$70,455	\$70,455	\$310,000
GIS Vendor	\$227,273	\$227,273	\$1,000,000
Project Personnel	\$189,091	\$189,091	\$832,000
ETD Vehicle Rental	\$99,174	\$148,760	\$300,000
<b>Total</b>	<b>\$3,412,147</b>	<b>\$3,818,097</b>	<b>\$15,577,921</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
System Enhancement for Aboveground Leaks	\$30,000	-	\$51,150
<b>Total</b>	<b>\$30,000</b>	<b>-</b>	<b>\$51,150</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$16.4 million
<b>Average Annual Revenue Requirement</b>
\$8.1 million

**2022 SB 1371 Compliance Plan**  
**Chapter 2: Increased Leak Survey**

Cost Assumptions:

- 6,114 feet surveyed per day per full-time equivalent (FTE)
- Represented Employee Hourly Rate: \$40.92
- 13 Leak Survey Field FTEs
- 3 Survey Supervisors
- 2 Quality Assurance FTEs
- 15 Incremental ETDs (FDQI Project)
- 2 Incremental Project Managers (FDQI Project)
- 3 Incremental Tech Advisors (FDQI Project)
- 1 Incremental PPA (FDQI Project)
- 1 Incremental Lead Planner (FDQI Project)
- 1 Incremental GIS Specialist (FDQI Project)
- \$100K annual salary for Supervisors and QA employees
- 10% contingency is included in the total loaded costs

**Part 5. Cost Effectiveness/Benefits**

**Historical Achieved Cost Effectiveness Calculations (2018-2020) (\$/MCF)**

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
\$33	\$32	\$11

**Forecast of Cost Effectiveness Calculations (2023-2030) (\$/MCF)**

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
\$28	\$27	\$6

**Part 6. Supplemental Information/Documentation**

Attachment 2A: Historical Project Schedule for Increased Leak Survey

**2022 SB 1371 Compliance Plan**  
**Chapter 3: Blowdown Reduction Activities**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 23: Minimize Emissions from Operations, Maintenance and Other Activities</b>
Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e. low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.
<b>Best Practice 3: Pressure Reduction Policy</b>
Written company policy stating that pressure reduction to the lowest operationally feasible level in order to minimize methane emissions is required before non-emergency venting of high-pressure distribution (above 60 psig), transmission and underground storage infrastructure consistent with safe operations and considering alternative potential sources of supply to reliably serve customers.
<b>Best Practice 4: Project Scheduling Policy</b>
Written company policy stating that any high-pressure distribution (above 60 psig), transmission or underground storage infrastructure project that requires evacuating methane will build time into the project schedule to minimize methane emissions to the atmosphere consistent with safe operations and considering alternative potential sources of supply to reliably serve customers. Projected schedules of high-pressure distribution (above 60 psig), transmission or underground storage infrastructure work, requiring methane evacuation, shall also be submitted to facilitate audits, with line venting schedule updates TBD.
<b>Best Practice 5: Methane Evacuation Procedures</b>
Written company procedures implementing the BPs approved for use to evacuate methane for non-emergency venting of high-pressure distribution (above 60 psig), transmission or underground storage infrastructure and how to use them consistent with safe operations and considering alternative potential sources of supply to reliably serve customers.
<b>Best Practice 6: Methane Evacuation Work Orders Policy</b>
Written company policy that requires that for any high-pressure distribution (above 60 psig), transmission or underground storage infrastructure projects requiring evacuating methane, Work Planners shall clearly delineate, in procedural documents, such as work orders used in the field, the steps required to safely and efficiently reduce the pressure in the lines, prior to lines being vented, considering alternative potential sources of supply to reliably serve customers.
<b>Best Practice 7: Bundling Work Policy</b>
Written company policy requiring bundling of work, whenever practicable, to prevent multiple venting of the same piping consistent with safe operations and considering alternative potential sources of supply to reliably serve customers. Company policy shall define situations where work bundling is not practicable.

SoCalGas has documented use of cost-effective methods to reduce vented emissions during high-pressure construction projects, including performing pressure reduction using mobile compressors, transferring gas to lower pressure systems, and isolating smaller sections of pipe using stopples.

**2022 SB 1371 Compliance Plan**  
**Chapter 3: Blowdown Reduction Activities**

Operators of natural gas pipeline systems routinely reduce line pressure and discharge gas from pipeline sections to provide safe working conditions during maintenance and repair activities. Typically, operators block the smallest possible linear section of the pipeline and depressurize it by venting gas. Using pump-down techniques to lower gas line pressure before performing maintenance and repair activities is an effective way to reduce emissions and yield significant economic savings. Pipeline pump-down techniques involve using in-line compressors either alone or in sequence with portable compressors. Using in-line compressors is generally justifiable because of their low capital cost and they have a quick return on investment. The cost-effectiveness of using a portable compressor to increase gas recovery depends greatly on site-specific factors and operating costs. Regardless of the pump-down technique selected, emission reductions are directly proportional to how much pipeline pressure is reduced before venting occurs. Pipeline pump-down techniques are most economical for larger volume, higher pressure gas lines and work most effectively for planned maintenance activities and cases in which sufficient manifolding exists to connect a portable compressor.

In the 2020 Compliance Plan, SoCalGas was approved to continue blowdown reduction efforts and also authorized to increase the resources to support blowdown gas capture activities. This included purchasing compressors and cross-compression equipment to reduce blowdown emissions, increasing field operations staff to support the incremental time required to reduce blowdown, and creating a record keeping and compliance process to document that the requirements of the Best Practices are being met. Seventeen incremental full-time equivalents (FTEs) were required at SoCalGas for this implementation.

In addition to staffing efforts, in October 2021 SoCalGas published a Gas Standard GS 223.0155 *Planning Pipeline Blowdowns and Reporting* to outline the methods of blowdown reduction and provide resources to Planners and Project Managers when planning pipeline blowdowns and the associated blowdown reductions.

**Emission Reductions Achieved:**

The 2015 baseline for blowdown emissions reported for Blowdowns in Transmission Pipelines, Transmission Measurement and Regulation (M&R) Stations, Distribution Main & Service Pipelines, and Distribution Measurement and Regulation (M&R) Stations totaled 204,987 MCF. Emissions from these categories in the calendar years 2018, 2019 and 2020 totaled 167,212 MCF, 134,793 MCF and 76,352 MCF respectively. This equates to an estimated reduction of 37,775 MCF for 2018, 70,194 MCF for 2019, and 128,635 MCF for 2020.

**Historical Emission Reductions (MCF)**

2018	2019	2020
37,775	70,194	128,635

The emission reductions achieved in 2021 are expected to be in line with, or greater than, the 2020 emissions but cannot be evaluated at this time and are pending submittal of the 2021 Annual Emissions Report. Similarly, SoCalGas anticipates achieving greater reductions in 2022.

**2022 SB 1371 Compliance Plan**  
**Chapter 3: Blowdown Reduction Activities**

Cost Effectiveness Evaluation on Historic Work:

**Historical Standard Cost Effectiveness (\$/MCF)**

<b>Projected in 2020 Compliance Plan</b>	<b>Actual Cost Effectiveness</b>
\$19	\$16

Pipeline Blowdown Reduction Activities have proven to be more cost effective than originally anticipated. This can be attributed to updated standards and practices in the company, faster than anticipated adoption of blowdown reduction activities across the company, and the effectiveness of the centralized department specializing in blowdown reduction execution.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes to continue high-pressure pipeline blowdown reduction efforts. SoCalGas will continue to bundle work on high-pressure lines when and where it is practical to do so. SoCalGas will also be exploring the expansion of blowdown reduction efforts into Distribution operations in 2022. If these efforts prove cost-effective, SoCalGas will expand its blowdown reduction efforts to large Medium Pressure Distribution projects. To support these efforts, 15 additional FTEs (Field Technicians, Construction Managers, and a Supervisor) will be needed.

Incremental work includes, but is not limited to, expanding the blowdown reduction program to include gas capture on more projects, increasing the use of cross compression, additional funding for labor due to the increased time required for blowdown reduction, and installing fittings on valves to expand cross compression capabilities. In addition, there is an increased need to improve data collection and recordkeeping for blowdown reduction to improve capabilities for planning blowdown reduction and monitor progress and cost-effectiveness.

**Part 3. Abatement Estimates**

SoCalGas estimates that the emission reductions achieved by increasing blowdown reduction activities will result in a total emission reduction of 188,232 MCF from the 2015 baseline of 204,987 MCF by the end of 2024. These emissions will be reduced from the Blowdown Emission Source Category within the Transmission Pipeline, Transmission M&R Stations, Distribution Mains & Services, and Distribution M&R Station Categories.

**Forecast of Emission Reductions from Baseline (MCF)**

<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
172,098	188,232	188,232	188,232	188,232	188,232	188,232	188,232

Blowdown emissions are a function of activity level. Reductions shown in the above table are ≈98% of the 2015 baseline and are being realized due to additional staffing and equipment purchases to support the central organization managing blowdown activities and a wider adoption of new blowdown reduction technologies throughout various operational groups within SoCalGas.

**2022 SB 1371 Compliance Plan**  
**Chapter 3: Blowdown Reduction Activities**

This is assuming the activity level remains constant and there are no unforeseen emergency blowdowns. SoCalGas will continue evaluating opportunities to expand on blowdown reduction capabilities, and emerging technologies may allow for further reductions in future compliance periods that cannot be forecasted at this time.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Blowdown Reduction Central Organization	\$1,003,000	\$1,003,000	\$3,605,360
Transmission Operations Incremental Staff	\$506,773	\$506,773	\$2,134,760
Blowdown Reduction Transmission Projects	\$972,405	\$1,021,025	\$2,905,425
Distribution Operations Incremental Staff	\$539,282	\$539,282	\$2,230,280
Blowdown Reduction Projects in Distribution	\$420,000	\$441,000	\$1,254,908
<b>Total</b>	<b>\$3,441,460</b>	<b>\$3,511,080</b>	<b>\$12,130,733</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Blowdown Reduction Central Organization - Equipment Purchases	\$10,000,000	\$10,000,000	\$24,200,000
Blowdown Reduction Transmission Projects	\$4,630,500	\$4,862,025	\$13,835,355
Blowdown Reduction Projects in Distribution	\$840,000	\$882,000	\$2,509,815
Improved Data Collection Tools & Software Upgrades (Distribution)	\$240,000	-	\$468,600
<b>Total</b>	<b>\$15,710,500</b>	<b>\$15,744,025</b>	<b>\$41,013,770</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$118.9 million
<b>Average Annual Revenue Requirement</b>
\$8.1 million

**2022 SB 1371 Compliance Plan**  
**Chapter 3: Blowdown Reduction Activities**

Cost Assumptions:

- Annual cost of \$100K per management FTE
- Average rate of \$41.47 per Field FTE
- Centralized organization (all management employees)
  - 17 FTEs for 2023 and 2024
- Transmission Operations
  - Two (2) Supervisors (Management)
  - Three (3) Field Employees
- Distribution Operations
  - Three (3) Supervisor (Management)
  - 12 Field Employees

**Part 5. Cost Effectiveness/Benefits**

**Historical Achieved Cost Effectiveness Calculations (2018-2020) (\$/MCF)**

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
\$16	\$15	-\$6

**Forecast of Cost Effectiveness Calculations (2023-2030) (\$/MCF)**

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
\$41	\$40	\$19

**Part 6. Supplemental Information/Documentation**

Attachment 3A: Historical Project Schedule Blowdown Reduction Activities

Attachment 3B: Historical Project Schedule Blowdown Reduction Planning tool

**2022 SB 1371 Compliance Plan**  
**Chapter 4: Large Leak Prioritization**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 15: Gas Distribution Leak Surveys</b>
Utilities should conduct leak surveys of the gas distribution system every 3 years, not to exceed 39 months, in areas where General Order (G.O.) 112-F, or its successors, requires surveying every five (5) years. In lieu of a system-wide three-year leak survey cycle, utilities may propose and justify in their Compliance Plan filings, subject to Commission approval, a risk-assessment based, more cost-effective methodology for conducting gas distribution pipeline leak surveys at a less frequent interval. However, utilities shall always meet the minimum requirements of G.O. 112-F, and its successors.
<b>Best Practice 16: Special Leak Surveys</b>
Utilities shall conduct special leak surveys, possibly at a more frequent interval than required by G.O. 112-F (or its successors) or BP 15, for specific areas of their transmission and distribution pipeline systems with known risks for natural gas leakage. Special leak surveys may focus on specific pipeline materials known to be susceptible to leaks or other known pipeline integrity risks, such as geological conditions. Special leak surveys shall be coordinated with transmission and distribution integrity management programs (TIMP/DIMP) and other utility safety programs. Utilities shall file in their Compliance Plan proposed special leak surveys for known risks and proposed methodologies for identifying additional special leak surveys based on risk assessments (including predictive and/or historical trends analysis). As surveys are conducted over time, utilities shall report as part of their Compliance Plans, details about leakage trends. Predictive analysis may be defined differently for differing companies based on company size and trends.
<b>Best Practice 20a: Quantification</b>
Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.
<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.

SoCalGas has historically repaired leaks based on safety risk and has coded leaks as grades 1, 2, or 3 based on proximity to buildings, population density, and concentration of the leak. In the past, leak repair prioritization was solely based on safety and there was no correlation with emission volumes.

In the 2018 Compliance Plan, SoCalGas was approved to develop a method to differentiate leak locations with potentially larger leak rates and to conduct leak quantification resulting in repairs prioritized by leak rate.

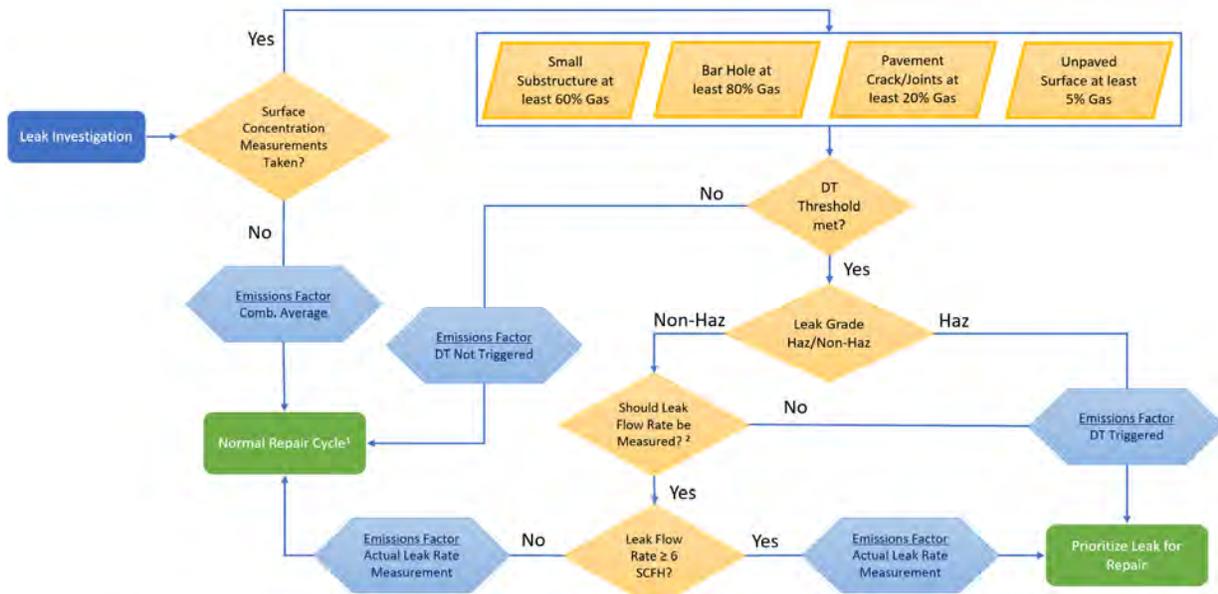
**2022 SB 1371 Compliance Plan**  
**Chapter 4: Large Leak Prioritization**

In 2019, SoCalGas developed a decision tree methodology to identify and prioritize Code 2 and Code 3 leaks using surface expression measurements and implemented this program in three (3) Gas Distribution Service Districts using surface expression measurements to prioritize potentially large leaks for accelerated repair. Expedited leak repair was performed by the leakage personnel hired to support incremental leak repair for emission reduction, as outlined in Chapter 1.

During the Decision Tree Pilot Study, data showed that approximately 15% of leaks that met the Decision Tree threshold required measurement. Of the leaks that required measurement, approximately 13% were identified as “large leaks,” or roughly 2% of all detected leaks. At the time of the pilot study, the threshold for a leak to be considered large is a flux rate greater than or equal to 10 CFH.

Based on the results of the 2021 Emission Factor Pilot Study Report, where emission flux rates were measured on 195 leaks, the average emission rate for large leaks is estimated at 8.29 CFH. Leaks that did not meet the decision tree threshold have an estimated emission rate of 2.10 CFH, and leaks where the decision tree process cannot be applied have an estimated emission rate of 4.52 CFH. SoCalGas will consider large leak cutoff points of 10 SCFH for all leaks that meet the decision tree and 6 CFH for all quantified leaks. All large leaks are prioritized for repair as soon as logistically possible within three (3) months of detection. The updated decision tree is shown below:

Early implementation of this program included training internal employees, purchasing vehicles and equipment, creating a record-keeping system, and performing data analysis.



<sup>1</sup>The normal repair cycle is based on leak grade (e.g., Haz leaks are repaired immediately, Non-Haz leaks are currently repaired within three years)  
<sup>2</sup>The need for flow rate data is dependent on local operations' ability to accelerate the leak repair without a flow rate measurement. Measurement of leak flow rate is also dependent on operational issues; such as outskirt areas not resourced to perform leak flow rate measurements; insufficient time prior to repair; and accessibility issues.

**2022 SB 1371 Compliance Plan**  
**Chapter 4: Large Leak Prioritization**

Emission Reductions Achieved:

Emission reductions achieved in 2021 by implementing this activity in the Gas Distribution Service Districts were 27,008 MCF. Unfortunately, due to the 2020 Compliance Plan being approved in late 2020 and the COVID-19 pandemic, the implementation of the Large Leak Prioritization (LLP) program was implemented late in 2021, resulting in emissions reductions lower than the estimated 54,646 MCF in the 2020 Compliance Plan. In 2022, SoCalGas estimates that the emission reductions are expected to be at 74,020 MCF from the results collected in 2021 when quantifying and accelerating leaks.

Cost Effectiveness Evaluation on Historic Work:

Actual cost effectiveness cannot yet be calculated for this measure because systemwide implementation began in 2021. Results are expected in the 2024 Compliance Plan.

**Historical Standard Cost Effectiveness (\$/MCF)**

<b>Projected in 2020 Compliance Plan</b>	<b>Actual Cost Effectiveness</b>
\$73	N/A

**Part 2. Proposed New or Continuing Measure**

In 2021, SoCalGas implemented the LLP program. Because of the COVID-19 pandemic, training was restricted to online only. This required creating and implementing training videos and modules to ensure that over 800 employees understood the surface concentration measurement process when measuring and reevaluating leaks on SoCalGas distribution medium pressure facilities. SoCalGas will look to reevaluate the LLP data after a complete year of implementation of the program at the end of 2022.

SoCalGas will not be requesting additional staff for the 2022 Compliance Plan as LLP has been adopted into the leak survey process and leak detection training. LLP will continue to be part of normal base business when detecting and measuring leaks. SoCalGas anticipates using LLP as a way to help determine emissions factors using the data collected for emissions reporting. As SoCalGas looks to reduce its leak inventory beyond 6 months, all non-hazardous below ground leaks will eventually be prioritized for repair.

SoCalGas will continue to make enhancements to its IT systems to flag large leaks for quantification and accelerated leak repair.

Project Milestones:

- System Enhancements to company software: October 2021
- Created interactive Training Module: September 2021
- Trained 800 employees: December 2021

**2022 SB 1371 Compliance Plan**  
**Chapter 4: Large Leak Prioritization**

**Part 3. Abatement Estimates**

In the 2020 Compliance Plan, SoCalGas estimated a total emission reduction of 54,646 MCF for the systemwide implementation of large leak prioritization to be achieved per year over the next three (3) years. Because of the late implementation as mentioned above, SoCalGas was not able to capture an entire year of emission reductions. Estimated emission reductions starting in 2023 can be shown in the table below which SoCalGas has elected to include in Chapter 1 of this Compliance Plan since accelerated repairs are still part of the total leak inventory and no cost are associated with this chapter.

SoCalGas anticipates emission reductions achieved by this activity to decline as leak repair time decreases for the overall leak inventory. Accelerated leak repair, increased leak survey, and aerial monitoring, as described in Chapters 1, 2 and 14, will reduce the opportunity for further emission reductions from accelerated leak repair. If the leak inventory for SoCalGas can reach a three (3) month inventory sustainably, as mentioned in Chapter 1, the emission reductions for LLP will be 0 as the accelerated leak time frame and inventory goal will be the same.

**Forecast of Emission Reductions from Baseline (MCF)**

<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
55,515	18,505	0	0	0	0	0	0

**Part 4. Cost Estimates**

SoCalGas is not requesting funding for this measure during this Compliance period.

**Part 5. Cost Effectiveness/Benefits**

Cost effectiveness cannot be calculated since SoCalGas is not requesting funding for this measure during this Compliance period.

**Part 6. Supplemental Information/Documentation**

Attachment 4A: Historical Project Schedule for Large Leak Prioritization

**2022 SB 1371 Compliance Plan**  
**Chapter 5: Damage Prevention Algorithm and Proactive Intervention**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 24: Dig-Ins and Public Education Program</b>
Expand existing public education program to alert the public and third-party excavation contractors to the Call Before You Dig – 811 program. In addition, utilities must provide procedures for excavation contractors to follow when excavating to prevent damaging or rupturing a gas line.
<b>Best Practice 25: Dig-Ins and Company Standby Monitors</b>
Utilities must provide company monitors to witness all excavations near gas transmission lines to ensure that contractors are following utility procedures to properly excavate and backfill around transmission lines.
<b>Best Practice 26: Dig-Ins and Repeat Offenders</b>
Utilities shall document procedures to address Repeat Offenders such as providing post-damage-safe excavation training and on-site spot visits. Utilities shall keep track and report multiple incidents, within a 5-year period, of dig-ins from the same party in their Annual Emissions Inventory Reports. These incidents and leaks shall be recorded as required in the recordkeeping best practice. In addition, the utility should report egregious offenders to appropriate enforcement agencies including the California Contractor’s State License Board. The Board has the authority to investigate and punish dishonest or negligent contractors. Punishment can include suspension of their contractor’s license.

In 2019, SoCalGas completed a pilot using four (4) Damage Prevention Analysts to engage, educate, and enforce the use of Dig Alert, which involves calling 811 prior to excavation. These communications were triggered by a risk analysis algorithm that flags excavations that may be at a higher risk for resulting in pipeline damages. The pilot resulted in over 2,100 field contacts with excavators, over 200 educational safe excavation training sessions, and 300 damage investigations, thus promoting improved excavation safety. In 2021, SoCalGas continued to develop the damage prevention risk analysis algorithm to utilize the information that would be used to trigger a proactive intervention. Proactive interventions include activities that SoCalGas can perform to address potential excavation sites that pose a high risk of damage, resulting in methane emissions. Furthermore, SoCalGas expanded the resources necessary to accommodate implementing the risk analysis algorithm process by hiring an additional six (6) Damage Prevention Analysts (DPA).

Using the prioritized results from the risk analysis algorithm, SoCalGas personnel can initiate communication with excavators to discuss the project and remind them of the importance of locating and protecting natural gas pipes within the project’s delineated area. The method of communication can be a phone call, text message, email, or job site visit prior to the date of excavation. Through these proactive interventions, company personnel can effectively address a larger number of excavation projects rather than being on standby. This proactive excavation intervention enables SoCalGas to minimize methane emissions from preventable damages.

**2022 SB 1371 Compliance Plan**  
**Chapter 5: Damage Prevention Algorithm and Proactive Intervention**

Emission Reductions Achieved:

The estimated emission reduction of 5,481 MCF is achieved through proactive intervention at six (6) operational districts by the six (6) incremental DPAs hired from the previous compliance period, in addition to the six (6) existing DPAs. Continuing to expand systemwide to the degree of intervention achieved since the pilot that was completed in 2019 and implementation thereafter would require 50 damage prevention analysts, one assigned to each SoCalGas district. Rather than implementing on such a large scale, SoCalGas assigned 12 DPAs, so that each analyst would cover 4-5 districts. SoCalGas reported damage emissions from Distribution Main & Services in 2020 at 73,665 MCF. Applying an estimated 31% reduction based on the 2020 results, prorated by the staffing level (12 DPAs), SoCalGas estimates an annual emission reduction of 5,481 MCF per year.

Emissions Reductions with 12 Damage Prevention Analysts (DPAs):

$$73,665 * 31\% * (12/50) = 5,481 \text{ MCF}$$

Cost Effectiveness Evaluation on Historic Work:

<b>Historical Standard Cost Effectiveness (\$/MCF)</b>	
<b>Projected in 2020 Compliance Plan</b>	<b>Actual Cost Effectiveness</b>
\$233	\$6

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes continuing developing the damage prevention risk analysis algorithm described above; this information is used to trigger targeted proactive interventions. Proactive interventions include activities that SoCalGas can perform to address potential excavation sites that pose a high risk of damage, resulting in methane emissions. These activities include on-site engagement and educating the excavators, stopping work that does not comply with excavation safety laws, and providing outreach to educate all excavators at their place of business.

The current risk algorithm assigns risk scores to incoming 811 tickets to provide SoCalGas with prompt visibility into high-risk dig sites and mark out locations. SoCalGas is proposing to continue enhancing the algorithm to reduce potentially preventable excavation damages further. These planned enhancements to the algorithm include further optimization, more data sets, expanding permit data, incorporating locator data, and utilizing natural language processing. These risk scores and attributes will allow SoCalGas to prioritize and conduct appropriate and timely interventions before damages occur. The analysis and algorithms will also provide SoCalGas automated visibility into repeat offenders who continue to cause excavation damages.

**2022 SB 1371 Compliance Plan**  
**Chapter 5: Damage Prevention Algorithm and Proactive Intervention**

SoCalGas proposes hiring a Damage Prevention Supervisor to support the six (6) incremental Damage Prevention Analysts, one (1) Data Scientist, and two (2) Technical Advisors who were approved in the 2020 Compliance Plan to perform the increased volume of proactive intervention efforts with prioritized Dig Alert tickets.

Project Milestones:

- Hire Supervisor: Q1 2023
- Collect data and perform proactive interventions: Ongoing

**Part 3. Abatement Estimates**

Emission reductions are estimated based on the results of a proactive intervention performed at six (6) SoCalGas districts from 2017 to 2020. During implementation, SoCalGas achieved an average annual reduction in damages per 1,000 tickets of approximately 31%. The results are summarized in the table below.

District	2017	2019	2020	% Reduction
Base 1	6.97	3.96	4.29	38%
Base 2	7.67	6.13	5.66	26%
Base 3	4.48	2.34	2.75	39%
Base 4	7.18	4.54	2.8	61%
Base 5	6.71	6.06	5.35	20%
Base 6	4.47	5.28	4.39	2%
<b>Average</b>			<b>31%</b>	

Continuing to expand systemwide to the degree of intervention achieved since the pilot that was completed in 2019 and implementation thereafter would require 50 damage prevention analysts, one assigned to each SoCalGas district. Rather than implementing on such a large scale, SoCalGas assigned 12 DPAs, so that each analyst would cover 4-5 districts. If emission reductions achieved in this compliance period align with forecasted reductions, SoCalGas may propose expanding further in future compliance periods. However, to minimize risk and cost to ratepayers, a slower ramp-up continues to be appropriate.

Based off estimated emission reductions from 2020, SoCalGas proposes an additional 2-3 DPAs for this compliance period, for a total of 15 DPAs, which equates to an estimate of an annual emission reduction of 6,851 MCF per year.

$$73,665 * 31\% * (15/50) = 6,851 \text{ MCF}$$

**Forecast of Emission Reductions from Baseline (MCF) with 15/50 DPAs**

2023	2024	2025	2030
6,851	6,851	6,851	6,851

*\*Estimated emission reductions are calculated assuming savings will be the same year over year.*

**2022 SB 1371 Compliance Plan**  
**Chapter 5: Damage Prevention Algorithm and Proactive Intervention**

However, forecasts may have many variables that could influence overall program effectiveness. As more data becomes available, SoCalGas will continue to refine these forecasts or propose expanding this implementation if reductions achieved support an appropriate cost-effectiveness. If more analysts are proposed in the future, savings will likely increase because the analysts will be able to perform more interventions. Actual savings may vary because emissions resulting from damages are calculated based on damage severity, the damaged asset dimensions, and line pressure. A decrease in damages will not necessarily achieve a proportional decrease in emissions due to this variability.

Assumptions:

- SoCalGas’ Annual Emissions Report in 2020 were reported at 73,665 MCF
- 31% \* 73,665 MCF\* 15/50 analysts = 6,851 MCF (Forecasted)
- Damages reduced will be proportional to interventions performed
- Emission reductions achieved will be proportional to damage reductions

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Ongoing Damage Prevention Analysts	\$600,000	\$600,000	\$2,640,000
Ongoing Data Scientist	\$150,000	\$150,000	\$660,000
Ongoing Technical Advisors	\$200,000	\$200,000	\$880,000
Incremental DPA Supervisor	\$120,000	\$120,000	\$528,000
<b>Total</b>	<b>\$1,070,000</b>	<b>\$1,070,000</b>	<b>\$4,708,000</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$4.9 million
<b>Average Annual Revenue Requirement</b>
\$2.5 million

Cost Assumptions:

- One (1) incremental Damage Prevention Supervisor at \$120,000 per year
- Six (6) Damage Prevention Analysts, one (1) Data Scientist, and two (2) Technical Advisors to maintain the algorithm and analyze data of approximately \$950,000 per year
- Cost associated with positions to cover vehicle utilization and equipment needs

**2022 SB 1371 Compliance Plan**  
**Chapter 5: Damage Prevention Algorithm and Proactive Intervention**

**Part 5. Cost Effectiveness/Benefits**

**Historical Achieved-Cost Effectiveness Calculations (2018-2020) (\$/MCF)**

<b>Standard Cost Effectiveness</b>	<b>With Cap and Trade Cost Benefits</b>	<b>Net Cost Effectiveness</b>
\$6	\$4	-\$17

**Forecast of Cost Effectiveness Calculations (2023-2030) (\$/MCF)**

<b>Standard Cost Effectiveness</b>	<b>With Cap and Trade Cost Benefits</b>	<b>Net Cost Effectiveness</b>
\$357	\$355	\$334

**Part 6. Supplemental Information/Documentation**

Attachment 5A: Historical Project Schedule for Damage Prevention Algorithm and Proactive Intervention

**2022 SB 1371 Compliance Plan**  
**Chapter 6: Advanced Meter Analytics Algorithm**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 17: Enhanced Methane Detection</b>
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Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.
--

Prior to the installation of the Advanced Meter network in the SoCalGas service territory, the SoCalGas' Customer Information System (CIS) would flag unusually high consumption so that an order for a field technician to investigate could be scheduled within 14 days to perform a leak investigation. Since the meter usage data was only read once a month, a field technician investigation could occur up to 45 days after unusually high consumption occurred.

In May 2016, SoCalGas began using hourly usage data available through the Advanced Meter technology to identify facilities with unusual consumption patterns. Once these unusual consumption patterns are identified, an analyst reviews a report daily and manually creates orders for field technicians to visit the site of continuous excessive consumption. Field technicians perform clock tests and leak investigations and/or close and secure the service valve to prevent further leakage of natural gas. These activities have reduced the time from when unusually high consumption occurs to when an investigation occurs from up to 45 days to 48 hours.

This advanced and more granular awareness of energy data utilization is uncovering new opportunities and benefits potential. Leveraging the Advanced Meter network could result in faster identification of abnormally high gas usage, which enables SoCalGas to identify, investigate, and respond to potential emission sources more quickly. By discovering abnormally high gas usage and notifying customers, SoCalGas can reduce methane emissions at customer facilities, which saves energy and reduces potential climate impact, while also reducing the financial burden on customers from higher usage.

New insights gained with the identification and evaluation of gas usage anomalies have resulted in many accomplishments. In 2019, the Consumption Analytics team implemented processes to categorize consumption anomalies that enabled the identification of gas leaks at customer facilities. In 2020, the Consumption Analytics team designed, built, tested, and implemented systems to evaluate 144 million AMI data points (approximately 5.9 million residential meters) daily, to identify gas usage anomalies. The results from these new processes included:

- 3,652 Customer facilities visited by field technicians for safety investigations
- 11,251 Customers contacted to investigate possible appliances unintentionally left on for extended periods of time

In 2020, SoCalGas implemented COVID-19 restrictions that reduced the number of safety investigations by extending the monitoring period to allow gas usage anomalies to self-correct.

**2022 SB 1371 Compliance Plan**  
**Chapter 6: Advanced Meter Analytics Algorithm**

In 2021, the Consumption Analytics team implemented new algorithms and refined the algorithms to identify gas consumption anomalies consistent with above-ground gas leaks. Additionally, continuous improvement of the accuracy of the algorithms will create enhancements that are expected to reduce manual intervention in the verification of gas usage anomalies that will ensure the timely scheduling and completion of safety investigations.

Additional data points were introduced to the algorithms to help differentiate customer preferences from possible safety issues. In order to implement these enhancements, an experienced Data Scientist was hired to accomplish these planned system enhancements. This project enabled hourly monitoring of consumption anomalies from the time the system receives data from each Meter Transmission Unit (MTU), further reducing the turnaround time since the monitoring application automatically requests a field visit to facilities with highly unusual gas consumption. This project reduced the investigation turnaround time to 18 hours or less and minimized manual labor associated with current unusual consumption tracking activities.

**Emission Reductions Achieved:**

In 2018, these efforts reduced methane emissions downstream of the meter by approximately 37 MCF by accelerating leak identification, notification, and repair. These emission reductions were not captured in the emission report because emissions are downstream of the meter.

**Cost Effectiveness Evaluation on Historic Work:**

This measure is a technology enhancement and process improvement that supports the goals of the overall program. Because emissions savings achieved are downstream of the meter and not reflected in the emissions report, cost effectiveness cannot be calculated.

**Part 2. New or Continuing Measure**

SoCalGas proposes enhancements to the algorithms to include weather and customer preferences to the evaluation of gas usage anomalies to continue to improve the quality of the facilities identified for safety investigations by a technician. In addition, SoCalGas proposes the implementation of processes to identify gas usage anomalies that are later identified as incorrect results. Ongoing training of the algorithms with gas usage anomalies that are missed will provide ongoing incremental accuracy of the algorithms.

Lastly, SoCalGas proposes to introduce additional algorithm design specifically to understand and identify fugitive methane at restaurants. Creating processes that identify unusual gas usage patterns at restaurants to categorize those usage patterns and link them to gas appliances and hour of operations is expected to bring new insights in SoCalGas' ability to reduce fugitive methane from various sources. Advanced Meter data provides a unique opportunity to catalog 'normal' consumption for those customers to more quickly identify unusual patterns that need investigation and resolution.

**2022 SB 1371 Compliance Plan**  
**Chapter 6: Advanced Meter Analytics Algorithm**

The expected enhancements will include the following:

- New technologies, tools, and techniques to improve the labeling of gas leaks
- New processes to enhance the accuracy of the algorithms by training them every six months
  - Training will enable the introduction of gas usage anomalies that are not gas leaks to ‘teach’ the algorithms to ignore some gas consumption patterns and the introduction of under-ground gas leaks that tend to hide for long periods of time. With proper identification of small under-ground gas leaks at customer facilities, SoCalGas can reduce methane emissions at customer facilities, which saves energy and reduces potential climate impact, while also reducing the financial burden on customers from higher usage
- New algorithm to identify houseline gas leaks
- New algorithm to catalog gas consumption measurements at the appliance level

**Project Milestones:**

- Design scope of work: Estimated five (5) months
- Build out application: Estimated nine (9) months
- Application testing: Estimated 15 months
- Application deployment: Estimated 17 months

**Part 3. Abatement Estimates**

This measure is expected to reduce emissions by an estimated 37 MCF per year based on results from the initial project. These savings are calculated based on accelerating leak findings and their subsequent repair or meter turn off. Although emission reductions are forecasted to remain level each year, savings will vary annually due to fluctuations in customer gas usage. These reductions will not be captured in the Annual Emissions Report because emissions are downstream of the meter.

**Forecast of Emission Reductions from Baseline (MCF)**

<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
37	37	37	37	37	37	37	37

**2022 SB 1371 Compliance Plan**  
**Chapter 6: Advanced Meter Analytics Algorithm**

The methodology is based on following assumptions:

For vacant facilities:

- (Total Daily Usage) \* [(Next Bill Date – Advanced Meter Detection (AMD) Read/Verify (R/V) Field Date) +14 days] = Total MCF Saved
- Total Daily Usage: Meter Data Management System (MDMS) daily consumption usage that brought the facility into AM Analytics processes
- Next Bill Date: The date when Customer Information System (CIS) processes would first have awareness of excessive consumption at a vacant facility
- AMD R/V Field Date: The date the meter was hard closed or excessive consumption was identified (hot water leak) or resolved
- 14 Days: The minimum number of days when the previous process would have generated an order for increased consumption at a vacant facility

For occupied facilities:

- (Min Hourly Consumption\*24hrs) \* [(Next Bill Date - AMD R/V Field Date) +2 days] = Total MCF Saved
- Min Hourly Consumption: Lowest MDMS consumption usage for the date when excessive consumption brought the facility into AM Analytics processes
- Next Bill Date: The date when CIS would first have awareness to excessive consumption at an occupied facility.
- AMD R/V Field Date: The date the meter was hard closed or excessive consumption was identified (hot water leak) or resolved
- Days: The number of days when current CIS processes would have generated an order for increased consumption at an occupied facility

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Data Scientist - Contractor	\$250,000	\$250,000	\$605,000
<b>Total</b>	<b>\$250,000</b>	<b>\$250,000</b>	<b>\$605,000</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$0.6 million
<b>Average Annual Revenue Requirement</b>
\$0.3 million

**2022 SB 1371 Compliance Plan**  
**Chapter 6: Advanced Meter Analytics Algorithm**

Cost Assumptions:

- One (1) Data Scientist (non-labor) to provide on-call support (break/fix), maintain and enhance the Deep Learning Models running 24/7. Annual cost of \$250K for Data Scientist non-labor support

**Part 5. Cost Effectiveness/Benefits**

This measure is a technology enhancement and process improvement that supports the goals of the overall program. Because emissions savings achieved are downstream of the meter and not reflected in the emissions report, cost effectiveness cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 6A: Historical Project Schedule for Advanced Meter Analytics

**2022 SB 1371 Compliance Plan**  
**Chapter 7: Recordkeeping IT Project**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 9: Recordkeeping**

Written Company Policy directing the gas business unit to maintain records of all SB 1371 Annual Emissions Inventory Report methane emissions and leaks, including the calculations, data and assumptions used to derive the volume of methane released. Records are to be maintained in accordance with G.O. 112-F and succeeding revisions, and 49 CFR 192. Currently, the record retention time in G.O. 112-F is at least 75 years for the transmission system. 49 CFR 192.1011 requires a record retention time of at least 10 years for the distribution system.

*Measure 1: Data Lake*

In the past, developing the Annual Emissions Report required by the Leak Abatement Proceeding involved querying various records, which were stored in varying formats, locations, databases, and with various record owners. This made report generation a time-consuming manual process. An additional challenge involved the electronic systems not being designed for generating reports for emissions, but rather for billing, maintenance, or operational recordkeeping. As a result, the records included varying types of nomenclature relevant to specific departments. Therefore, SoCalGas developed a Data Lake with automated interfaces from various source systems to fully support capturing of the data elements required for emission reporting. The Data Lake through multiple phases automated the data retrieving process from existing systems as well as modifying the automated process and interface when source systems technical upgrades occurred in the company. The Data Lake enabled modifying the emission reporting templates as they evolve annually to include additional data since the CPUC and the utilities are continuously improving emissions estimation methodologies. The scope of the Data Lake will continue expanding to both capture the dynamic improvement of the company's technical system upgrades and incorporate new emissions estimation methodologies. Given the granularity of the emission reports, it was challenging to automate the characteristics of source system data previously performed by subject matter experts when emission reports were fully manually developed and calculated. Nevertheless, the automated capture of source system data greatly reduced the effort needed by the critical experienced staff in each business unit and made the data capture and reporting process accurate and more reliable.

Milestones Completed:

- Developed the Data Lake with automated interfaces from most source systems to support the capture of the data elements required for emission reporting
- Replaced existing automated interfaces when source systems were replaced
- Modified the automated interfaces when source system technical upgrades occurred
- Enhanced the automated interfaces when new data elements became available from extended use of existing source systems
- Modified and enhanced the reporting for annual changes to emissions report emission estimation methodologies and emission report templates

**2022 SB 1371 Compliance Plan**  
**Chapter 7: Recordkeeping IT Project**

*Measure 2: Engineering Data Analytics and Performance Optimization (EDAPO)*

SoCalGas developed an initial phase of the Engineering Data Analytics and Performance Optimization (EDAPO) system to provide capabilities to support advanced analytics for Gas Operations, System Integrity, Distribution, Transmission, and Storage. The initial phase completed a proof-of-concept to forecast distribution system pressure excursions using data from 20 electronic pressure monitors. The system is capable of capturing hourly pressure data for the entire distribution system. The project implemented a pilot project to capture hourly pressure data from 2,000 electronic pressure monitors representing the entire distribution system. The pilot project used machine learning to forecast 44% of the 25 distribution system pressure excursions that occurred over a four-year period. Although determining the balance between false positives and missed positives was challenging, each pressure excursion avoided due to operational changes in response to a positive forecast reduced the risk of emissions and saves the substantial cost of a leak repair.

Milestones Completed:

- Completed a proof-of-concept to forecast distribution system pressure excursions using data from 20 electronic pressure monitors
- Completed a pilot project using machine learning to forecast distribution system pressure excursions using hourly pressure data from 2,000 electronic pressure monitors

*Measure 3: Asset Field Verification*

Prior to the 2018 Compliance Plan, SoCalGas Maintenance and Inspection Work Management systems were designed for billing, maintenance, or operational record-keeping purposes only. Moreover, because there was no consistent naming convention in place, records used varying types of nomenclature relevant to specific departments. Querying records from numerous departments in the company and combining them to generate a single report was challenging and not readily available.

As a result of SB 1371 Compliance Plans, SoCalGas performed Asset Verification projects at its Transmission and Storage Facilities; the projects enhanced existing systems to include additional data elements required for the methane emission calculations into all Maintenance and Inspection work management systems. This enabled the field personnel to record the required information into systems that previously have not been capable of recording specific information, such as detailed components (e.g., manufacturer, date of install, and photos). Having such data readily available enhanced the emissions estimations for the mandated Annual Emissions Reports associated with these assets, it has also allowed departments to refer to assets by a unified naming method as well as improve the data governance to review and update Gas Standards if needed.

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Milestones Proposed:

- Field verification of Transmission assets anticipated to be completed by Q3 of 2022
- Field verification of Storage assets anticipated to be completed by Q3 of 2022
- Performed field verification and enhancement of Management systems assets and update engineering/mapping information to support improved data management and reporting accuracy expected to be anticipated to be completed by Q4 of 2022

*Measure 4: Real-time Data Management for Methane Abatement/Monitoring Support for Other Gas Operational Units*

Real-time data management and monitoring are essential features to analyze methane emissions and implement efforts to reduce methane emissions effectively across all operational areas. SoCalGas purchased a software license to modernize real-time data management to improve existing and new methane emission reduction projects. The tool's operational and maintenance cost will be distributed to the end of 2025 to comply with regulatory accounting requirements. The tool enabled SoCalGas to improve maintenance/performance practices of its assets in Transmission, Distribution, and Storage facilities. Moreover, the collected data is being used to develop analytical capabilities to provide the ability to integrate with enterprise initiatives across the company.

Milestones Completed:

- Obtained Enterprise license
- Enabled additional analytics capabilities and provide the ability to integrate with other enterprise initiatives
- Integrated existing infrastructure into SB 1371 solutions to enhance the company's compliance with methane emission requirements

*Measure 5: Develop Mobile Field Forms*

Prior to the 2022 Compliance Plan, the Work Management Systems did not include digitized forms, mobile capabilities, or data governance. Enhancement efforts to address these deficiencies commenced in 2021 with software module updates to the work management system. The second part of such enhancement is to digitize forms and add mobile and spatial capabilities. Such improvement will facilitate data recovery for maintaining assets, improve safety, and eliminate inconsistencies that the paper form might cause. The digitized forms will also be used for reporting purposes, e.g., SB 1371. The project is anticipated to be completed in Q4 of 2022.

Milestones Proposed:

- Digitized paper forms and processes are anticipated to be completed by Q3 of 2022
- Modernized and enhanced mobile solutions to have offline capabilities
- Enabled spatial capabilities to the mobile solution by Q4 of 2022

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Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

*Measure 1: Data Lake*

The measure's objective is to continue enhancing the existing Data Lake to capture updates to reporting requirements, such as template changes and emission estimation methodologies. The Data Lake will also continue implementing additional automated integration from new operational systems and changes to existing operational systems. The measure will develop an internal emissions dashboard to support the project management team based on actual emissions (Annual Emissions Reports) and asset data. The Data Lake will enable the modeling of alternatives so that the impact of policy changes (e.g., increased leak surveys) can be assessed and readily reviewed.

Project Milestones:

- Integration of asset data
- Capturing regulatory reporting requirements updates and changes
- Continuous operating systems updates and changes
- Develop internal emissions dashboard

*Measure 2: Historizing Emission Sensor Data (HESD)*

Under other company initiatives, emissions sensors are being purchased and deployed in various locations throughout the SoCalGas' service territory. Additional emission sensors will continue to be deployed at more locations as data communications channels are enabled, tested, and brought online. The measure's goal is to capture, store, organize, design, and implement information technology infrastructure to enable analytics and data-driven approaches to reduce emissions via the sensors' data. This infrastructure should be robust enough to be able to consume and organize thousands of continuous data streams from individual sensors. The technology infrastructure for thousands of continuous data streams will require the implementation of widely distributed and hierarchically organized recording and data management systems.

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This technology will be architected from the ground up for high availability to continuously store and backup sensor data that will become the foundation for emission analysis, reporting for real-time operations, and periodic reporting. For example, capturing aerial monitoring data presents many technology challenges due to the size of the collected data. Therefore, HESD will help provide the foundation for storing capabilities and data analytics that can increase the effectiveness of future analytical tools for the interpretation of emission data that will result in more effective emission reduction efforts.

Project Milestones:

- Capturing and storing sensor data
- Designing and implementing the information technology infrastructure

*Measure 3: Emission Reduction Analytical Tools (ERAT)*

With the streams of emission data throughout the company, Emission Reduction Analytical Tools (ERAT) will apply major data analytics to the emissions data and other utility data (historized data streams & Data Lake) to analyze and understand data trends to ultimately bridge and convert the emission data to emission reduction best practices. ERAT will help identify efforts with the best cost-emission reduction ratios based on actual emissions, asset data, and maintenance data. ERAT will be developed to identify emission sources, associated assets, maintenance processes, and process frequencies. Industry benchmark data and statistical techniques can be employed to determine the emission reductions that can be achieved by modifying maintenance and operational practices. Other initiatives may also be identified and developed by recognizing emission reduction opportunities when replacing equipment at end of life.

Project Milestones:

- Develop Requirements
- Analyze and select the analytical tool
- Implement ERAT tools (Pilot Phase)
- Evaluate results

*Measure 4: Program Process Improvement*

The Emissions Strategy Program focuses on the technology, data, and best practices that guide SoCalGas and our stakeholders in reducing emissions to provide the cleanest, safest, and most innovative energy to our customers while preserving the environment. The Emissions Strategy Program is structured to support the elements of developing and submitting regulatory requirements, tracking financials and compliance requirements, guiding consistent messaging, responding to data requests, establishing dashboard(s) with metrics/project controls, and implementing the projects as outlined in the SB 1371 Compliance Plan for emission reductions.

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Incorporating tools to support these efforts and integrating them into projects would help establish consistency and accuracy across the program and allow for better tracking of key performance indicators and decision making. This process improvement will utilize tools and methodologies to effectively manage the Program's workflow, including the below workstreams:

- Finance & Regulatory
- Project Execution
- Research & Development
- Policy & Communication

**Project Milestones:**

- Digitize paper forms and processes by Q3 of 2023
- Data storage and report creation by Q4 of 2023
- Create metrics dashboard in support of analytics for decision making and resource planning by Q1 of 2024

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

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**Chapter 7: Recordkeeping IT Project**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Data Lake	\$300,000	\$300,000	\$1,320,000
Historization	-	-	-
ERAT	-	\$99,900	\$120,879
Project Manager/Project Engineer	\$108,000	\$124,200	\$510,840
Internal IT Support	\$32,400	-	\$71,280
Contractor Support	\$1,188,000	-	\$1,437,480
<b>Total</b>	<b>\$1,628,400</b>	<b>\$524,100</b>	<b>\$3,460,479</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Data Lake	\$1,398,600	\$999,000	\$3,792,096
Historization	\$799,200	\$799,200	\$2,528,064
ERAT	\$924,000	\$399,600	\$2,047,056
<b>Total</b>	<b>\$3,121,800</b>	<b>\$2,197,800</b>	<b>\$8,367,216</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$15.1 million
<b>Average Annual Revenue Requirement</b>
\$3.7 million

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 7A: Historical Project Schedule for Recordkeeping IT Project

**2022 SB 1371 Compliance Plan**  
**Chapter 8: Geographic Tracking**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 9: Recordkeeping</b>
Written Company Policy directing the gas business unit to maintain records of all SB 1371 Annual Emissions Inventory Report methane emissions and leaks, including the calculations data and assumptions used to derive the volume of methane released. Records are to be maintained in accordance with G.O. 112 F and succeeding revisions, and 49 CFR 192. Currently, the record retention time in G.O. 112 F is at least 75 years for the transmission system. 49 CFR 192.1011 requires a record retention time of at least 10 years for the distribution system. Exact wording TBD by the company and approved by the CPUC, in consultation with CARB, as part of the Compliance Plan filing.
<b>Best Practice 20b: Geographic Tracking</b>
Utilities shall develop methodologies for improved geographic tracking and evaluation of leaks from the gas systems. Utilities shall work together, with CPUC and ARB staff, to come to agreement on a similar methodology to improve geographic evaluation and tracking of leaks to assist demonstrations of actual emissions reductions. Leak detection technology should be capable of transferring leak data to a central database in order to provide data for leak maps. Geographic leak maps shall be publicly available with leaks displayed by zip code or census tract.

To improve capabilities of leak surveys performed at high pressure facilities, SoCalGas requested in the 2018 and 2020 Compliance Plans to back model high pressure facilities in AVEVA and enable scanning technology at facilities with storage and compressor components; AVEVA is a system that enables engineering to create data centric 3D models of facilities. Having these 3D models will make it easier to estimate emission volumes, tie leaks with the company’s supply management programs to order replacement parts when needed, identify lead times for replacement, and identify if leaks are on critical systems, which will influence plans for repair.

Since the 2018 Compliance period, SoCalGas will have completed the digitizing and mechanical walkdown of approximately 2,000 Piping & Instrumentation Diagrams (P&IDs) for SoCalGas high pressure facilities. These intelligent P&IDs will allow the SoCalGas engineering department to locate tags for equipment or instrumentation that is currently found in these facilities. Additionally, several facilities will have 3D models generated. These 3D models are digital twins to the facilities that will allow SoCalGas to query data based on a tag, type of equipment, service, location, etc. The tags in the 3D model will link to the P&IDs, enabling proper engineering information to be provided. The 3D model will provide material information to help identify connection points and support queries for potential leak points in the existing facilities.

To support this ongoing effort SoCalGas will continue to maintain the labor support and resources necessary to create the drawings and modeling.

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Currently, SoCalGas’s rights-of-ways are posted to GIS by the company’s internal employees as part of the land acquisition process. However, historic land agreements are not geospatially depicted in the GIS system. For these historic land agreements, the company’s Land Team conducts site specific rights-of-way research by reviewing strip maps and leak survey maps (company maps) to identify the right-of-way number. Subsequently, the land agreement is reviewed to determine if the land agreement correlates to the specific location. In order to prioritize the right-of-way location information to be more readily available for leak survey, repair, and replacement projects, the historic land agreements will be digitized and mapped to the GIS system. The Easement Digitalization project will:

- Reduce research time by having the accurate right-of-way location mapped to the GIS system
- Save time and money by identifying the accurate right-of-way locations in GIS and Portal in response to leak survey and repair work within private property
- Increase productivity and reduce response time to gas operations groups (i.e., Construction Planning, Pipeline Integrity etc.) to reduce emissions and increase safety
- Efficiently track agreements in the Portal system with a spatial depiction

**Emission Reductions Achieved:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Cost Effectiveness Evaluation on Historic Work:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes to continue completing back modeling of complex high-pressure facilities. The goal of this project is to create the digital twin for the existing facilities to enable a quick query of its facilities. The intelligence found in the 3D model and the P&IDs will enable the SoCalGas engineering department and operations to identify, track, and keep proper documentation of the digital asset records. It will enable future reporting from these databases that can include mileage of pipeline/service, the type of equipment and location, and the capability to connect the 3D model database systems to other SoCalGas database systems. This will enable increased ability to calculate blowdown and bundle projects for blowdown, repair leaks quicker, and identify materials with repeated leaks, indicating requirements for replacement.

SoCalGas plans to conduct back modeling for an additional five (5) compressor stations and one (1) storage facility that were not part of the 2018 or 2020 Compliance Plans. SoCalGas also plans to maintain IT support and any supplemental drawing updates.

**2022 SB 1371 Compliance Plan**  
**Chapter 8: Geographic Tracking**

In addition, SoCalGas proposes to digitize historic land agreements for leak survey, repair, and replacement projects and plan leak surveys and repairs more effectively by having the appropriate right-of-way location digitized and mapped in the GIS system. The scope includes approximately 15 pipelines, totaling approximately 750 miles including applicable right-of-way agreements.

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Back Modeling and QA/QC for 5 Compressor Stations & 1 Storage Facility	\$5,040,000	\$3,360,000	\$10,164,000
AVEVA Contract Support	\$600,000	\$400,000	\$2,200,000
IT Services & Support	\$1,260,000	\$840,000	\$2,541,000
Mechanical and I&C P&IDs Update	\$1,200,000	\$800,000	\$2,420,000
Transmission Project Manager	\$100,000	\$100,000	\$440,000
Storage Project Manager	\$100,000	\$100,000	\$440,000
Land & Right of Way Oversight and Project Support -1/2 FTE	\$50,000	\$50,000	\$220,000
Contract Land Support	\$360,000	\$360,000	\$871,200
GIS Contract Support	\$200,000	\$200,000	\$484,000
Title Services	\$22,000	\$22,000	\$53,240
<b>Total</b>	<b>\$8,932,000</b>	<b>\$6,232,000</b>	<b>\$19,833,440</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$20.7 million
<b>Average Annual Revenue Requirement</b>
\$10.4 million

**2022 SB 1371 Compliance Plan**  
**Chapter 8: Geographic Tracking**

**Cost Assumptions:**

- Cost per facility approximately \$1.4M for Back Modeling Services
- AVEVA project management contract support of annual \$200K per contractor for 3 contractors in 2023 and 2 contractors in 2024
- IT services and support which includes contractor executing project scope and acquiring AVEVA software Licenses
- AVEVA Drawing - Mechanical and I&C P&IDs updates for proper maintenance. Cost estimate based on historical spend for drawing updates
- Annual cost of \$100K per management FTE (Operations Project Managers and Land & Right of Way)
- Contract Land Support of 3500 hours each year at approx. \$97 per hour for project scope completion
- GIS Contract Support to map pipelines into GIS database of approximately 3000 rights-of-way at \$60/right-of-way plus \$5,000 base fee per pipeline
- Title services to support GIS mapping of pipelines. Cost estimate based on historical spend for title services

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 8A: Historical Project Schedule for Geographic Tracking

**2022 SB 1371 Compliance Plan**  
**Chapter 9: Competency Based Training Development**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 13: Performance Focused Training Program</b>
Create and implement training programs to instruct workers, including contractors, on how to perform the BPs chosen, efficiently and safely. Training programs to be designed by the Company and approved by the CPUC, in consultation with CARB, as part of the Compliance Plan filing. If integration of training and program development is required with the company's GRC and/or CBC processes, then the company shall file a draft training program and plan with a process to update the program once finalized into its Compliance Plan.

SoCalGas has a robust classroom training program facilitated at a centralized training facility in Pico Rivera. The training facility is equipped with an area known as Situation City where trainees can experience real world emergencies, such as a blowing high-pressure line with an ignition source, while in a safe and controlled environment. Training programs have historically focused primarily on PHMSA's safety regulations. Safety is a core value at SoCalGas and is embedded in operations – from uniquely curated training programs to the maintenance of policies and procedures, and to providing safe and reliable service to our customers. Per SoCalGas's Safety Management System (SMS), "competence, awareness and training" are part of the Company's seven core Safety Values.

Gas Operations training follows an established systematic approach to training development. The development of training programs at SoCalGas includes needs assessment and training analysis, which is essentially a scope of work development. Based on findings, curriculum design, and development of training, materials will follow. When development is completed, implementation of instruction and internal/external evaluation begin.

In 2018-2020, SoCalGas began redeveloping the course materials related to emissions abatement for the following roles: Construction Technician, Leak Survey, Energy Technician, Lead Construction Technician, Measurement and Regulation Technician I, Measurement and Regulation Technician II, Transmission Measurement Specialist, Pipeline Technician, Leakage Clerk, Storage Technician, and System Protection Specialist. The focus of this effort has been on transforming these courses from a traditional classroom training approach to an integrated, multimedia, performance focused instruction. The new training content that has been incorporated is due to processes, procedures and policies established because of the SB 1371 Compliance Plans.

**Emission Reductions Achieved:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

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**Chapter 9: Competency Based Training Development**

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

Historically, Gas Operations Training has been driven by a strong emphasis on PHMSA's safety regulations. The Leak Abatement Program requires an additional emphasis on the control of emissions. As changes in processes, procedures, equipment, and technology emerge due to implementation of Best Practices, existing training needs to be modified and new training modules developed. This training will support the new process and policies and train new employees with an increased focus on the environmental impact of methane emissions on the atmosphere.

SoCalGas proposes continuing to implement a competency-based training program that will encompass training designed for all new methane mitigation policy and procedural changes. SoCalGas will continue transitioning from a traditional classroom training approach to a competency-based web-based video training module system to enhance the ability to incorporate new policies and increase learning at a faster pace.

Changes to the Gas Operations Training department operations will be comprehensive. Instead of scheduling classes that start and end on specific dates on a calendar, training will operate in an open-for-business paradigm. The individualized instruction environment will allow students to begin training anytime, and training will conclude when the student has demonstrated competence. The role of the instructor will change from the primary dispenser of instructional content to a facilitator of learning. Interactive, media-rich training materials will be the primary channel for students to learn training content as opposed to the current traditional classroom format. The instructor's role will transition focus efforts on coaching, mentoring, and observing hands-on activities performed by students. This new training format should increase the speed of competency development.

Project Milestones:

- Establish scope of work for training modifications: Q1 2023 – Estimated 1 month
- Develop instructional Design: Q1 2023 -Estimated 6 months
- Develop training materials: Q1 2023 - Estimated 6 months
- Evaluate training materials and train-the-trainer: Q3 2023 Estimated 6-12 months
- Implement Training: Q3 2023 - Estimated 6-12 months

**2022 SB 1371 Compliance Plan**  
**Chapter 9: Competency Based Training Development**

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Curriculum Design	\$250,000	-	\$302,500
Project Manager	\$120,000	-	\$264,000
<b>Total</b>	<b>\$370,000</b>	-	<b>\$566,500</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$0.6 million
<b>Average Annual Revenue Requirement</b>
\$0.3 million

Cost Benefits:

Although there is insufficient data to quantify the benefits, this measure does result in cost benefits because many of the field personnel can take these trainings remotely at their home office and avoid travel expenses associated with travelling to the Pico Rivera training office.

Cost Assumptions:

- One (1) FTE at \$120,000 to support managing the project and coordinate with consultant to design curriculum
- Consultant support of \$250,000 to design and develop training curriculum for both hands-on and digital training

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 9A: Historical Project Schedule for Competency Based Training Development

**2022 SB 1371 Compliance Plan**  
**Chapter 10: Training Facility Enhancements**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 13: Performance Focused Training Program**

Create and implement training programs to instruct workers, including contractors, on how to perform the BP's chosen, efficiently, and safely. Training programs to be designed by the Company and approved by the CPUC, in consultation with CARB, as part of the Compliance Plan filing. If integration of training and program development is required with the company's GRC and/or CBC process, then the Company shall file a draft training program and plan with a process to update the program once finalized into its Compliance Plan.

SoCalGas has a robust classroom training program provided at a centralized training facility in Pico Rivera. The training facility is equipped with an area known as Situation City, where trainees can experience hands-on real-world scenarios, such as blowing high-pressure lines with an ignition source, while in a controlled and safe environment. Training programs are focused primarily on PHMSA's safety regulations. Per SoCalGas's SMS, "competence, awareness and training" are one of the Company's seven core Safety Values. All current training programs are focused around incorporating safety in all procedures as a primary goal. As part of its formal training program and Operator Qualification requirements, SoCalGas incorporates hands-on elements at Situation City.

Situation City consists of 22 "homes" set up on residential streets with gas meters, gas mains, and services in the streets. In addition to a certified training area for Cathodic Protection training, meter read training, and firefighter training, this facility can train students using a real, working gas distribution system in a safe, controlled environment. Situation City can currently simulate gas leaks at approximately 10 CFH for training purposes. These simulations were primarily created as a safety measure and were easily detectable in training. As gas emission standards have evolved, the need to detect smaller and more varied sized leaks has become apparent. In 2021, the planning to modify the leak simulation system at Situation City was initiated. SoCalGas' plans for modifications to the leak simulation system included creating leaks of varying sizes to enhance trainee leak detection skills and meet the training needs of emission reduction regulations.

Additionally, SoCalGas completed the learning lab at Pico Rivera training center to support facilitating the performance focused training programs. This Learning Lab includes resources, reference materials, study carrels, computers, virtual reality goggles, and a printer. The key driver for this project was to facilitate self-paced, modular eLearning.

**Part 2. Proposed New or Continuing Measures**

The construction project for Situation City is scheduled to be completed by October 2022. However, this assumes there will be only minor delays and inconveniences, such as minor weather delays, during the construction phase. Complications due to supply chain disruptions, labor shortages, and material cost increases caused by the COVID-19 pandemic may slow the construction process. If these delays occur, modifying the leak simulation system at Situation City may extend into 2023.

**2022 SB 1371 Compliance Plan**  
**Chapter 10: Training Facility Enhancements**

Milestones Proposed:

- Contractor construction time: Estimated nine (9) months
- Situation City modifications to leak detection training system: Estimated 12 months

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Project Manager	\$120,000	-	\$264,000
Construction Contractor	\$580,000	\$200,000	\$943,800
<b>Total</b>	<b>\$700,000</b>	<b>\$200,000</b>	<b>\$1,207,800</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$2.0 million
<b>Average Annual Revenue Requirement</b>
\$0.03 million

Cost Assumptions:

- Project Manager to manage scope of project with annual salary of \$120K
- Construction to complete work at approximately \$800K. The estimate is based on Contractor’s proposal using time and material

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 10A: Historical Project Schedule for Training Facility Enhancement

**2022 SB 1371 Compliance Plan**  
**Chapter 11: Blowdown Reduction Projects at Storage**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 23: Minimize Emissions from Operations, Maintenance and Other Activities**

Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e. low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.

In the 2020 Compliance Plan, SoCalGas was approved to implement emission reduction efforts at Storage facilities. From 2018 to 2021, SoCalGas implemented over 17 projects that reduced emissions from storage facilities. These projects included the modification/removal of orifice meters, replacement of chemical injection pumps with ventless types, reduction of wellhead venting, gas blowdown studies, and the replacement of gas-powered actuation with compressed air.

To support these efforts, SoCalGas staffed a Project Manager to support emission reduction projects in storage operations.

In addition to staffing efforts, SoCalGas published Gas Standard GS 223.0155, *Planning Pipeline Blowdowns and Reporting*, to outline the methods of blowdown reduction and provide resources to Planners and Project Managers when planning pipeline blowdowns and the associated blowdown reductions.

Emission Reductions Achieved:

Due to the complexities of storage facilities, SoCalGas was unable to forecast emission reductions in the 2020 Compliance Plan. The Underground Storage Emissions reported as the approved adjusted baseline in 2015 were 125,837 MCF. Underground Storage Emissions reported in the calendar year 2018 were 43,481 MCF, with an estimated reduction of 82,356 MCF. Underground Storage Emissions reported in the calendar year 2019 were 23,750 MCF, with an estimated reduction of 102,087 MCF. Underground Storage Emissions reported in the calendar year 2020 were 10,178 MCF, with an estimated reduction of 115,659 MCF. The following table summarizes these reductions.

**Historical Emission Reductions (MCF)**

2018	2019	2020
82,356	102,087	115,659

It is not possible to reasonably estimate emission reductions from this measure for 2021 and 2022 at this time because vented emissions fluctuate based on normal operation activities and a variety of other external factors.

**2022 SB 1371 Compliance Plan**  
**Chapter 11: Blowdown Reduction Projects at Storage**

Cost Effectiveness Evaluation on Historic Work:

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, due to the inherent nature of the program as explained in the emissions reduction section in Part 1.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes continuing to implement emission reduction measures in storage operations. SoCalGas has identified several projects to achieve emission reductions during normal storage operations and will continue to explore opportunities for emission reduction.

Although new projects may be identified during the Compliance period, the following projects have been identified for storage operations:

- Utilize stationary or mobile cross compression equipment during station blowdowns to minimize blowdown volumes
- Convert main plant emergency shutdown valves from gas-powered to air-powered
- Performing preventative maintenance for relief valves
- Repair above ground leaks associated with increased leak survey
- EPA Method 21<sup>1</sup> leak detection training
- Replace actuated valves from gas-powered to air-powered
- Replace intermittent bleed devices
- Explore use of no-bleed valves
- Reduce vented emissions during choke changes

SoCalGas will develop an electronic tool to plan and track blowdown reduction efforts for planned blowdown events at Storage Facilities. The tool will improve data collection and recordkeeping for blowdown reduction efforts, enhance capabilities for planning blowdown reduction, and monitor progress and cost-effectiveness.

No additional incremental staffing is forecasted to support this measure during this Compliance period.

**Part 3. Abatement Estimates**

There is insufficient data to reasonably calculate emission reductions from these activities, due to the inherent nature of the program as explained in the emissions reduction section in Part 1.

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<sup>1</sup> EPA Method 21 – Volatile Organic Compound Leaks; <https://www.epa.gov/emc/method-21-volatile-organic-compound-leaks>.

**2022 SB 1371 Compliance Plan**  
**Chapter 11: Blowdown Reduction Projects at Storage**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Incremental Project Manager - Storage	\$20,000	\$20,000	\$88,000
<b>Total</b>	\$20,000	\$20,000	<b>\$88,000</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Blowdown Reduction Activities in Storage	\$8,570,000	\$8,570,000	\$21,868,000
<b>Total</b>	\$8,570,000	\$8,570,000	<b>\$21,868,000</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$67.0 million
<b>Average Annual Revenue Requirement</b>
\$1.4 million

Cost Assumptions:

- \$100K annual salary for Project Manager
- 20% of labor charged to O&M
- Capital Costs were developed using actuals for similar projects in Storage Operations

**Part 5. Cost Effectiveness/Benefits**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, due to the inherent nature of the program as explained in the emissions reduction section in Part 1.

**Part 6. Supplemental Information/Documentation**

Attachment 11A: Historical Project Schedule for Blowdown Reduction Projects at Storage

**2022 SB 1371 Compliance Plan**  
**Chapter 12: Stationary Methane Detectors**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 18: Stationary Methane Detectors</b>
Utilities shall utilize Stationary Methane Detectors for early detection of leaks. Locations include: Compressor Stations, Terminals, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R above ground and pressures above 300 psig only). Methane detector technology should be capable of transferring leak data to a central database, if appropriate for location.

SoCalGas conducted a phased study of stationary methane detection technologies at company facilities from 2018-2020. This activity explored a range of alternative monitoring technologies to assess their accuracy and propensity to generate false alarms at Meter and Regulating (M&R) stations. The sites were operating stations so the data gathered would be representative of real-world conditions. SoCalGas included sensors from multiple tunable diode vendors in the evaluation to assess their relative performance in comparison to each other and to the results of on-site leak surveys. The results of the evaluation determined that implementation of stationary methane detector technology at above ground Distribution M&R regulator stations was not cost effective for early leak detection compared to performing additional leak surveys.

Emission Reductions Achieved:

**Historical Emission Reductions (MCF)**

<b>2018</b>	<b>2019</b>	<b>2020</b>
279	279	279

Cost Effectiveness Evaluation on Historic Work:

The results of the evaluation determined that implementation of stationary methane detector technology at above ground Distribution M&R regulator stations was not cost effective for early leak detection compared to performing additional leak surveys, as discussed in the 2021 CPUC Winter Workshop.

In 2021, SoCalGas moved the focus of the evaluation of methane sensor feasibility and cost effectiveness to Transmission facilities. This effort will focus on the potential for sensor installations at Transmission M&R and compressor stations. Additionally, this measure will include controlled laboratory evaluations of alternative stationary methane detectors.

**Part 2. Proposed New or Continuing Measure**

The evaluation of methane sensor feasibility and cost effectiveness for Transmission facilities is expected to be completed in 2022 and should provide a structured evaluation of both the technologies deployed and the emission profiles of the selected stations. For the 2023-2024 period, SoCalGas proposes to begin the implementation of installing methane detectors at approximately 50 facilities.

**2022 SB 1371 Compliance Plan**  
**Chapter 12: Stationary Methane Detectors**

SoCalGas proposes the selection of sites with varying factors, such as limited space for new equipment, multifaceted emission profiles, and larger total site footprint. Addressing these variables will be a key factor in further expanding the volume of monitoring sites.

**Project Milestones:**

- Confirm selection of evaluation facilities and applicable monitoring technology: Estimated Months 1-3
- Order and receive sensors and construction materials: Estimated Months 4-6
- Construction and Commissioning at evaluation facilities: Estimated Months 7-13
- Monitoring and Operations of the facilities: Estimated Months 14-22
- Assembled report-out and recommendations: Estimated Months 22-24

**Part 3. Abatement Estimates**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, and SoCalGas anticipates that after implementation and recording activities, there should be sufficient data to calculate emission reductions and cost-effectiveness.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Sensor-specific effort	\$117,480	\$469,920	\$1,266,144
Cross-site effort	\$13,068	\$132,352	\$175,958
<b>Total</b>	<b>\$130,548</b>	<b>\$602,272</b>	<b>\$1,442,102</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Site-specific effort (Transmission facilities)	\$1,349,700	\$33,000	\$1,947,495
Sensor-specific effort	\$1,410,420	\$599,280	\$3,250,665
Cross-site effort	\$614,526	\$40,480	\$937,677
<b>Total</b>	<b>\$3,374,646</b>	<b>\$672,760</b>	<b>\$6,135,837</b>

**2022 SB 1371 Compliance Plan**  
**Chapter 12: Stationary Methane Detectors**

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$16.9 million
<b>Average Annual Revenue Requirement</b>
\$1.1 million

Cost Assumptions:

- For the site-specific effort estimated cost includes design, materials, and installation
- For the sensor-specific effort estimated cost includes materials, installation, monitoring, and support, as well as decommissioning activities and assumes 6 sensors per site
- For the cross-site effort estimated cost includes design, product evaluation and verification, contracting, analytics and reporting, as well as project management

**Part 5. Cost Effectiveness/Benefits**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, and SoCalGas anticipates that after implementation and recording activities, there should be sufficient data to calculate emission reductions and cost-effectiveness.

**Part 6. Supplemental Information/Documentation**

Attachment 12A: Historical Project Schedule for Stationary Methane Detectors

**2022 SB 1371 Compliance Plan**  
**Chapter 13: Electronic Leak Survey**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 20b: Geographic Tracking**

Utilities shall develop methodologies for improved geographic tracking and evaluation of leaks from the gas systems. Utilities shall work together, with CPUC and ARB staff, to come to agreement on a similar methodology to improve geographic evaluation and tracking of leaks to assist demonstrations of actual emissions reductions. Leak detection technology should be capable of transferring leak data to a central database in order to provide data for leak maps. Geographic leak maps shall be publicly available with leaks displayed by zip code or census tract.

Using digital and mobile technology, SoCalGas automated the leak survey process, with the goals of reducing costs, increasing processing efficiency, and the visibility of this safety critical activity. Leak survey instrumentation is used to track leaks, and leak data is electronically uploaded into GIS. Breadcrumb (GIS Location) data was collected for developing the Electronic Leak Survey (ELS) mobile application. The ELS project replaces the existing leak survey process involving paper maps with:

- GIS web-based portal application that is used to electronically prepare, review, audit, and store leak survey map completions
- Mobile application on an iPad device that is used by operator qualified technicians to report leak survey completions and to document conditions found that require follow-up, such as leaks
- Highly integrated solution with GIS, SAP and Click that leverages our existing enterprise systems and business workflows to auto-create and generate follow-up work orders
- Dashboard for managing near real-time work order status and completions

The ELS project tested the release of the mobile application that resulted in the training and deployment of the application. As implementation continues, the gas system is benefitting from improved geographic evaluation and tracking of leaks, Atmospheric Corrosion (ACOR), and other Abnormal Operating Conditions (AOC) locational data using smart forms. Furthermore, point and click technology using GIS coordinates allows information, such as addresses, to be auto populated. These improvements are beneficial systemwide. However, there has been direct impact to progress due to COVID-19 limitations. Capacity for students in training classes has been reduced along with an increased need for the training materials required for remote learning. Hardware procurement was impacted due to shortages of equipment and deployment was limited due to travel restrictions. The project schedule has also been extended due to more complex technical issues that have been discovered and resulted in phasing the rollout schedule. Deployment phases will be contingent on how the technical issues are resolved and the approaches required to manage the resources and schedule. Once the scope outlined in the 2020 Compliance Plan is completed, it will become the prerequisite for beginning future phases that will extend this functionality to other work types, including special leak survey and other business areas, such as Transmission.

**2022 SB 1371 Compliance Plan**  
**Chapter 13: Electronic Leak Survey**

Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

As the initial routine survey implementation for ELS continues, there is an expectation that new enhancement requests will become apparent as the solution is deployed and employees begin utilizing it in the field. Upon successful implementation, the first phase of the ELS project will deploy the solution company wide and will cover the Leak Survey functionality for Gas Distribution. Consequently, in subsequent phases, the solution will be extended to cover pipeline patrol and then Transmission. Software packages will go through upgrade cycle and the underlying product will be upgraded by a vendor to provide additional functionality and stability. After each deployment cycle is complete, SoCalGas plans to consolidate all outstanding items that include issues that arose during deployment/training, additional requirements and enhancement requests.

*Electronic Leak Survey: Pipeline Patrol*

Scope:

- Mobile application and Pipeline Patrol maps on mobile device (iPad mini) & capture Breadcrumb data
- Capturing conditions found that require follow-up such as missing markers, class location changes and encroachments
- SAP work order (WO) order generation and enhanced integrations
- Ensure all required high pressure pipelines have been patrolled and AOCs are captured as required

*Electronic Leak Survey: Transmission*

Scope:

- Mobile application and Electronic Leak Survey/Patrol maps on mobile device (iPad), Breadcrumb Tracking
- Capturing Leak Indications, other Abnormal Operating Conductions (AOCs), Business Districts changes & Encroachments Data
- Work order (WO) generation and enhanced integrations with Maximo
- Click form configuration / modification for tablet devices and enhanced integrations
- Ensuring all pipeline assets have been Patrolled as required and all Leak Indications and other AOCs are captured as required

**2022 SB 1371 Compliance Plan**  
**Chapter 13: Electronic Leak Survey**

*Electronic Leak Survey: Abnormal Operating Conditions*

Scope:

This project includes build/configuration, test and deploy of Special leak survey functionality including:

- Leverage existing ELS Mobile application deployed on mobile device (iPad mini) and Breadcrumb Tracking
- Capture and record conditions found during special leak survey that require follow-up such as leak Indications or other Abnormal Operating Conditions (AOCs)
- SAP WO generation and enhanced integrations, transferring captured AOC data to SAP
- Capability to create special leak surveys on demand and ensuring all identified pipelines are leak surveyed / patrolled before completion
- Leverage GIS capacity to quickly identify locations requiring special leak survey and generate leak survey work orders

Benefits:

- Creates leakage clerical capacity and cost savings associated with plotting, printing, reviews, and mailing of paper-based leak survey maps. Eliminates preparing, printing, review, monitoring, re-work, associated with paper maps that are lost and result in re-work
- Reduces risk and wait times for leak survey maps during significant events improving productivity, increasing safety, and enabling field personnel to respond more quickly to significant events such as system overpressure, earth movement, fires, floods, etc
- Automates the leak survey process in Distribution creating efficiency, flexibility in cross district assignment and routing, and improves utilization of workforce since there is no longer dependency on paper maps
- Integration with SAP and improved geographic location data, tracking of leaks, and other Abnormal Operating Conditions (AOC) that require follow-up. GIS coordinates will be auto populated
- Improves efficiency by eliminating manual processes and allows the ability to track whether all pipelines have been surveyed or patrolled

Project Milestones:

- ELS – Abnormal Operating Conditions: Q1 2023
- ELS – Pipeline Patrol: Q2 2023
- ELS – Transmission: Q2 2024

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**2022 SB 1371 Compliance Plan**  
**Chapter 13: Electronic Leak Survey**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Contractors	\$575,000	\$1,200,000	\$2,147,750
Travel	\$22,500	\$222,750	\$296,753
<b>Total</b>	<b>\$597,500</b>	<b>\$1,422,750</b>	<b>\$2,444,503</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Software	\$200,000	\$145,376	\$417,905
Hardware	\$50,000	\$100,000	\$181,500
Contractors	\$1,901,000	\$2,026,500	\$4,752,275
Internal Labor	\$720,556	\$750,006	\$3,235,238
Vendor Services	\$48,825	\$34,875	\$101,277
Software – Transmission	-	\$250,000	\$302,500
Hardware - Transmission	-	\$120,000	\$145,200
Contractors - Transmission	-	\$2,093,000	\$2,532,530
Internal Labor - Transmission	-	\$812,200	\$1,786,840
Vendor Services - Transmission	-	\$41,850	\$50,639
<b>Total</b>	<b>\$2,920,381</b>	<b>\$6,373,807</b>	<b>\$13,505,903</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$28.9 million
<b>Average Annual Revenue Requirement</b>
\$1.9 million

**2022 SB 1371 Compliance Plan**  
**Chapter 13: Electronic Leak Survey**

Cost Assumptions:

- Contractor Support and Vendor Services line items include cost estimates from multiple vendors based on total project scope performing services for design, development, testing, training, and deployment
- Software purchase includes vendor license and software upgrades for enterprise license.
- Hardware purchase includes server cabinets, devices, and accessories
- Internal labor will include multiple FTEs conducting various tasks, such as project management, coordination with contractors, and QA/QC

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 13A: Historical Project Schedule for Electronic Leak Survey

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 16: Special Leak Surveys</b>
Utilities shall conduct special leak surveys, possibly at a more frequent interval than required by G.O. 112-F (or its successors) or BP 15, for specific areas of their transmission and distribution pipeline systems with known risks for natural gas leakage. Special leak surveys may focus on specific pipeline materials known to be susceptible to leaks or other known pipeline integrity risks, such as geological conditions. Special leak surveys shall be coordinated with transmission and distribution integrity management programs (TIMP/DIMP) and other utility safety programs. Utilities shall file in their Compliance Plan proposed special leak surveys for known risks and proposed methodologies for identifying additional special leak surveys based on risk assessments (including predictive and/or historical trends analysis). As surveys are conducted over time, utilities shall report as part of their Compliance Plans, details about leakage trends. Predictive analysis may be defined differently for differing companies based on company size and trends.
<b>Best Practice 17: Enhanced Methane Detection</b>
Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.
<b>Best Practice 20a: Quantification</b>
Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to agreement on a similar methodology to improve emissions quantification of leaks to assist in the demonstration of actual emissions reductions.

In 2019, SoCalGas performed a Research, Development, and Demonstration (RD&D) evaluation of Bridger Photonics Gas Mapping LiDAR™ (GML) system as a potential aerial technology to detect and quantify methane emissions within the Distribution system. The evaluation included flying over 69 square miles of SoCalGas’ service territory, inspecting 1,086 miles of main lines, 110,779 service lines, and 148,581 meters for leaks. The findings from the initial demonstrated project showed the technology could be used to map methane over large areas of the distribution system, identify large methane plumes, and accurately pin-point the emission source locations. The decision was made to conduct a pilot study and the program was titled Aerial Methane Mapping (AMM) to adequately differentiate the activity from compliance Leak Survey.

In 2020, SoCalGas performed two additional phases of the pilot program while preparing to implement the program systemwide. Overall, the RD&D pilot studies conducted in 2019 through 2021 covered over 154 square miles of SoCalGas’ Distribution service territory, inspecting for leaks over 1,770 miles of main lines, 167,638 service lines, and 161,743 customer meters and facilities.

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

The RD&D pilot study evaluated performance of the GML™ system as follows:

- Performance in a variety of terrains (coastal, basin, foothills, mountains, deserts) and a variety of operating environments, such as Residential/Commercial/Industrial Customers and areas where the Distribution Main & Service (DM&S) system is in proximity to Oil & Gas production, natural methane seeps, and biogenic methane sources
- Assess the probability of detection by the emission flux rate
- Assess the precision of emission quantification estimates
- Develop data processing methods, prioritization algorithms, and draft work-flow processes
- Develop predictive methods for resource management
- Estimate emissions reduction potential, assess cost-effectiveness, and optimize implementation strategy to maximize methane emissions reductions

In 2021, SoCalGas transitioned the program from the RD&D pilot evaluation to system-wide implementation with the optimized initial strategy to focus on the Non-State-of-the-Art (NSOTA) distribution pipelines. SoCalGas began mapping new areas weekly on an ongoing basis, ramping up from one (1) to three (3) areas per week, covering a total of 580 square miles. Due to staffing requirements and changes to enterprise data management systems, implementation was ramped up during the 2021-2022 Compliance Period to achieve full coverage of the NSOTA portion of the distribution system annually. Some of the other challenges encountered throughout the rollout and implementation of the program included delays in onboarding and training of incremental staff due to limited training class availability, difficulty developing methods to track costs associated with the program, and obstacles integrating advanced meter data analytics to manage order priority based on established company risk management policies. Due to the COVID-19 pandemic, the project R&D and pilot studies were delayed by six (6) months and there were training limitations for operating groups due to reduced capacity.

This project will offer numerous benefits to SoCalGas when complete, including improved cost effectiveness and emissions reductions by adjusting the target areas to focus on leak-prone areas, increased knowledge of methane sources within the distribution operating environment to target leak reduction efforts, and reduced duration of system leaks.

**Completed Milestones:**

- Completed Phase II and III of the RD&D pilot study (2019-2021)
- Onboarded and trained incremental FTEs to support the program implementation (2019-2021)
- Established flight schedules and management of aviation safety (2020)
- Selected aerial vendor and secured contract (2021-2022)
- System Enhancements to be completed by the end of 2022
- Full implementation of proposed scope by the end of 2022
- Develop and implement system enhancements and automation to efficiently receive and respond to data (Ongoing)

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

Emission Reductions Achieved:

**Historical Emission Reductions (MCF)**

2018	2019	2020
N/A	814	5,191

The area mapping and leak investigations for the RD&D pilot ran from October 2019 – April 2021. Therefore, the reported emissions reductions shown for 2019 and 2020 correspond to the RD&D pilot study. Systemwide implementation began in April 2021 and ramped up through the year, so RD&D and implementation emissions reduction are combined for 2021. For post-meter customer emissions, there were a total of 167 post-meter customer leaks and 105 emissions sources due to incomplete combustion from Customer equipment found during the RD&D phases. In 2021, there was a total of 345 post-meter customer leaks and 370 emissions sources due to incomplete combustion from Customer equipment.

The actual emission reductions are slightly less than what was projected in the 2020 Compliance Plan due to a later start and slower ramp-up in 2021 than anticipated; however, the emission reductions are expected increase significantly in 2022 due to the change in strategy to mapping methane plume areas with higher known rates of emissions.

Cost Effectiveness Evaluation on Historic Work:

There is not enough data to conduct a historical standard cost effectiveness evaluation for this chapter yet because the program was still in pilot phase in years 2019 and 2020.

**Part 2. Proposed New or Continuing Measure**

SoCalGas is proposing initiatives to further enhance the Aerial Methane Mapping program and maximize the program benefits. In 2022, SoCalGas will conduct flights with GML2.0, a Gas Mapping LiDAR system with enhanced methane detection capabilities. Some of the improvements include two times lower methane detection sensitivity than GML1.0. This enhancement may result in more data and may require changes in the current process. Assuming the results are positive, SoCalGas will roll out the GML2.0 sensor beginning in 2023.

Starting in 2023, SoCalGas will be conducting two (2) AMM runs per year at two (2) Transmission Compressor Facilities. These runs will be compared to ground leak surveys to verify the feasibility of using AMM in the future to identify leaks and fugitive emissions.

Customer Services Field operation is planning to optimize processes, procedures, tools, and platforms utilized to compile and distribute leak investigation data, reporting, and field orders. While exploring these opportunities, feasibility, and cost effectiveness of handheld methane sensors will be evaluated for the additional FTEs supporting the program. The team will identify and implement strategies to integrate customer service field methane investigation data and analytics into 2023 and 2024 cloud initiatives and migrations.

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

SoCalGas plans to enhance record management of the data collected and processed during the flights for records retention purposes. Integrated tracking and reporting between Customer Services and Gas Operations of AMM sourced investigations and discovered leaks will be automated throughout the course of this project. An automated Work Management solution to centrally receive, track, monitor and report Investigations at scale is planned to be built, which will help eliminate manual errors when the program expands. The project also plans to improve the accuracy of investigation assignments by revising algorithms based on past data and by procuring most accurate data sources. These enhancements will help reduce the number of field visits and teams involved as a result of the project.

In addition to the AMM efforts, SoCalGas plans to pursue researching how methane plume data from satellites can be integrated into the AMM program, leveraging the AMM methane plume data processing approach to detect large methane plumes on a frequent basis within the SoCalGas service territory. SoCalGas is conducting a RD&D project to determine if there is incremental value in methane data from satellites, along with other emission reduction practices. To implement this additional scope, IT and GIS resources and services will be needed to develop the process to manage the data. Furthermore, the evaluation will result in incremental leak investigations which will require additional resource support as well. Ultimately, the endeavor to pursue satellite monitoring capabilities will be contingent on the efficacy and cost effectiveness of the technology, which will be determined by the RD&D evaluation and the cost. In the near future, methane plume data from satellites may become publicly available, which will also improve future cost effectiveness.

**Project Milestones:**

- Secure contract with aerial vendor (Q1 2023)
- Flight planning and schedules (Q1 2023)
- Hire and Train incremental FTEs (Q1 2023)
- Pilot at Transmission Facilities – Q1 2023- Q4 2024
- IT enhancements – Q1 2023- Q4 2024

**Part 3. Abatement Estimates**

*Distribution Main & Services*

SoCalGas estimates emission reductions achieved by performing aerial survey at 31,559 MCF reduced from SoCalGas' system. This estimate was generated by making the following assumptions:

- Based on historical leak findings and the aerial survey pilots, SoCalGas anticipates finding approximately 844 leaks on its system
- Approximately 36% of the leaks are large leaks
- The number of miles flown per year is estimated to be 71,332 (Mains and Services)

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**Chapter 14: Aerial Monitoring**

**Forecast of Emission Reductions from Baseline (MCF)**

<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
31,559	31,559	31,559	31,599	31,599	31,599	31,599	31,599

These emission reductions estimates are based upon various assumptions including leak find ratios, large leak ratios, reductions in days leaking, and reduction in days to repair. For Gas Distribution Operations, it is assumed 100% of the NSOTA, and 52% of State-of-the-Art (SOTA) and Multiyear State-of-the-Art (SOTA) pipeline mains will be covered annually by the program.

The emission reductions for this project may increase over time if there are improvements in the detection capabilities of LiDAR technology and/or if post-meter emission reductions are considered in the future.

Since there is less than a full year’s worth of data collected from full-scale implementation, there may be incorrect assumptions and factors in the forecast explanation provided above. These factors will be updated to reflect actual implementation results in the next Compliance Plan.

*Post-Meter Emissions*

Since the current reporting structure does not currently provide a means of accounting for mitigation of post-meter emission reductions, the estimated emissions mitigated through repair of leaks on the customer system are shown below by post-meter leaks and emissions sources count. Customer leak repairs typically occur in a timely manner and leakage flux rates are measured using customer meter consumption data. A rough approximation of customer emissions sources is provided for the mitigation of incomplete combustion emissions from customer equipment. Estimates for customer post-meter leaks and emissions sources count lack the full data needed to verify the emission reductions due to the length of time involved in the customer mitigating the leaks. Improved data collection and emissions abatement estimation methods are currently being researched for post-meter emissions.

The following assumptions were made:

- SoCalGas anticipates finding approximately 1,021 post-meter leaks on Customer facilities each year
- SoCalGas anticipates finding approximately 1,180 emissions sources due to incomplete combustion from Customer equipment each year
- The number of customers meters monitored by AMM is estimated to be 3,603,923

SoCalGas has limited available data to evaluate how emission findings will change over time as a result of this implementation, especially with regards to leaks found downstream of SoCalGas’ system. It is also challenging to account for how this technology will improve over time. As such, emission reductions forecasts are assumed to be linear and are based on the findings of the 2019 pilot studies and 2021 rollout. SoCalGas will continue to expand its efforts with aerial monitoring as technology improves and as more data becomes available after implementation. A more accurate forecast will likely be presented in future Compliance Plans.

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023–2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Customer Service Field Techs	\$1,397,760	\$1,453,760	\$6,273,344
Customer Service Analytics	\$374,400	\$389,376	\$1,680,307
Distribution Project Management	\$400,000	\$400,000	\$1,760,000
Vendor Service	\$7,066,800	\$7,066,800	\$17,101,656
Project Management Organization	\$408,000	\$408,000	\$1,383,360
AMM Data Management	\$558,000	\$558,000	\$2,455,200
Gas Operations & ARSO	\$886,178	\$886,178	\$3,899,183
Compressor Stations	\$56,000	\$58,800	\$211,970
Customer Service Field Techs - Satellite Support	\$698,880	\$726,880	\$3,136,672
Customer Service Analytics - Satellite Support	\$374,400	\$389,376	\$1,680,307
AMM Data Management - Satellite Support	\$558,000	\$558,000	\$2,455,200
<b>Total</b>	<b>\$12,778,418</b>	<b>\$12,895,170</b>	<b>\$42,037,199</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
AMM Data Management	\$1,534,575	\$1,221,575	\$6,010,070
Distribution Tools & Trucks	\$663,500	-	\$802,835
<b>Total</b>	<b>\$2,198,075</b>	<b>\$1,221,575</b>	<b>\$6,812,905</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$54.3 million
<b>Average Annual Revenue Requirement</b>
\$23.4 million

**2022 SB 1371 Compliance Plan**  
**Chapter 14: Aerial Monitoring**

Cost Assumptions:

- 14 FTEs for leak investigations for customer services field operations
- 12 FTEs for leak investigations for distribution operations
- Average Represented Employee Hourly Rate: \$44/hour
- Two (2) Incremental Project Managers at approximately \$100K annual salary
- One (1) Project Manager to oversee the program
- Two (2) Data Analysts for customer leak investigations
- 10% contingency is included in the total loaded O&M cost
- Actual costs may vary as more information becomes available

**Part 5. Cost Effectiveness/Benefits**

There will be no historical achieved cost effectiveness evaluation for this chapter since the program was still in pilot phase in years 2019 and 2020. The cost associated with reducing emissions post-meter have been removed from the cost effectiveness calculations because no emission reductions are currently claimed for post-meter reductions. If a post-meter emission reduction claim procedure becomes available in the future, the cost effectiveness calculation will be updated with the costs and emission reductions associated with the post-meter emission activities. The cost effectiveness of this project is expected to improve if a post-meter emission reduction claim procedure becomes available.

**Forecast of Cost Effectiveness Calculations (2023-2030) (\$/MCF)**

<b>Standard Cost Effectiveness</b>	<b>With Cap and Trade Cost Benefits</b>	<b>Net Cost Effectiveness</b>
\$466	\$464	\$443

**Part 6. Supplemental Information/Documentation**

Attachment 14A: Historical Project Schedule for Aerial Monitoring

**2022 SB 1371 Compliance Plan**  
**Chapter 15: Damage Prevention Public Awareness**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 24: Dig-Ins and Public Education Program</b>
Expand existing public education program to alert the public and third-party excavation contractors to the Call Before You Dig – 811 program. In addition, utilities must provide procedures for excavation contractors to follow when excavating to prevent damaging or rupturing a gas line.
<b>Best Practice 25: Dig-Ins and Company Standby Monitors</b>
Utilities must provide company monitors to witness all excavations near gas transmission lines to ensure that contractors are following utility procedures to properly excavate and backfill around transmission lines.
<b>Best Practice 26: Dig-Ins and Repeat Offenders</b>
Utilities shall document procedures to address Repeat Offenders such as providing post-damage safe excavation training and on-site spot visits. Utilities shall keep track and report multiple incidents, within a 5-year period, of dig-ins from the same party in their Annual Emissions Inventory Reports. These incidents and leaks shall be recorded as required in the recordkeeping best practice. In addition, the utility should report egregious offenders to appropriate enforcement agencies including the California Contractor’s State License Board. The Board has the authority to investigate and punish dishonest or negligent contractors. Punishment can include suspension of their contractor’s license.

SoCalGas has a federally mandated Public Awareness program, as prescribed in 49 CFR § 192.616, which contributes to enhanced public safety. In addition, the State of California mandates a preconstruction meeting with excavators requesting Locate and Mark support and requires continuous monitoring of all excavations within ten feet of high-pressure pipelines pursuant to Cal. Gov’t Code § 4216.2. The Public Awareness program is driven by the requirements of 49 C.F.R. § 192.616, the technical document, Public Awareness Programs for Pipeline Operators, API RP 1162 and program expansion recommendations by regulators.

In the 2018 and 2020 Compliance Plans, SoCalGas requested and was approved to expand the Public Awareness program and staff. SoCalGas implemented the following activities to support these efforts:

- *National Excavator Initiative* – Use of NEI Mike Rowe damage prevention PSA videos
- *Paradigm Excavator Outreach meetings* – Additional excavator safety outreach meetings throughout service territory
- *RPA City Partnerships* – Support for damage prevention/public with local nonprofits, cities, municipalities utilizing RPA's relationships
- *Community Relations nonprofit partnerships* – Damage prevention/public awareness partnerships with major nonprofit organizations utilizing Community Relation's relationships
- *Solar/Electrical Contractor printing & postage* – Stand-alone solar/electrical contractor mailer for pipeline safety
- *Online Surveys* – Pursuing online surveys to get more responses

**2022 SB 1371 Compliance Plan**  
**Chapter 15: Damage Prevention Public Awareness**

- *Angels Outreach* - Damage prevention messaging at Angels Stadium for National Safe Digging Month. Airing of SoCalGas safe digging video at 12 home games, safe digging radio commercial at Angels stadium
- *Long Beach Grand Prix* - Damage prevention messaging at the Long Beach Grand Prix along with Shell Oil. Booth space and Big Shovel to communicate safe digging messages to audience at the Expo which about 140K people go through during the weekend of the Grand Prix
- *811 Damage Prevention Float at Rose Parade* - Damage Prevention outreach of 811 messaging at the 2020 Rose Parade
- *CGA Collaborations* - 811 day collaboration with other operators at various MLB games, Kentucky Derby and other events
- *Orange County Fair* - Damage Prevention Public Awareness outreach during Fair
- *Ventura County Fair* - Damage Prevention Public Awareness outreach during Fair
- *Next Door App program* - Local neighborhood damage prevention outreach using Next Door app and targeting top 25 dig-in zip codes
- *811 Campaign* - Damage prevention messaging during timeframe to include 811 Day. Campaign includes damage prevention and 811 digital content with social media influencer
- *ESPN* - Damage prevention and 811 digital content on ESPN streaming and websites
- *Public Awareness Brochure Photo Shoot* - updating images for each of the Public Awareness brochures for refresh and better accuracy
- *Social Media boosts* - social media boosts that target certain areas in the service territory
- *Common Ground Alliance Annual Conference* - Expenses for Marketing/Communication team to attend annual conference for Damage Prevention

Several of the activities were not active or were limited due to impacts from the COVID-19 pandemic. Public gatherings were canceled due to CDC guidelines and, as a result, minimized the opportunity to educate the public on the 811 Program. Additionally, low attendance at events due to capacity restrictions was also a significant impact to effectively implementing several of the programs.

**Emission Reduction Achieved:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Cost Effectiveness Evaluation on Historic Work:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**2022 SB 1371 Compliance Plan**  
**Chapter 15: Damage Prevention Public Awareness**

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes to continue conducting incremental outreach and education to the general public, contractors, and excavators, mailing safe digging procedures to contractors, and maintaining the incremental FTE hired to support the public awareness program. Continued activities to support this measure include, but are not limited to:

- Analyzing excavation damage data and cause of incidents, utilize this information to develop and implement a target communication plan that will effectively address the damaging parties and reduce incidents
- Analyzing the effectiveness of pipeline safety communications and engagement strategies
- Using data and analysis to develop strategies to increase effectiveness for continuous improvement plans
- Conducting focus groups to refine messaging and strategies based on findings
- Working with other departments to analyze repeat offender data and develop strategies to reduce damages
- Being a point of contact for assisting with education services for pipeline and public awareness programs or concerns

Similar to SoCalGas' 2020 Compliance Plan, assessing the relationship between investment in the Public Awareness Program and Third-Party Damages shows that investment in public awareness is negatively correlated with the number of third-party damages to company property. Therefore, an increase in public awareness campaigns should result in decreased damages and lower emissions related to damages.

SoCalGas proposes to increase funding in these areas to further contribute to lowering the numbers of third-party damages. To continue to maintain the expanded public awareness program, SoCalGas will focus on outreach and education to the general public, outreach to contractors and excavators, and mailing safe digging procedures to contractors. The expanded public awareness program allows SoCalGas to increase focus on minimizing emissions.

This measure will require the continued effort of two (2) FTEs. An Advisor will continue to analyze damage data and use the data to assist in the strategizing of effective communications. The Project Manager will continue to manage incremental projects and programs implemented for the measure.

**Part 3. Abatement Estimates**

Emission reductions cannot be calculated for this measure, as the efforts overlap with Chapter 5 – Damage Prevention Algorithm and Proactive Intervention. The Damage Prevention Public Awareness Program supports efforts outlined in Chapter 5 by increasing the awareness of 811 and educating the general public and ultimately result in lowering the number of third-party damages. Please refer to Chapter 5 for the emissions reduction estimates forecasted for damage prevention activities.

**2022 SB 1371 Compliance Plan**  
**Chapter 15: Damage Prevention Public Awareness**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Marketing Material/Programs	\$887,000	\$887,000	\$2,146,540
2 FTEs	\$240,000	\$240,000	\$1,056,000
<b>Total</b>	<b>\$1,127,000</b>	<b>\$1,127,000</b>	<b>\$3,202,540</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$3.3 million
<b>Average Annual Revenue Requirement</b>
\$1.7 million

Cost Assumptions:

- Annual cost estimate of \$120K per FTE for two (2) FTEs (An Advisor and Project Manager)
- Marketing material includes production and distribution of mailers, pamphlets, brochures, key chains, and additional materials for customers to bring awareness of the requirements. Cost estimates for these materials are based on historical cost and implementations

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 15A: Historical Project Schedule for Damage Prevention Public Awareness

**2022 SB 1371 Compliance Plan**  
**Chapter 16: Pipe Fitting Specifications**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 22: Pipe Fitting Specifications**

Companies shall review and revise pipe fitting specifications, as necessary, to ensure tighter tolerance/better quality pipe threads. Utilities are required to review any available data on its threaded fittings, and if necessary, propose a fitting replacement program for threaded connections with significant leaks or comprehensive procedures for leak repairs and meter set assembly installations and repairs as part of their Compliance Plans. A fitting replacement program should consider components such as pressure control fittings, service tees, and valves metrics, among other things.

Materials meet SoCalGas' Material Specification Properties (MSP) requirements for all components. When materials are received, samples are inspected at a warehouse facility to verify requirements are met. Pipe fittings are components used to join pipe sections together with other fluid control products like valves and pumps to create pipelines. If there are any concerns regarding the quality of materials, including the threaded components and fittings, the Supply Management department is engaged to correct the issue and either engage the current vendor to increase quality assurance standards or to begin contract negotiations with alternative vendors to confirm all concerns are addressed.

In 2019, SoCalGas hired a third-party consultant to review the company's quality control process and MSP standards to identify consistent requirements across component categories. The results from the investigation identified the need to improve the following processes:

- 1) Manufacturing and Quality Control
- 2) Shipping, Handling, and Storage
- 3) Construction and Installation
- 4) Operations and Maintenance

The purpose of these improvements is to reduce emissions from threaded pipe fittings by improving manufacture tolerances and thread quality. In 2021, SoCalGas hired a project manager to develop a project execution plan. The project execution plan was separated into two (2) phases. Phase 1 focused on updating the material specification and quality control inspection instruction standards. Phase 2 focuses on implementing the updated standards during the inspection process, shipping and handling, and construction and installation.

Four (4) new Quality Control (QC) Inspectors were hired and incorporated into the program to support implementation and to improve the review processes going forward. Due to the COVID-19 pandemic, full implementation of the program has had limitations due to lack of in-person inspections and limited training sessions.

**2022 SB 1371 Compliance Plan**  
**Chapter 16: Pipe Fitting Specifications**

Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

SoCalGas' continuous improvements in the inspection of threaded components have been supported by the four (4) QC Inspectors who were hired in 2022. The role of these QC Inspectors has been expanded to include improving test setups and testing efficiency and verifying that the checks being performed on the materials are adequate. SoCalGas will continue to work with component manufacturers to align gauging practices and develop process controls to maintain high material thread quality standards. Due to these additional tasks and changes in the MSPs, supplemental contractor support will be needed to further implement the changes in a programmatic effort as well as incorporate new measures to track the process. Along with additional measures, such as utilizing higher rated thread sealants, SoCalGas will continue to evaluate additional feasible solutions based on results of material QC analysis.

Project Milestones:

- Update material specifications, if necessary: Estimate of 12 months
- Implement Quality Control inspection process: Estimate of nine (9) months
- Implement inspection process for shipping and handling at different storage locations: Estimate of nine (9) months
- Implement inspection guidelines during construction and installation phase: Estimate of nine (9) months
- Implement inspection procedure during operation and maintenance phase: Estimate of nine (9) months

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**2022 SB 1371 Compliance Plan**  
**Chapter 16: Pipe Fitting Specifications**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Implementation	\$130,000	\$130,000	\$572,000
Labor for 4 QC FTEs	\$400,000	\$400,000	\$1,760,000
Update MSPs/QCIIs	\$187,200	\$187,200	\$453,024
Inspector	\$187,200	\$187,200	\$453,024
<b>Total</b>	<b>\$904,400</b>	<b>\$904,400</b>	<b>\$3,238,048</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$3.4 million
<b>Average Annual Revenue Requirement</b>
\$1.7 million

Cost Assumptions:

- Implementation cost estimates for QC Process improvements based on historical costs
- Annual cost of \$100K per FTE for four (4) QC employees
- Annual estimated cost of \$90 per hour for 2,080 hours (Total \$187,200) for contractor to Update MSPs/QCIIs
- Annual estimated cost of \$90 per hour for 2,080 hours (Total \$187,200) for contractor Inspector

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 16A: Historical Project Schedule for Pipe Fitting Specifications

**2022 SB 1371 Compliance Plan**  
**Chapter 17: Repeat Offenders IT Systems**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 26: Dig-Ins and Repeat Offenders**

Utilities shall document procedures to address Repeat Offenders such as providing post-damage safe excavation training and on-site spot visits. Utilities shall keep track and report multiple incidents, within a 5-year period, of dig-ins from the same party in their Annual Emissions Inventory Reports. These incidents and leaks shall be recorded as required in the recordkeeping best practice. In addition, the utility should report egregious offenders to appropriate enforcement agencies including the California Contractor's State License Board. The Board has the authority to investigate and punish dishonest or negligent contractors. Punishment can include suspension of their contractor's license.

Best Practice (BP) 26 required a solution for capturing and reporting all dig-in incidents. Incidents caused by contractors are identified using contractor identification data from the California Contractor State License Board (CCSLB). CCSLB data enabled accurate identification and reporting of repeat offenders. Incident information was captured on a paper form called the Company Property Damage Report (CPDR.) The Repeat Offenders IT System project converted the paper form to an electronic form called the eCPDR and made it available on mobile devices. The eCPDR shared the form data across the systems used by the Customer Service, Distribution, and Claims departments. The data is also shared with the Data Lake (discussed in Chapter 7), which enables emissions reporting. There were technical challenges in sharing data in real time with robust data security across six (6) systems, with some systems being cloud-based and some supported by different IT vendors. In addition to identifying repeat offenders, Repeat Offenders IT System eliminated manual effort and potential for data errors in managing paper damage forms as well as improved the timeliness of reporting through automated sharing of data and claim creation. The implementation of the Repeat Offenders IT System commenced in Q1 of 2022.

Milestones Completed:

- Converted the legacy paper form known as the Company Property Damage Report to electronic form
- The electronic form eCPDR was made available as a Customer Service and Distribution mobile solution to capture and update damage information
- The electronic form eCPDR was integrated with mobile solution
- The eCPDR data was integrated with other SoCalGas systems for incident tracking, claims, and regulatory reporting

Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**2022 SB 1371 Compliance Plan**  
**Chapter 17: Repeat Offenders IT Systems**

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

The Repeat Offenders IT System project will continue evaluating the digitized process and will contribute to complete integration in case new operational systems go live or changes to existing operational systems take place.

**Part 3. Abatement Estimates:**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
IT Labor to Maintain System	\$150,000	\$150,000	\$660,000
<b>Total</b>	<b>\$150,000</b>	<b>\$150,000</b>	<b>\$660,000</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$0.7 million
<b>Average Annual Revenue Requirement</b>
\$0.3 million

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 17A: Historical Project Schedule for Repeat Offenders IT Systems

**2022 SB 1371 Compliance Plan**  
**Chapter 18: Accelerated Leak Repair - Transmission**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.

SoCalGas has historically repaired transmission leaks to meet the requirements of 49 C.F.R. Part 192 and the CPUC’s G.O. 112-F based on safety risk, and has coded leaks as grades 1, 2 & 3 based on population density, and concentration of the leak. In the past, leak repair prioritization was solely based on safety and was not correlated to emission volumes.

In the 2020 Compliance Plan, SoCalGas was approved to fund accelerated leak repairs beyond the normal repair timeframes. From 2018-2021, SoCalGas accelerated four (4) leaks for repair on transmission assets. Repairing leaks faster on Transmission lines directly attributes to lower emissions.

**Emission Reductions Achieved:**

During the 2018-2020 compliance period, Transmission Operations accelerated four (4) leaks on Transmission assets. Leaks on Transmission assets typically emit a larger volume of gas compared to leaks on Distribution assets. SoCalGas will continue to accelerate leak repairs on Transmission assets when practical. Individual leaks and their grades cannot be reasonably predicted; therefore, there is insufficient data to evaluate emission reductions from this measure.

Currently, emission reductions are being calculated on population-based factors. The company is continuing to evaluate methodologies to transition to a leak-based emissions model for this category in future compliance periods to improve emission estimations.

**Cost Effectiveness Evaluation on Historic Work:**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities due to emission reductions being calculated based on the population-based factors.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes to continue to accelerate leak repairs on Transmission assets when practical. Due to improvements in company outage coordination, SoCalGas anticipates being able to take advantage of planned pipeline blowdowns to accelerate leak repairs. By shortening leak repair time and avoiding additional blowdown emissions to repair leaks, these measures will contribute to a reduction in emissions.

No incremental staffing is forecasted to support this measure during this Compliance period.

**2022 SB 1371 Compliance Plan**  
**Chapter 18: Accelerated Leak Repair - Transmission**

**Part 3. Abatement Estimates**

There is insufficient data to reasonably calculate emission reductions from these activities, due to emission reductions being calculated based on the population-based factors.

**Part 4. Cost Estimates**

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Accelerated Leak Repair Projects in Transmission	\$2,500,000	\$2,500,000	\$7,287,500
<b>Total</b>	<b>\$2,500,000</b>	<b>\$2,500,000</b>	<b>\$7,287,500</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$19.4 million
<b>Average Annual Revenue Requirement</b>
\$0.3 million

Cost Assumptions:

- Assuming 5 or more accelerated leak repairs per year
- Assuming average direct cost of \$500,000 per leak repair
- This estimate is based on potential aggregate leaks in the system and the cost forecast is derived from the assumption that the leak repairs can be accelerated

**Part 5. Cost Effectiveness/Benefits**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, due to emission reductions being calculated based on the population-based factors.

**Part 6. Supplemental Information/Documentation**

N/A

**2022 SB 1371 Compliance Plan**  
**Chapter 19: Gas Speciation**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 17: Enhance Methane Detection</b>
--

Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.
--

SoCalGas has a robust laboratory known as the Engineering Analysis Center (EAC). When a methane source is in question, the EAC will dispatch a mobile gas speciation van to identify the chemical content of the gas and identify its source.

SoCalGas expanded the capacity of the EAC by increasing staff and equipment to respond to requests from Operations for leak speciation where the methane source is in question. The lower detection limits of new advanced leak detection instrumentation, in addition to the increased level of leak survey activities being driven by the Program, required an expansion of these resources. As a result, SoCalGas hired an additional employee in 2019 and the van, tools, and equipment were purchased, delivered, and installed in 2020.

Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

SoCalGas proposes continuing to fund the incremental lab technician, hired as part of the 2018 Compliance Plan, in addition to hiring one (1) more lab technician to continue to support the expanded capacity of the EAC. Due to the demands of increased leak surveys as a result of other measures (i.e., Large Leak Prioritization and Aerial Methane Mapping) this additional resource will support response to requests from Operations for leak speciation where methane source is in question. The lower detection limits of new advanced leak detection instrumentation plus increased level of leak survey activities being driven by the Program requires SoCalGas to maintain and increase where necessary the expansion of these resources.

Project Milestones:

- Hire and train new employee: 6 months
- Purchase and install mobile gas speciation materials in van: As needed

**2022 SB 1371 Compliance Plan**  
**Chapter 19: Gas Speciation**

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
2 Technicians	\$200,000	\$200,000	\$880,000
Lab Materials	\$20,000	\$20,000	\$48,400
<b>Total</b>	<b>\$220,000</b>	<b>\$200,000</b>	<b>\$928,400</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$1.0 million
<b>Average Annual Revenue Requirement</b>
\$0.5 million

Cost Assumptions:

- Annual cost of \$100K per Technician for two (2) Technicians
- Lab materials cost estimate based on historical cost for similar materials/tools

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 19A: Historical Project Schedule for Gas Speciation

**2022 SB 1371 Compliance Plan**  
**Chapter 20: Public Leak Maps**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

**Best Practice 20b: Geographic Tracking**

Utilities shall develop methodologies for improved geographic tracking and evaluation of leaks from the gas systems. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve geographic evaluation and tracking of leaks to assist in demonstrations of actual emissions reductions. Leak detection technology should be capable of transferring leak data to a central database in order to provide data for leak maps. Geographic leak maps shall be publicly available with leaks displayed by zip code or census tract.

In 2021, SoCalGas developed and published publicly available geographic maps of Distribution Main and Services leak information (e.g., zip codes & volume of emissions). The list of the Distribution Main and Services leaks is available to the public under Appendix 4 of the Annual Emissions Reports. SoCalGas updates the leak information in Q3 of each year because the submission date of the Annual Emissions Report is usually June 15th of each year. The maps allow customers to navigate the map via zip codes and view the current and historic volume of emissions associated with the zip code. The website address for the maps is as follows: <https://www.socalgas.com/stay-safe/distribution-pipelines-emissions-map>.

Emission Reductions Achieved:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

Cost Effectiveness Evaluation on Historic Work:

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 2. Proposed New or Continuing Measure**

SoCalGas will maintain and annually update the publicly available geographic maps of Distribution Main & Services Leaks information with the latest data of the Annual Emissions Report.

Project Milestones:

- Update the maps with the Annual Emissions Reports information: Q3 Annually

**2022 SB 1371 Compliance Plan**  
**Chapter 20: Public Leak Maps**

**Part 3. Abatement Estimates**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Labor	\$150,000	\$150,000	\$660,000
<b>Total</b>	<b>\$150,000</b>	<b>\$150,000</b>	<b>\$660,000</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$0.7 million
<b>Average Annual Revenue Requirement</b>
\$0.3 million

**Part 5. Cost Effectiveness/Benefits**

Because this measure is a technology enhancement and/or process improvement(s) that supports the overall Program, emission reductions and cost-effectiveness benefits directly attributed to its implementation cannot be calculated.

**Part 6. Supplemental Information/Documentation**

Attachment 20A: Historical Project Schedule for Public Leak Maps

## 2022 SB 1371 Compliance Plan

### Chapter 21: Leak and Vented Emission Reduction – Transmission Compressor Facilities

#### **Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 23: Minimize Emissions from Operations, Maintenance and Other Activities</b>
Utilities shall minimize emissions from operations, maintenance, and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e., low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.
<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.
<b>Best Practice 19: Aboveground Leak Surveys</b>
Utilities shall conduct frequent leak surveys and data collection at aboveground transmission and high-pressure distribution (above 60 psig) facilities including Compressor Stations, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R aboveground and pressure above 300 psig only). At a minimum, aboveground leak surveys and data collection must be conducted on an annual basis for compressor stations and gas storage facilities.

Aboveground leak surveys at Transmission Compressor facilities have historically been completed to meet the requirements of 49 C.F.R. Part 192 and CPUC’s G.O. 112-F; California Air Resources Board’s (CARB) Oil and Gas Rule became effective January 1, 2018, which requires quarterly leak surveys at several Transmission Compressor facilities. These surveys meet the requirement for Best Practice 19. However, most of the surveys use equipment to detect leaks rather than equipment that measures the concentration of the leak to levels required by the CARB. In addition to the regularly scheduled leak surveys, other surveys are performed using soap tests and by monitoring sight, sound, and smell leak indications.

In the 2020 Compliance Plan, SoCalGas was approved to continue to conduct blowdown reduction efforts in Transmission. The focus has mainly been on Transmission pipelines, but SoCalGas has begun exploring the use of blowdown reduction methods at Transmission Compressor Facilities.

#### Emission Reductions Achieved:

Emissions reductions for this program are variable due to nature of the project and have not been evaluated for 2018-2020 because SoCalGas did not request any funding for the period

#### Cost Effectiveness Evaluation on Historic Work:

Cost effectiveness cannot be calculated at this time due to insufficient data.

## **2022 SB 1371 Compliance Plan**

### **Chapter 21: Leak and Vented Emission Reduction – Transmission Compressor Facilities**

#### **Part 2. Proposed New or Continuing Measure**

SoCalGas has identified several projects to achieve emission reductions in 2023-2024. They will be implemented during normal operations at Transmission Compressor Facilities. Additionally, SoCalGas will continue to explore opportunities for emission reductions.

Although new projects may be identified during the Compliance period, the following projects have been identified for Transmission Compressor Facilities during this Compliance period:

- Utilize stationary or mobile cross compression equipment during station blowdowns to minimize blowdown volumes
- Pilot project to investigate the best method to capture blowdown valve leakage in lieu of acoustic metering
- Modify Emergency Shutdown Block Valve configurations to minimize blowdown volumes while performing Emergency Shutdown system tests
- Replace actuated valves and instruments from gas-powered to air-powered instruments
- Performing preventative maintenance for relief valves
- Repair above ground leaks associated with increased leak survey
- Replace drip tanks that currently vent directly to atmosphere; and explore use of in-line compressors and other new, lower emitting, compressor technologies
- Investigate and develop a quality and maintenance plan for compressor rod packing which will lead to proactive reduction of vented emissions and identification of non-conforming equipment
- Investigate and develop a quality and maintenance plan for compressor rod packing
- Investigate compressor fuel valve fugitive emissions and reduction solutions
- Investigate technologies for reducing fugitive emissions in the pressurized idle mode
- Investigate downstream capture systems for fugitive emissions

SoCalGas also proposes to utilize FLIR (Forward Looking InfraRed) and other visual technologies to conduct daily visual inspections. These visual inspections will assist in identifying leaks and accelerating leak repairs. One (1) additional FTE will be required for these inspections.

#### **Part 3. Abatement Estimates**

Although there is insufficient data to reasonably forecast emissions reductions at this time, SoCalGas anticipates a significant and repeatable reduction through 2030 by means of the activities outlined in the above section. There should be sufficient data to calculate emission reductions in the 2024 Compliance plan.

**2022 SB 1371 Compliance Plan**

**Chapter 21: Leak and Vented Emission Reduction – Transmission Compressor Facilities**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Incremental Staff for Increased Sweeps with FLIR Equipment	\$112,000	\$112,000	\$469,040
<b>Total</b>	<b>\$112,000</b>	<b>\$112,000</b>	<b>\$469,040</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Compressor Facility Blowdown Reduction Pilot	\$2,922,720	\$2,922,720	\$7,334,042
Vented Emission Reduction Projects	\$8,570,000	\$8,570,000	\$21,868,000
Capital Equipment Purchases (FLIR Equipment)	\$235,000	-	\$284,350
<b>Total</b>	<b>11,727,720</b>	<b>\$11,492,720</b>	<b>\$29,486,392</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$90.7 million
<b>Average Annual Revenue Requirement</b>
\$2.1 million

Cost Assumptions:

- \$100K annual salary for Supervisor and FLIR Operator
- \$1,000 monthly O&M cost per FTE
- \$100K for FLIR Camera Cost
- \$125K for Additional Tools for Visual Inspection
- Capital Costs were developed using actuals for similar projects in Storage Operations

**2022 SB 1371 Compliance Plan**

**Chapter 21: Leak and Vented Emission Reduction – Transmission Compressor Facilities**

**Part 5. Cost Effectiveness/Benefits**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities as mentioned in Part 2 above, and SoCalGas anticipates that after 12 months of implementation and recording activities, there should be sufficient data to calculate emission reductions and cost-effectiveness.

**Part 6. Supplemental Information/Documentation**

N/A

**2022 SB 1371 Compliance Plan**  
**Chapter 22: Vapor Collection Systems**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 23: Minimize Emissions from Operations, Maintenance and Other Activities</b>
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Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e., no-bleed) or vents significantly less natural gas (i.e., low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.
--

In the 2018 Compliance Plan, SoCalGas requested and was approved for funding to collect emissions data from compressor rod packing systems and install vapor recovery systems on Compressors. The vapor recovery system would collect rod packing emissions which would otherwise be vented to atmosphere. SoCalGas selected the Blythe Compressor Station to be the first Vapor Recovery System project. This system would be evaluated for cost effectiveness before proposing similar systems at other compressor stations. Being the first system of its kind, the project experienced several delays and design changes associated with conditions encountered at the station during construction. The Blythe Vapor Recovery system was completed in 2021. The system will allow for the collection of emissions from compressor rod packing that would otherwise be vented directly to atmosphere. No incremental staffing was required to implement this measure.

Theoretically, the calculation of total potential emissions savings assuming the system is 100% effective is shown below:

Piston rod packing systems are used to maintain a tight seal around piston rods within compressor engines. These packing systems are designed to vent under normal operation. This estimate is based on a vent rate of two (2) cubic feet per minute (CFM) per packing system, which operated for 439,320 minutes in 2021. There are six (6) packings per compressing engine and two (2) compressor engines found in the Blythe Compressor Station. The vapor recovery system will reduce emissions on these packing systems and, assuming the operating hours in 2021 represents the average operating hours through 2030, the potential emission reduction is calculated below:

$$\begin{aligned} 2 \text{ CF/min} \times 439,320 \text{ min/year} \times 6 \text{ packings/engine} \times 2 \text{ engines/plant} &= 10,543,680 \text{ CF/year} \\ &= 10,544 \text{ MCF/year} \end{aligned}$$

**Emission Reductions Achieved:**

The Blythe Vapor Recovery system was completed in 2021 and therefore did not realize any reductions in 2018-2020.

Since August 2021, the Blythe Vapor Recovery system has not been utilized due to the pipeline downstream being shut down for a large capital project.

**2022 SB 1371 Compliance Plan**  
**Chapter 22: Vapor Collection Systems**

Cost Effectiveness Evaluation on Historic Work:

Cost effectiveness will not be calculated as no funds were requested for this initiative in the last Compliance Plan.

**Part 2. Proposed New or Continuing Measure**

SoCalGas will not be proceeding with this initiative at other compressor stations. Based on the results of the Blythe Vapor Recovery system, SoCalGas has determined that a similar implementation at other compressor stations will not be cost effective. SoCalGas will explore more cost-effective measures at Transmission Compressor Stations to further reduce emissions.

**Part 3. Abatement Estimates**

Although the Vapor Recovery system was operational as of August 2021, the compressors have been out of commission due to a large capital project downstream of the station. Because of this, there were no reductions realized in 2021. The system is anticipated to be operational in 2022 and is anticipated to see a reduction upwards of 10,544 MCF (as explained in Part 1).

**Forecast of Emission Reductions from Baseline (MCF)**

<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
10,544	10,544	10,544	10,544	10,544	10,544	10,544	10,544

**Part 4. Cost Estimates**

SoCalGas will not be requesting funds for this initiative in this Compliance period.

**Part 5. Cost Effectiveness/Benefits**

Cost effectiveness will not be calculated because SoCalGas will not be requesting funds for this initiative in this Compliance period.

**Part 6. Supplemental Information/Documentation**

Attachment 22A: Historical Project Schedule for Vapor Collection Systems

**2022 SB 1371 Compliance Plan**  
**Chapter 23: Distribution Above Ground Leak Survey**

**Part 1. Evaluate the Current Practices Addressed in this Chapter**

This Chapter addresses the following Best Practices:

<b>Best Practice 19 Distribution: Aboveground Leak Surveys</b>
Utilities shall conduct frequent leak surveys and data collection at above ground transmission and high-pressure distribution (above 60 psig) facilities including Compressor Stations, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R above ground and pressures above 300 psig only). At a minimum, above ground leak surveys and data collection must be conducted on an annual basis for compressor stations and gas storage facilities.

Above ground leakage surveys have historically been completed to meet the requirements of 49 C.F.R. Part 192 and CPUC's G.O. 112-F, which also satisfy the requirements defined in Best Practice 19. Historically, not all leakage survey inspections performed on Measurement and Regulation (M&R) stations have been performed using instrumentation, resulting in leak indications not being captured. Currently, many of the M&R Stations leak inspections are performed using soap tests and by monitoring for sight, sound, and smell.

In the 2018 Compliance Plan, SoCalGas requested and was approved funding to provide M&R Technicians with instrumentation to begin performing and recording instrumented leakage surveys. SoCalGas purchased the required instruments to perform instrumented inspections. SoCalGas also updated Gas Standard 184.0275, *Inspection Schedule – Regulator Station, Power Generating Plant Regulation Equipment Requirements*, to require M&R Technicians to soap test all connections during inspections and leave facilities free of leaks.

In 2020, SoCalGas ordered approximately 21 Remote Methane Leak Detectors to assist with leak surveys on Regulator Stations. Due to the COVID-19 pandemic, in-person training was postponed with approximately 150 employees needing in person training for the new instrumentation. In 2021, SoCalGas conducted Train-the-Trainer classes consisting of training supervisors who then would train field personnel. No incremental staffing was required to implement this measure because the measurement tool is an additional piece of equipment that helps detect methane leaks on SoCalGas regulator stations in addition to what is being practiced in the field, as mentioned above.

**Emissions Reduction and Cost Effectiveness Evaluation**

Due to constraints presented by the COVID-19 pandemic, including limited training, there is insufficient data to determine the emissions reductions and cost effectiveness achieved by this measure at this time as there was not a complete year of data to study. After 2022, there will be more data to determine the emission reductions and cost effectiveness for this measure.

**2022 SB 1371 Compliance Plan**  
**Chapter 23: Distribution Above Ground Leak Survey**

**Part 2. Proposed New or Continuing Measure**

SoCalGas will continue performing instrumented above ground leakage surveys. The required instruments for M&R to perform above ground leakage surveys have been purchased and all qualified employees have been trained. SoCalGas is not requesting additional funding for this measure in this Compliance Period.

**Part 3. Abatement Estimates**

The CPUC approved transitioning to leaker-based emission factors to estimate Distribution M&R Stations Emissions. SoCalGas has the leaker-based data and information for 2020 & 2019. Therefore, it is omitting this category from its overall total emissions and replacing it with the added "Component Leaks Vented" and "Component Leaks Fugitive" as Emission Source Categories in the 2021 Annual Emissions Report in Appendix 8.

**Part 4. Cost Estimates**

SoCalGas is not requesting funding for this measure during this Compliance period.

**Part 5. Cost Effectiveness/Benefits**

Not applicable.

**Part 6. Supplemental Information/Documentation**

Attachment 23A: Historical Project Schedule for Distribution Above Ground Leak Survey

**2022 SB 1371 Compliance Plan**  
**Chapter 24: Storage Aboveground Leak Survey**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 19: Aboveground Leak Surveys</b>
Utilities shall conduct frequent leak surveys and data collection at aboveground transmission and high-pressure distribution (above 60 psig) facilities including Compressor Stations, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R aboveground and pressure above 300 psig only). At a minimum, aboveground leak surveys and data collection must be conducted on an annual basis for compressor stations and gas storage facilities.
<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.

Aboveground leak surveys at storage facilities are completed to meet the requirements of 49 C.F.R. Part 192, Subpart (Maintenance) and CPUC’s G.O. 112-F. These surveys meet the requirement for Best Practice 19. However, most of the surveys use equipment to detect the leak rather than equipment that measures the concentration of the leak to levels required by the California Air Resources Board (CARB). In addition to the regularly scheduled leak surveys, other surveys are performed using soap tests and by monitoring for sight, sound, and smell leak indications. CARB’s Oil and Gas Rule became effective January 1, 2018 and requires quarterly leak surveys at underground storage facilities. CARB also requires storage facilities implement a monitoring plan effective August 6, 2019. The monitoring plan includes ambient methane monitoring, wellhead leak detection monitoring, and optical gas imaging of a well blowout.

In October 2016, aboveground storage fence-line methane sensors were installed at an underground storage facility to monitor atmospheric methane concentrations.

In the 2018 Compliance Plan, SoCalGas was approved to provide Storage Technicians with instrumentation to begin performing EPA Method 21 leak survey and to accelerate leak repairs. SoCalGas purchased the required instruments and has been accelerating leak repairs beyond the timeframes required by regulations and compliance requirements.

To support these efforts, SoCalGas staffed five (5) Station Assistants and one (1) Station Supervisor. A total of six (6) employees are dedicated to the implementation of this measure.

**Emission Reductions Achieved:**

Emission reductions cannot be calculated for this measure, as the efforts overlap with Chapter 11 – Blowdown Reduction in Storage Operations. Storage Aboveground Leak Survey directly contributes to the emission reductions outlined in Chapter 11.

**2022 SB 1371 Compliance Plan**  
**Chapter 24: Storage Aboveground Leak Survey**

Cost Effectiveness Evaluation on Historic Work:

There is insufficient data to reasonably calculate emission reductions from these activities alone (as explained in Part 1 emissions reductions), emission reductions achieved in Storage Operations are outlined in Chapter 11 – Blowdown Reduction in Storage Operations.

**Part 2. Proposed New or Continuing Measure**

SoCalGas requests funding to continue to perform instrumented surveys and accelerate leak repairs in Storage Operations. SoCalGas proposes to make efforts to repair all leaks sooner than required by other regulations:

CalGEM gas wells

- Methane concentration greater than 50,000 ppm and repaired in less than one day
- Methane concentration between 10,000 and 50,000 ppm and repaired in less than five days

LDAR inspected facilities

- Methane concentration greater than 50,000 ppm and repaired in less than two days
- Methane concentration between 10,000 and 50,000 ppm and repaired in less than five days
- Methane concentration between 1,000 and 10,000 ppm and repaired in less than fourteen days

Beyond the instrumented surveys, SoCalGas is also proposing to utilize FLIR (Forward Looking InfraRed) and other visual technologies to conduct daily visual inspections. These visual inspections will assist in identifying leaks and accelerating leak repairs. One (1) additional FTE will be required for these inspections.

**Part 3. Abatement Estimates**

Emission reductions cannot be calculated for this measure, as the efforts overlap with Chapter 11 – Blowdown Reduction in Storage Operations. Storage Aboveground Leak Survey directly contributes to the emission reductions outlined in Chapter 11.

**2022 SB 1371 Compliance Plan**  
**Chapter 24: Storage Aboveground Leak Survey**

**Part 4. Cost Estimates**

<b>O&amp;M Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 – 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded O&amp;M Cost with Contingency</b>
Storage Above Ground Leak Survey	\$603,288	\$603,288	\$2,511,907
Incremental Staff for Increased Sweeps with FLIR Equipment	\$112,000	\$112,000	\$469,040
<b>Total</b>	<b>\$715,288</b>	<b>\$715,288</b>	<b>\$2,980,947</b>

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Capital Equipment Purchases (FLIR Equipment)	\$235,000	-	\$284,350
<b>Total</b>	<b>\$235,000</b>	<b>-</b>	<b>\$284,350</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$3.8 million
<b>Average Annual Revenue Requirement</b>
\$1.6 million

Cost Assumptions:

- Represented Employee Hourly Rate: \$41.47
- Five (5) Incremental Station Technician FTE's
- One (1) Additional Incremental FTE for FLIR Inspection
- One (1) Incremental Station Supervisor
- \$100K annual salary for Supervisor and FLIR Operator
- \$1,000 monthly O&M cost per FTE
- \$100K for FLIR Camera Cost
- \$125K for Additional Tools for Visual Inspection

**2022 SB 1371 Compliance Plan**  
**Chapter 24: Storage Aboveground Leak Survey**

**Part 5. Cost Effectiveness/Benefits**

Emission reductions and cost effectiveness cannot be calculated for this measure, as the efforts overlap with Chapter 11 – Blowdown Reduction in Storage Operations. Storage Aboveground Leak Survey directly contributes to the emission reductions outlined in Chapter 11.

**Part 6. Supplemental Information/Documentation**

Attachment 24A: Historical Project Schedule for Storage Aboveground Leak Survey

**2022 SB1371 Compliance Plan**  
**Chapter 25: Distribution Above Ground Leak Repair**

**Part 1. Evaluate the Current Practices Addressed in this Chapter**

This Chapter addresses the following Best Practices:

<b>Best Practice 19: Above Ground Leak Surveys</b>
Utilities shall conduct frequent leak surveys and data collection at above ground transmission and high-pressure distribution (above 60 psig) facilities including Compressor Stations, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R above ground and pressures above 300 psig only). At a minimum, above ground leak surveys and data collection must be conducted on an annual basis for compressor stations and gas storage facilities.
<b>Best Practice 21: Find It, Fix It</b>
Utilities shall repair leaks as soon as reasonably possible after discovery, but in no event, more than three (3) years after discovery. Utilities may make reasonable exceptions for leaks that are costly to repair relative to the estimated size of the leak.

In the 2018 Compliance Plan, SoCalGas requested and was approved funding to repair its above ground (AG) minor leak inventory. In October 2018, this inventory included roughly 5,400 AG minor leaks. In 2019, SoCalGas repaired approximately 5,000 of these AG minor leaks. In March of 2020, SoCalGas completed mitigating approximately 400 leaks to reduce SoCalGas existing inventory to zero. For the rest of 2020, SoCalGas worked on mitigating leaks within six (6) months of detection.

In addition to reducing the AG minor leak inventory in 2020, SoCalGas updated its Gas Standard 223.0126. *Above Ground Leakage Classification and Mitigation Schedules*, for AG minor leaks. Previously, Operations had the flexibility to repair AG minor leaks when it was practical to do so. Gas Standard 223.0126 was revised in 2020 requiring AG minor leaks discovered by Distribution to be classified as “AG Non-Hazardous” leaks and to be repaired in a time frame of ten (10) days to six (6) months, depending on the leak proximity to a building. Distribution no longer classifies above ground leaks as AG minor at the time of detection.

In 2021, SoCalGas continued the efforts of repairing AG Non-Hazardous leaks within six (6) months of detection and not having an inventory by that year’s end. To support these leak repair efforts, SoCalGas used incremental field employees discussed in Chapters 1 and 2 to manage the AG Non-Hazardous inventory.

Emission Reductions Achieved

AG Non-Hazardous leaks are included in Meter Set Assembly population-based emission factors. Therefore, AG Non-Hazardous leak repair emission reduction efforts are not being accounted for in the Annual Emissions Report.

Cost Effectiveness Evaluation on Historic Work

No cost effectiveness will be calculated for this measure in the 2022 Compliance Plan because emissions for AG-Non-Hazardous leaks are part of a population-based emission factor and not being accounted for in the Annual Emissions Report.

**2022 SB1371 Compliance Plan**  
**Chapter 25: Distribution Above Ground Leak Repair**

**Part 2. Proposed New or Continuing Measure**

SoCalGas will continue to repair all AG Non-Hazardous leaks within ten (10) days to six (6) months depending on the leak proximity to a building.

**Part 3. Abatement Estimates**

As mentioned above no emission reductions can be forecasted as emissions for AG-Non-Hazardous leaks are being calculated using population-based emission factors. If a decision is made to switch to leaker-based emissions, the reductions will be included in the next Annual Emissions Report.

**Part 4. Cost Estimates**

SoCalGas is not requesting funding for this measure during this Compliance period.

**Part 5. Cost Effectiveness/Benefits**

No cost effectiveness will be forecasted for this measure in the 2022 Compliance Plan because emissions for AG-Non-Hazardous leaks are part of a population-based emission factor and not being accounted for in the Annual Emissions Report.

**Part 6. Supplemental Information/Documentation**

Attachment 25A: Historical Project Schedule for Distribution Above Ground Leak Repair

**2022 SB 1371 Compliance Plan**  
**Chapter 26: High Bleed Device Replacement**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This Chapter addresses the following Best Practice(s):

<b>Best Practice 23: Minimize Emissions from Operations, Maintenance and Other Activities</b>
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Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e. low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.
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SoCalGas has been addressing the replacement of high-bleed pneumatic devices since 1993 through the EPA Natural Gas STAR<sup>1</sup> Best Practice. Pneumatic devices powered by pressurized natural gas are used widely in the natural gas industry as pressure regulators and valve controllers. Emission reductions may be achieved by replacing high-bleed devices with low-bleed devices, retrofitting high-bleed devices, and improving maintenance practices. Individual savings will vary depending on the design, condition, and specific operating conditions of the controller.

Pneumatic devices come in three basic designs:

1. Continuous bleed devices are used to modulate pressure and will generally vent gas at steady rate
2. Actuating or intermittent bleed devices perform snap-acting control and release gas only when they stroke a valve open or closed or as they throttle gas flows
3. Self-contained devices release gas into the downstream pipeline, not to the atmosphere

To reduce emissions from pneumatic devices the following options can be pursued, either alone or in combination:

- Replacement of high-bleed devices with low-bleed devices having similar performance capabilities
- Installation of low bleed retrofit kits on operating devices
- Enhanced maintenance, cleaning and tuning, repairing/replacing leaking gaskets, tubing fittings, and seals

In the 2018 Compliance Plan, SoCalGas was approved to remove the eight (8) remaining High Bleed Pneumatic Devices found in operation. As of 2020, all eight (8) devices have been removed or replaced. In 2021, no new devices were identified, removed, or replaced from the system. The asset verification project may potentially identify high bleed devices that would require removal or replacement in the future.

No incremental staffing was required to implement this measure.

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<sup>1</sup> Natural Gas STAR Program | US EPA: <https://www.epa.gov/natural-gas-star-program/natural-gas-star-program>

**2022 SB 1371 Compliance Plan**  
**Chapter 26: High Bleed Device Replacement**

Emission Reductions Achieved:

The estimated emission reductions achieved to date are 1,337 MCF for the calendar years 2018 and 2019 and 1,500 MCF for the calendar year 2020. Emissions from high bleed pneumatic devices are captured in population-based emission factors as part of a broader emission source category. As such, there is no separate baseline for high bleed pneumatic devices and the reductions will not be captured in the Annual Emissions Report.

**Historical Emission Reductions (MCF)**

2018	2019	2020
1,337	1,337	1,500

No additional emission reductions are expected in 2021 and 2022 as no new high bleed devices have been identified.

Cost Effectiveness Evaluation on Historic Work:

Historical cost effectiveness was not evaluated for the 2020 Compliance period because SoCalGas did not request any additional funding for this program.

**Part 2. Proposed New or Continuing Measure**

SoCalGas has removed or replaced all known high bleed pneumatic devices since 2018. No additional high bleed pneumatics replacements are being proposed at this time; however, SoCalGas is exploring opportunities to further reduce emissions by replacing high use intermittent or low bleed devices and other pneumatic devices that vent during operation and maintenance. Although intermittent bleed devices only vent gas during use, there are potential devices in the SoCalGas system that are used so frequently they may warrant replacement. Full implementation is dependent on results of a Transmission M&R Station Emission RD&D study. SoCalGas is proposing to initiate a trial implementation to replace these constant low bleed devices with either electro-hydraulic or compressed air pneumatics at a several locations to assess the cost effectiveness of this implementation.

No incremental staffing is forecasted to support this measure during this Compliance period.

**Part 3. Abatement Estimates**

The estimated emission reductions forecasted are 1,500 MCF per year with all eight (8) high bleed devices removed. There is potential for more emission reductions with execution of the trial implementation (refer to previous section) anticipated to be conducted by end of 2023. These reductions cannot be reasonably estimated at this time and are not included in the forecast.

**2022 SB 1371 Compliance Plan**  
**Chapter 26: High Bleed Device Replacement**

**Forecast of Emission Reductions from Baseline (MCF)**

2023	2024	2025	2026	2027	2028	2029	2030
1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500

The emission reductions for this measure are anticipated to remain constant through 2030, as all high bleed devices have been removed and the scope of this work is completed. Emissions can be further reduced pending results of the proposed constant bleed device replacement implementation. The estimated emission reductions shown in the table above will not be reflected in the annual emission reports because emissions from this category are calculated on a population-based emission factor for Transmission M&R Stations. Individual pneumatic device removal and replacements cannot reflect emission reductions until the Emissions Report template is changed to a leak-based model.

**Part 4. Cost Estimates**

<b>Capital Cost Estimates</b>			
<b>Activity</b>	<b>2023</b>	<b>2024</b>	<b>2023 - 2024</b>
	<b>Direct</b>	<b>Direct</b>	<b>Total Loaded Capital Cost with Contingency</b>
Electro-Hydraulic Actuator Pilot	\$4,603,718	\$6,905,577	\$16,355,108
<b>Total</b>	<b>\$4,603,718</b>	<b>\$6,905,577</b>	<b>\$16,355,108</b>

<b>Total Revenue Requirement over Expected Life of Investment</b>
\$40.5 million
<b>Average Annual Revenue Requirement</b>
\$20.3 million

Cost Assumptions:

- Assume two (2) stations to be upgraded in 2023 and three (3) in 2024
- Estimate developed utilizing actuals from projects with similar scope
- This funding will be required if SoCalGas proceeds with the trial implementation

**Part 5. Cost Effectiveness/Benefits**

There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities as mentioned in Part 3. SoCalGas anticipates that, after 12 months of implementation and recording activities, there should be sufficient data to calculate emission reductions and cost effectiveness.

**2022 SB 1371 Compliance Plan**  
**Chapter 26: High Bleed Device Replacement**

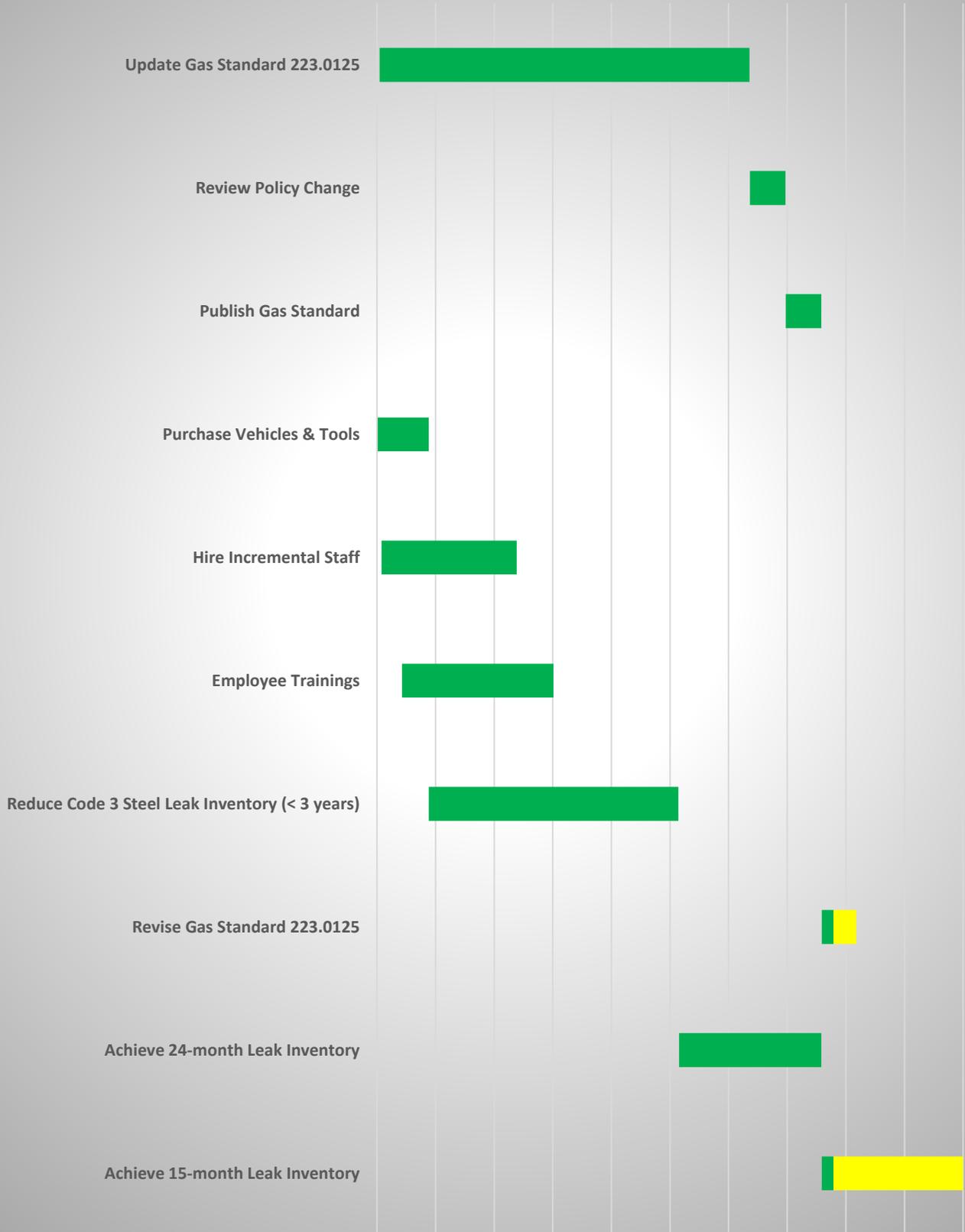
**Part 6. Supplemental Information/Documentation**

Attachment 26A: Historical Project Schedule for High Bleed Device Replacement

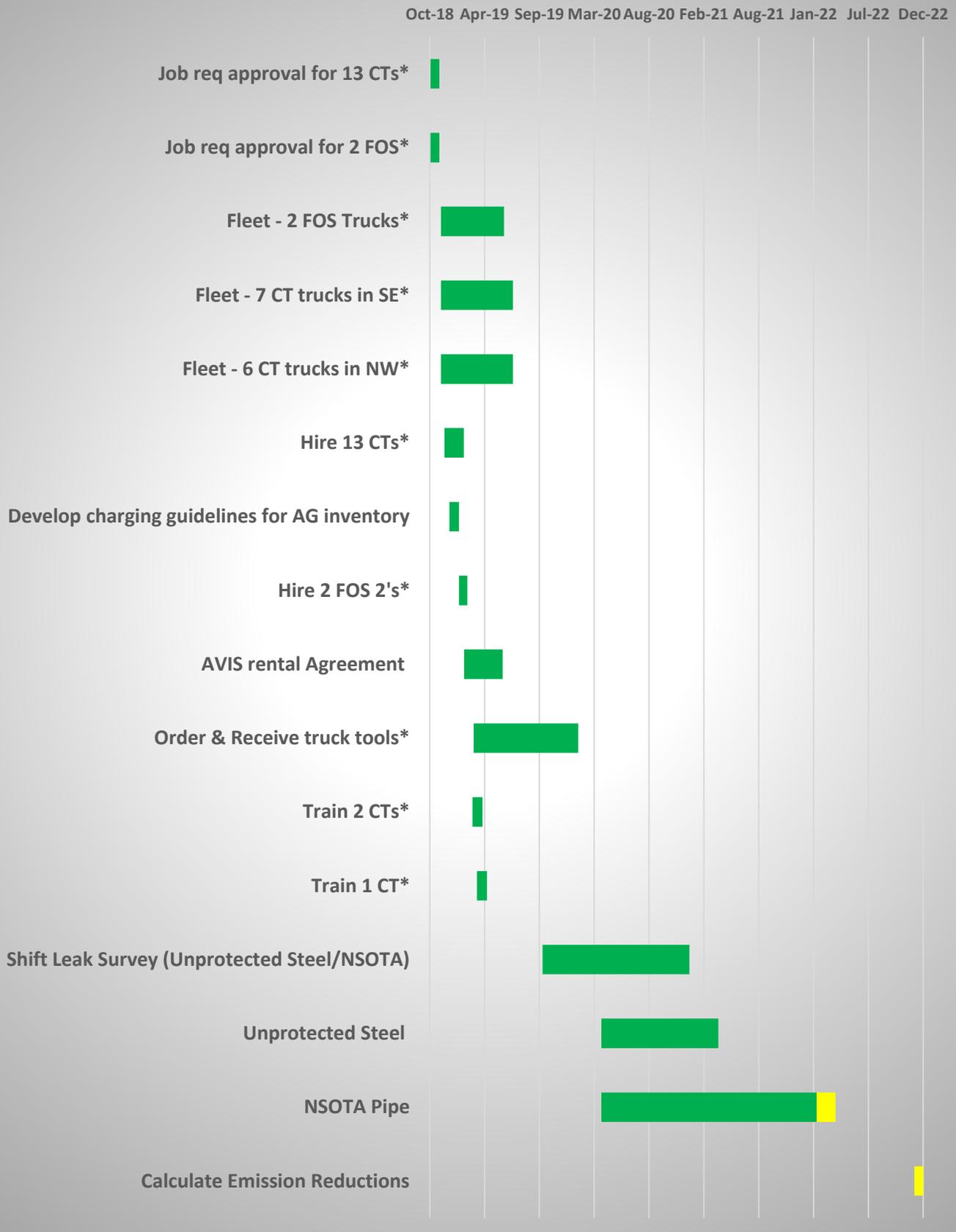
# ATTACHMENTS

# Ch 1. Leak Inventory Reduction

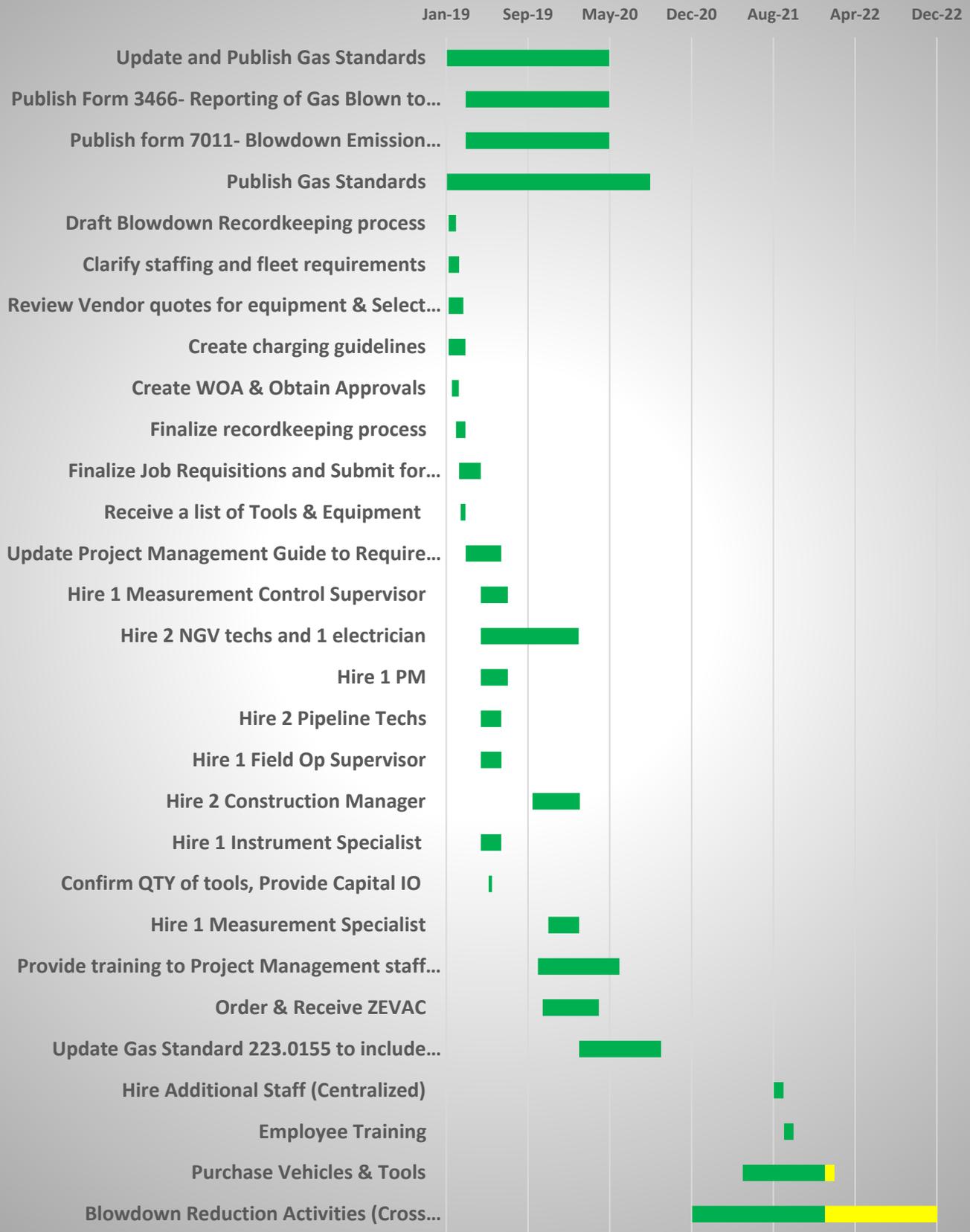
Nov-18 Apr-19 Sep-19 Feb-20 Jul-20 Dec-20 May-21 Oct-21 Mar-22 Jul-22 Dec-22



## Ch 2. Increased Leak Survey



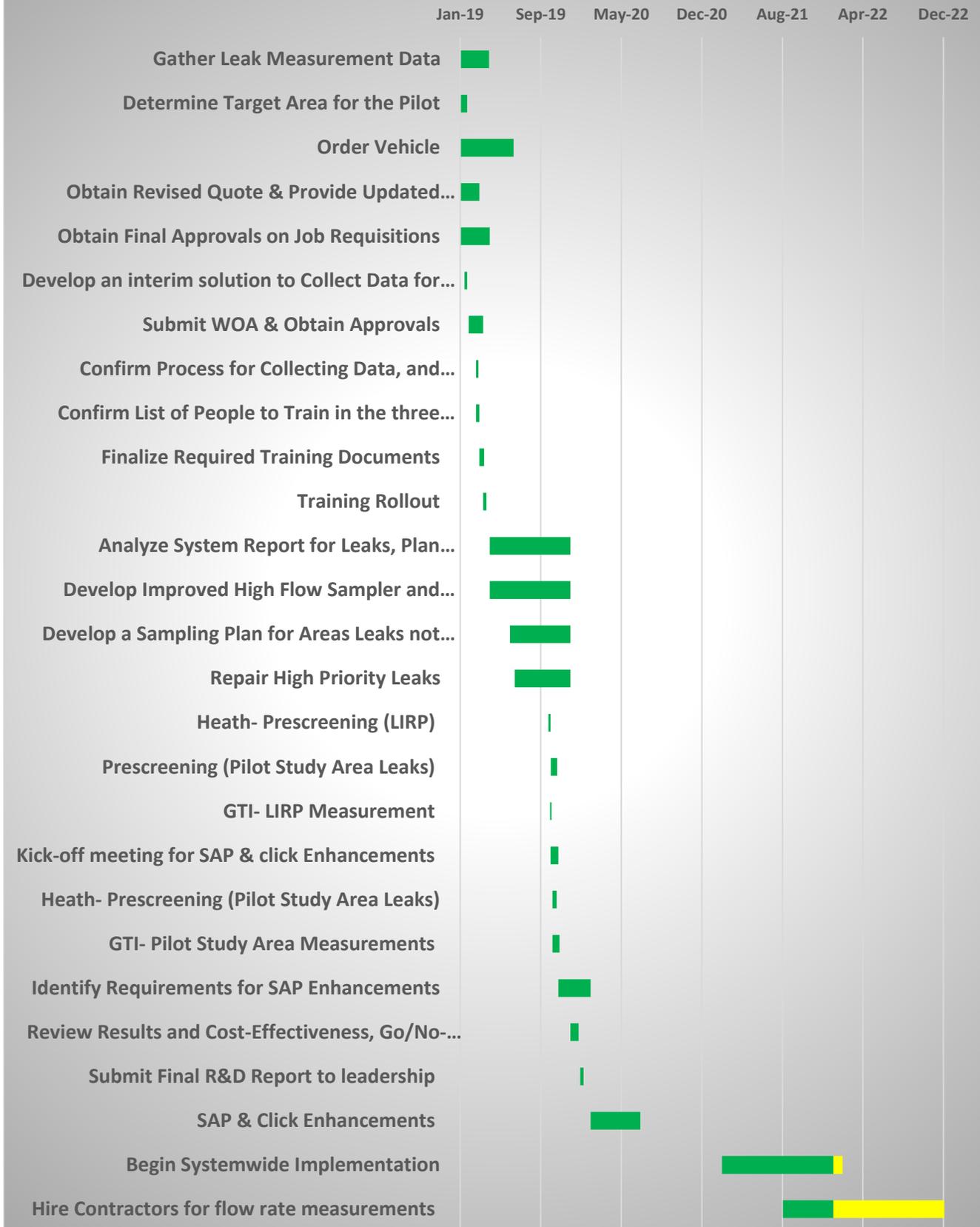
## Ch 3. Blowdown Reduction Activities



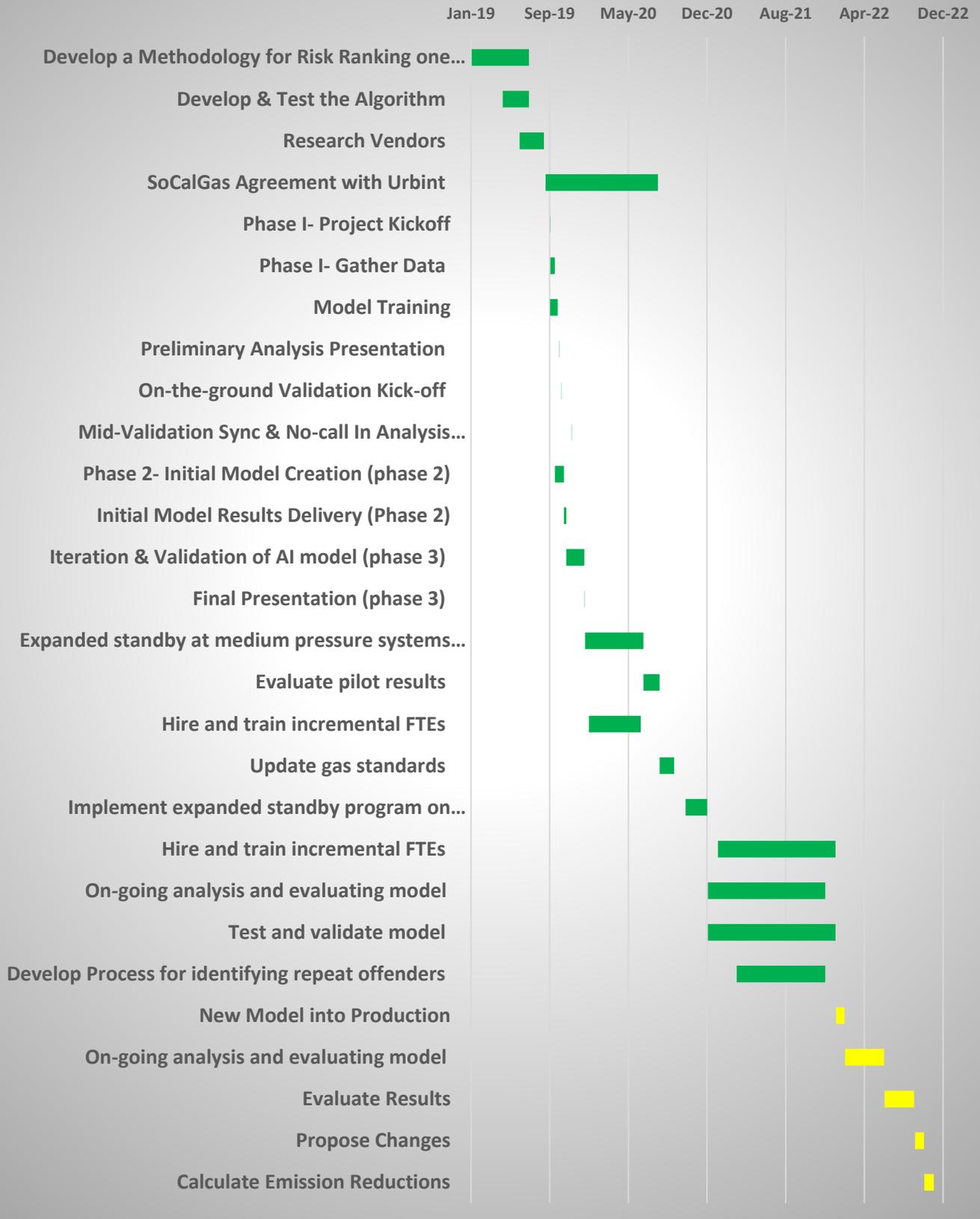
### Ch 3. Blowdown Reduction Planning Tool



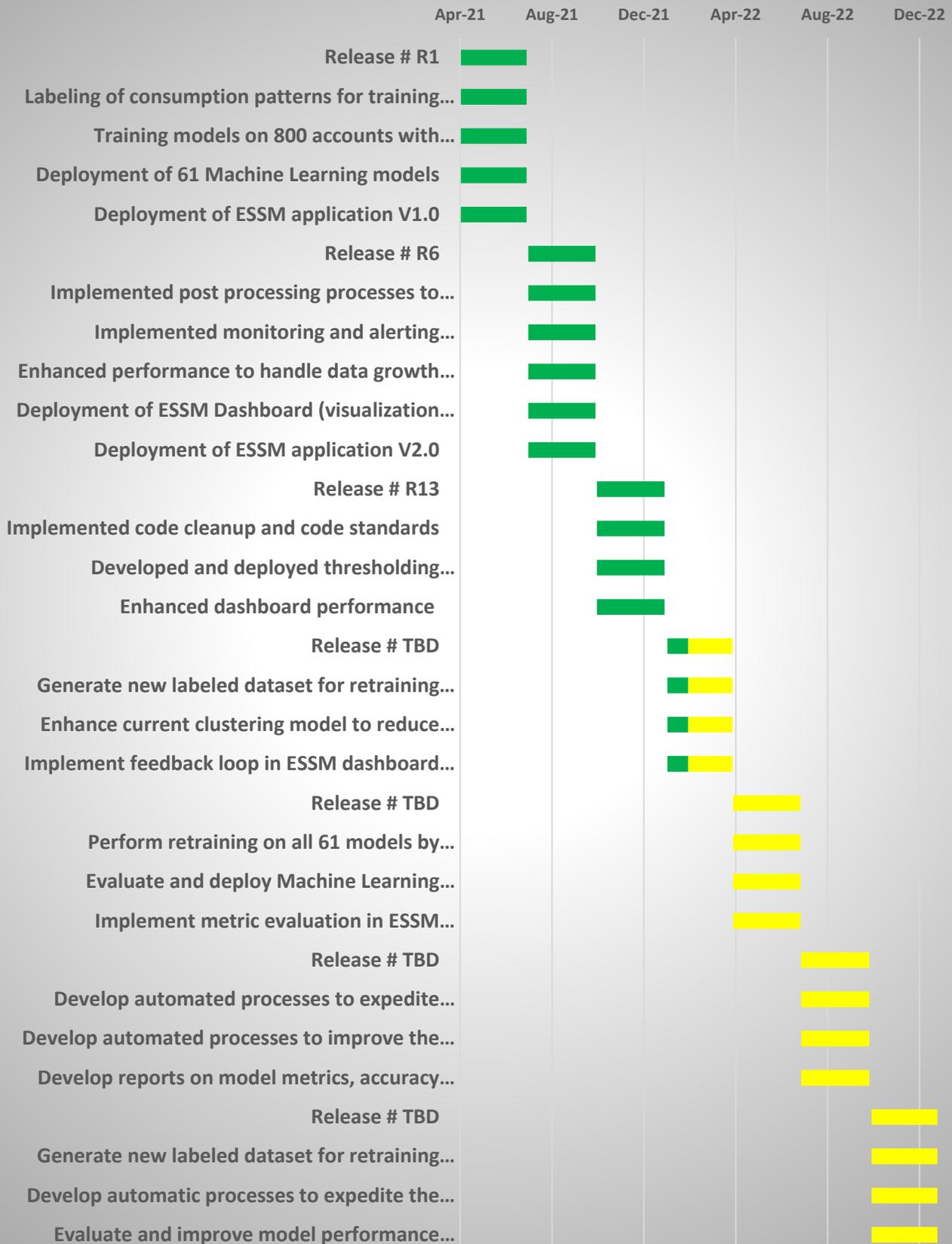
# Ch 4. Large Leak Prioritization



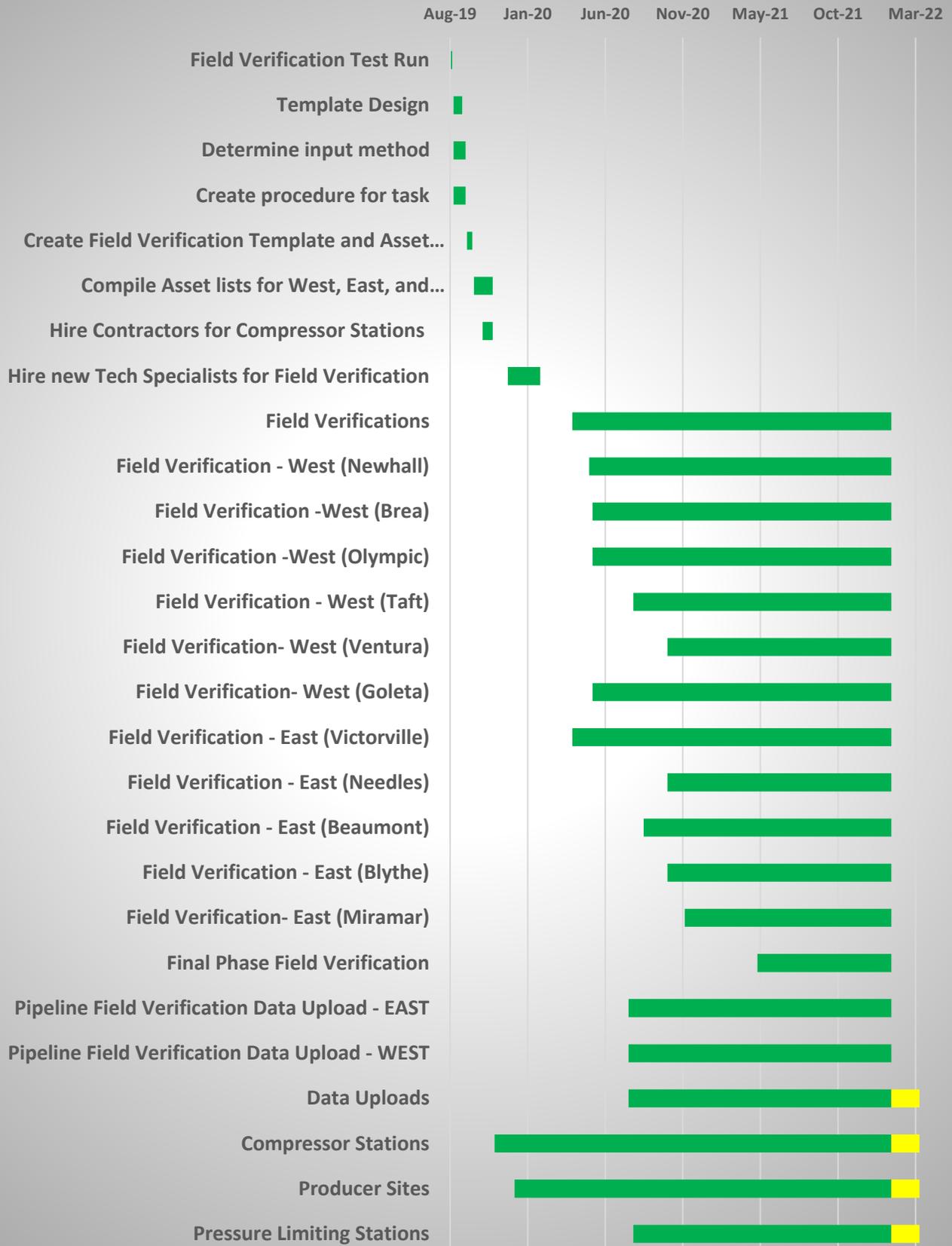
## Ch 5. Damage Prevention Algorithm & Proactive Intervention



## Ch 6. Advanced Meter Analytics



## Ch 7. Recordkeeping and Field Verifications

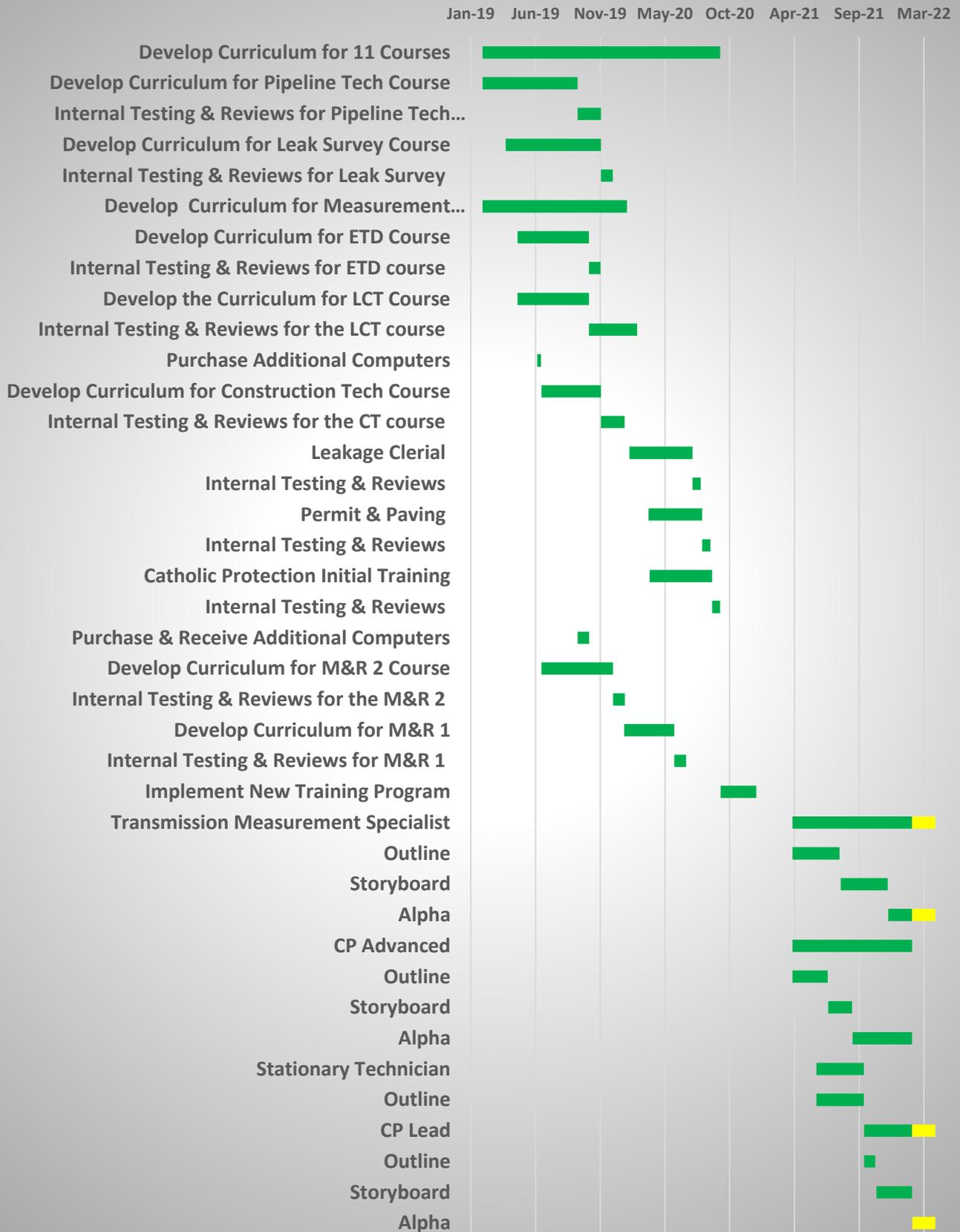


# Ch 8. Geographic Tracking - AVEVA

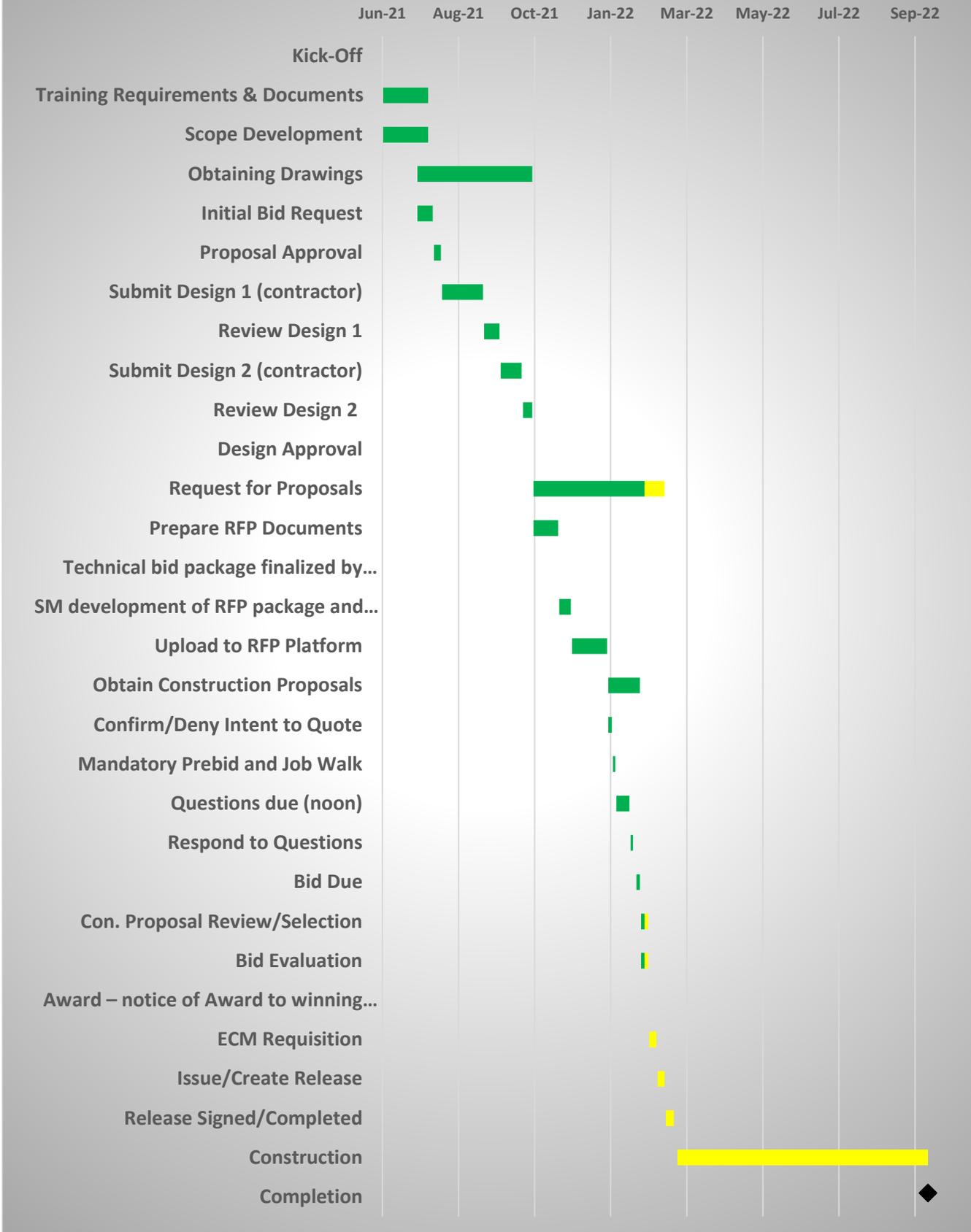
Apr-19 Sep-19 Mar-20 Aug-20 Feb-21 Jul-21 Jan-22 Jul-22 Dec-22



# Ch 9. Competency Based Training Development

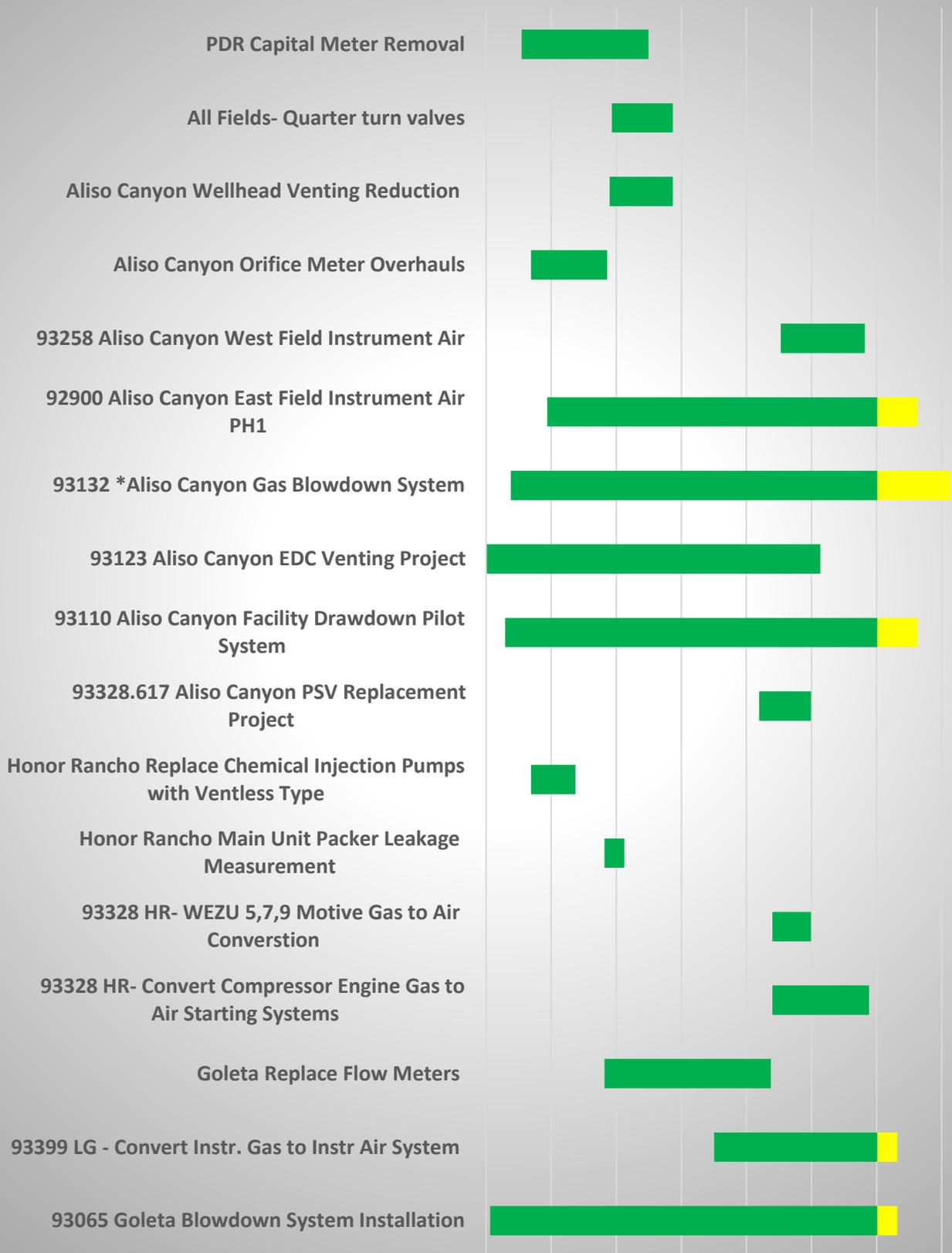


## Ch 10. Training Facility Enhancements

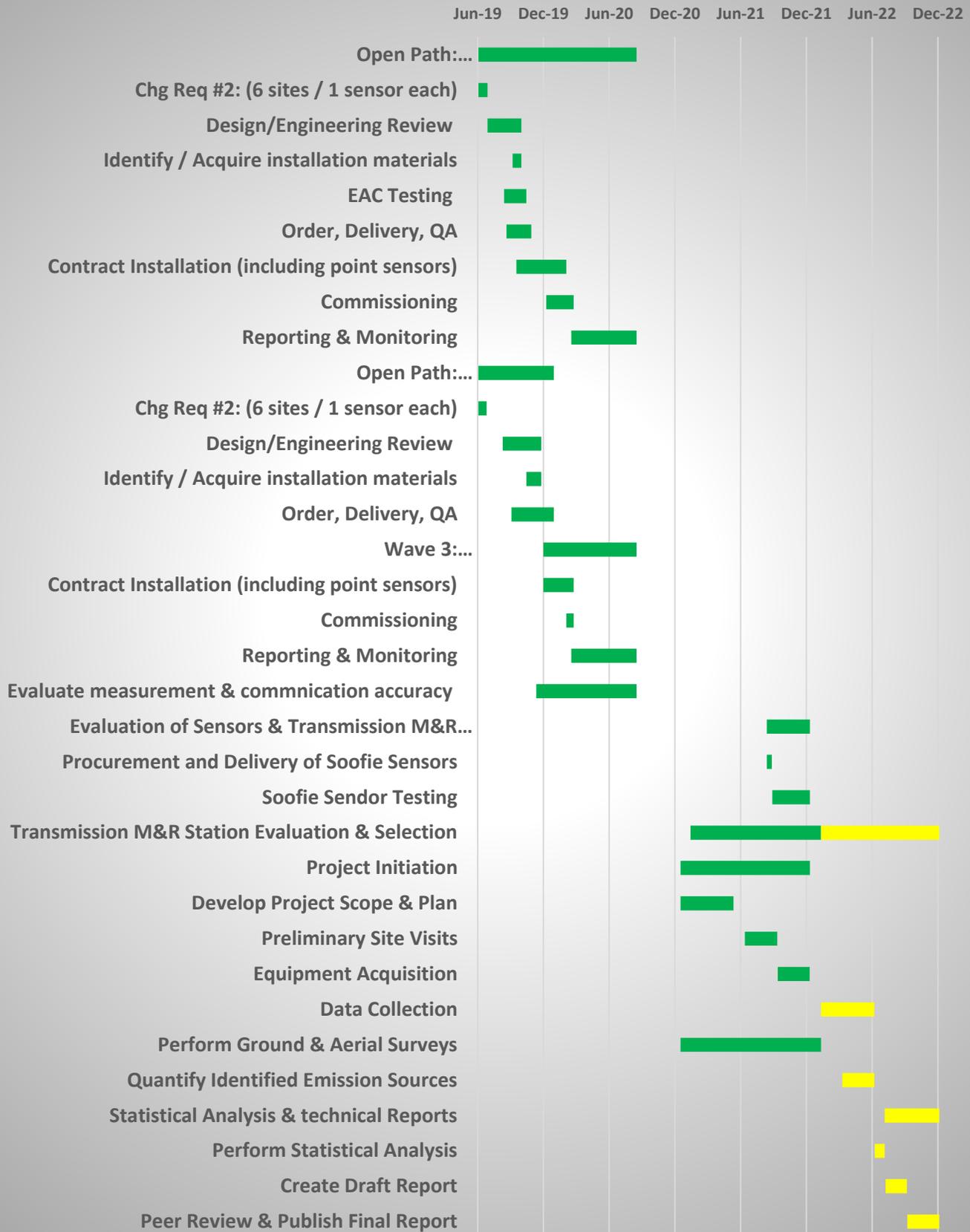


## Ch 11. Blowdown Reduction Projects at Storage

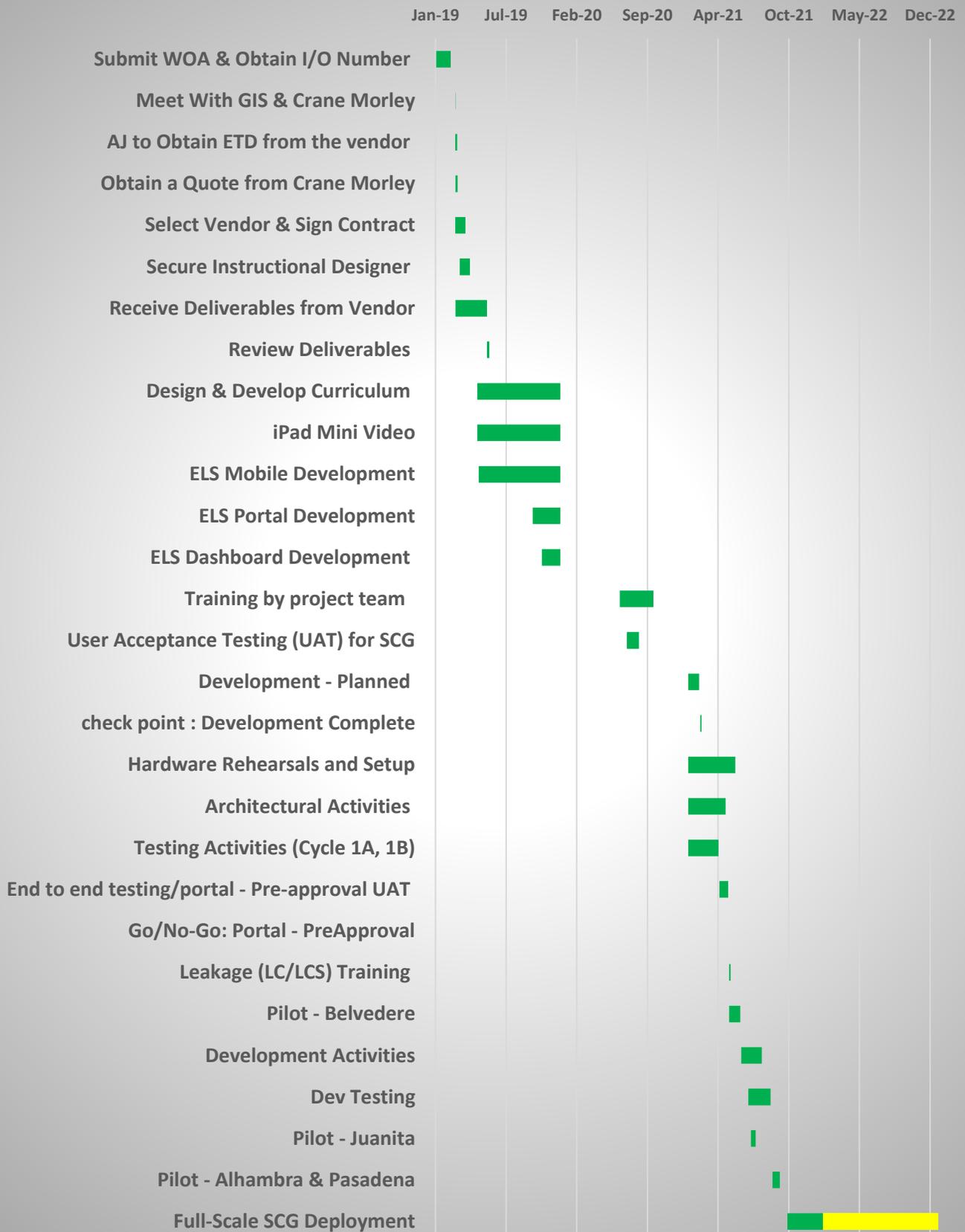
Feb-18 Oct-18 Jun-19 Jan-20 Sep-20 May-21 Jan-22 Sep-22



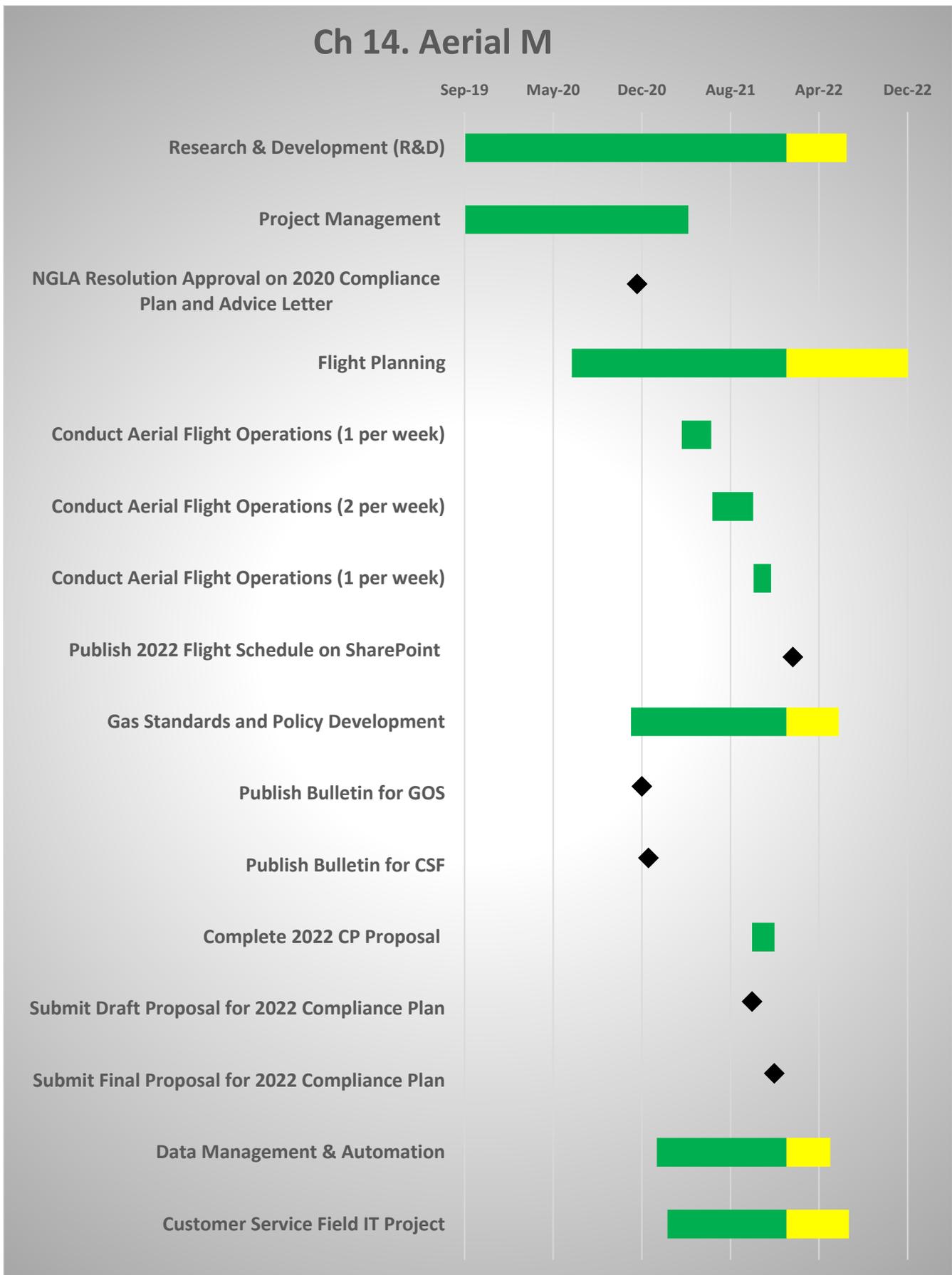
## Ch 12. Stationary Methane Detectors



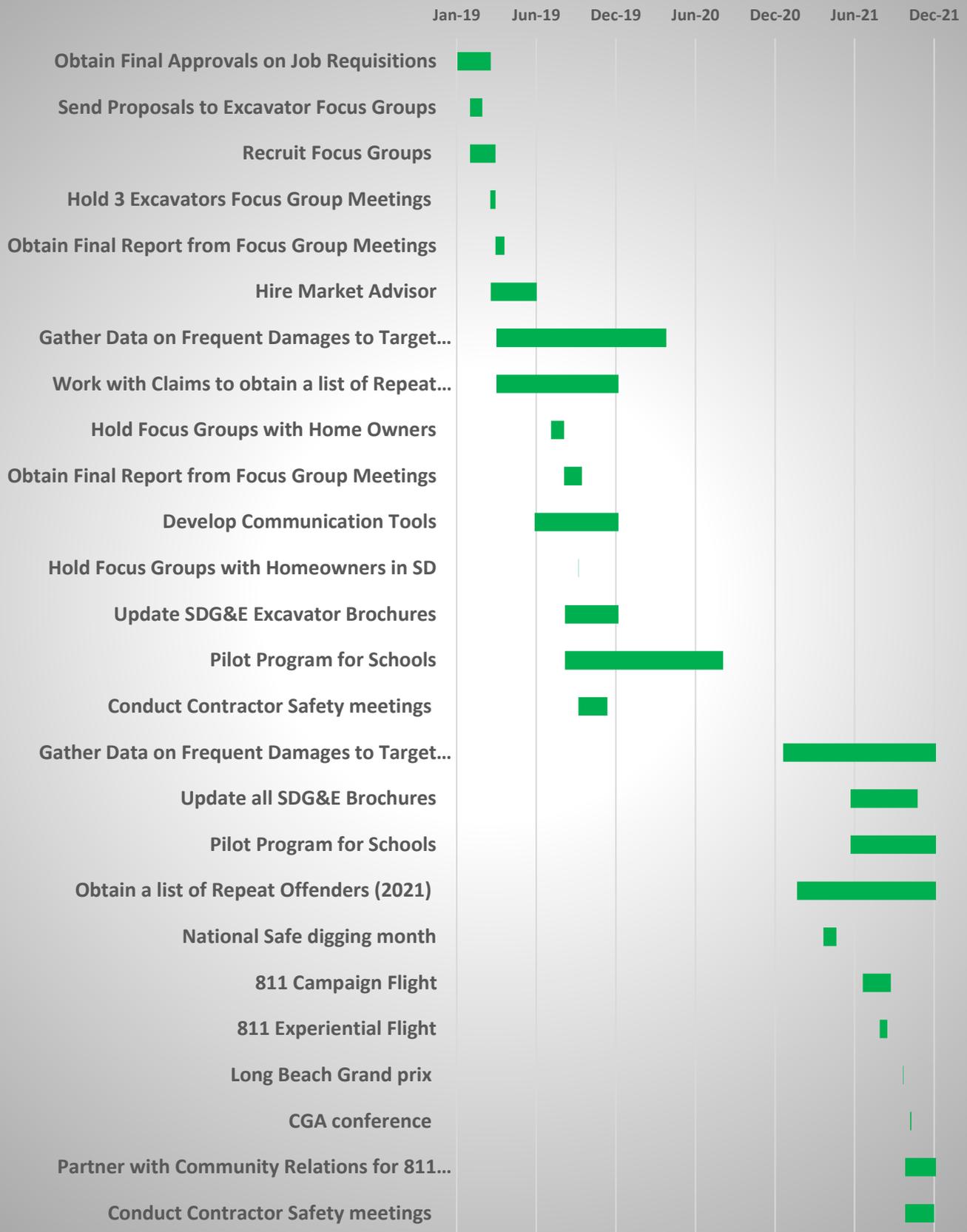
## Ch 13. Electronic Leak Survey



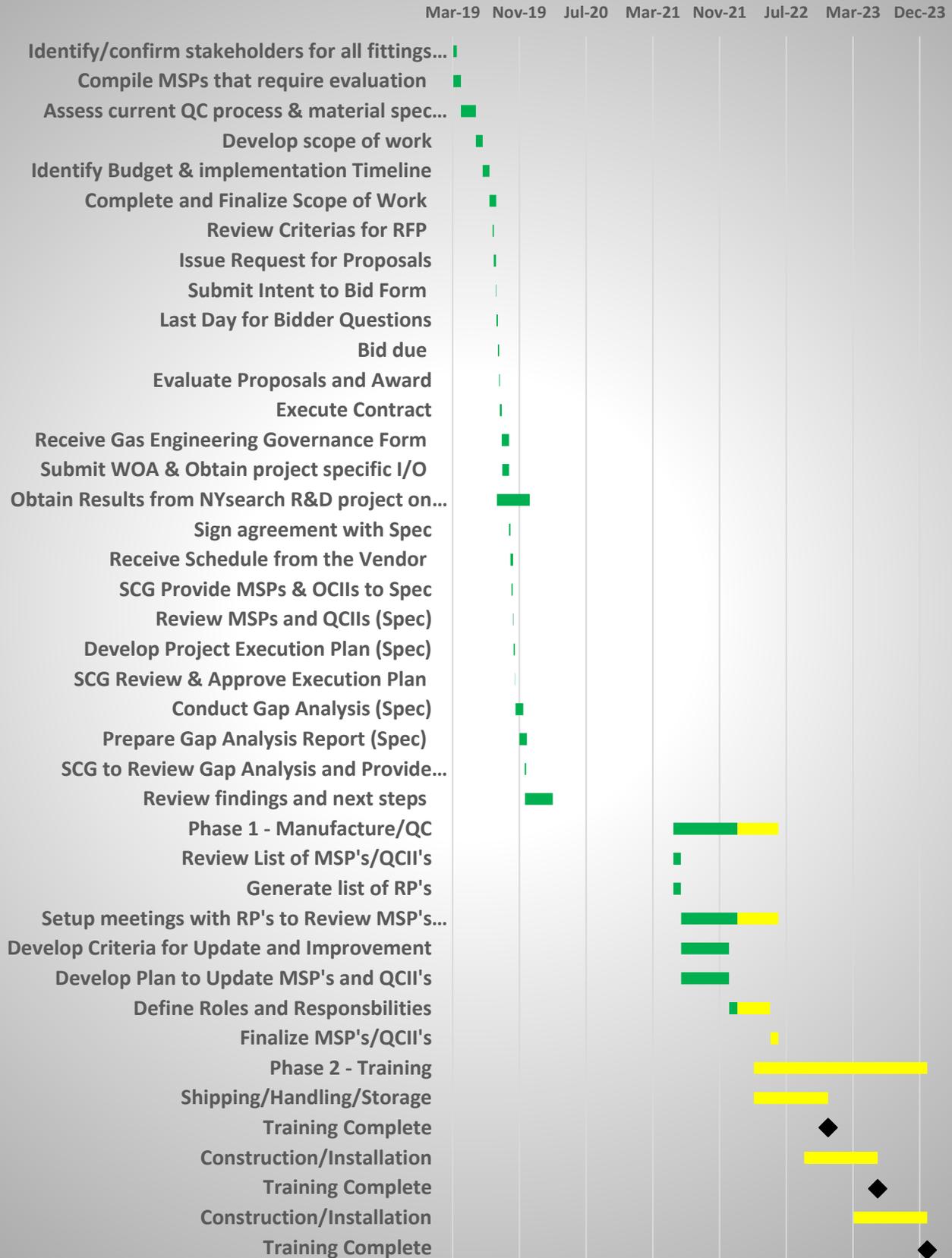
# Ch 14. Aerial M



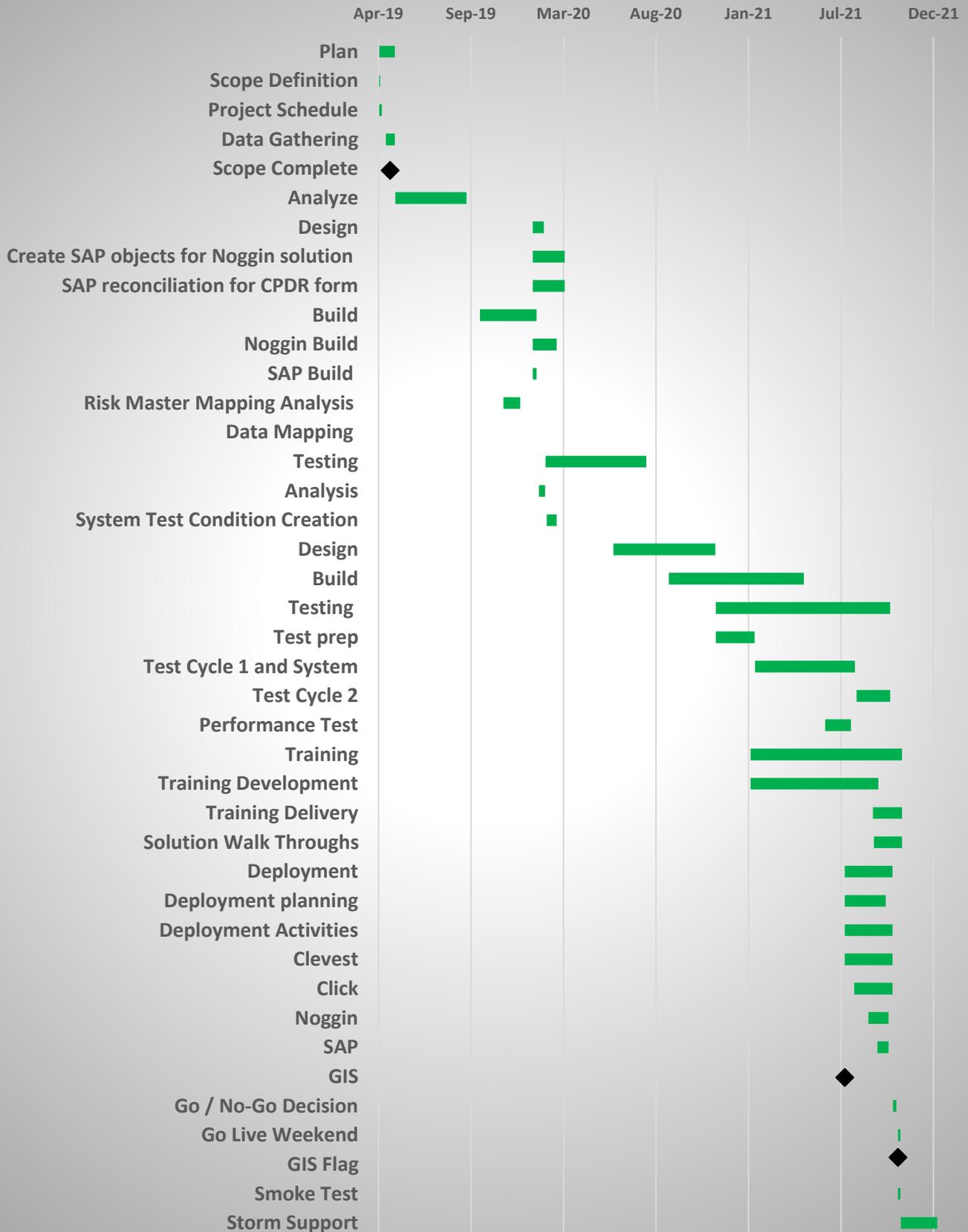
## Ch 15. Damage Prevention and Public Awareness



## Ch 16. Pipe Fitting Specifications

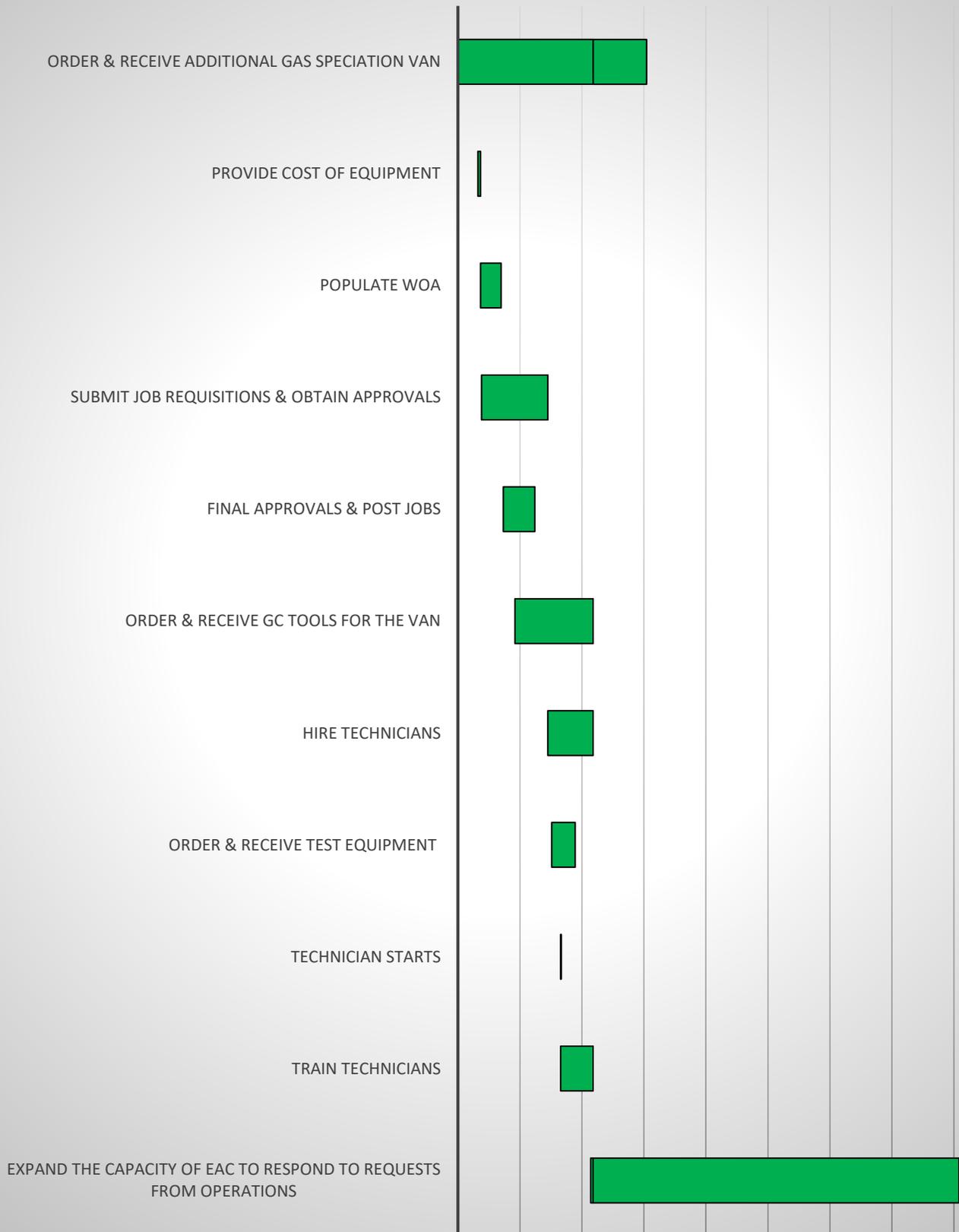


## Ch 17. Dig-Ins and Repeat Offenders IT System

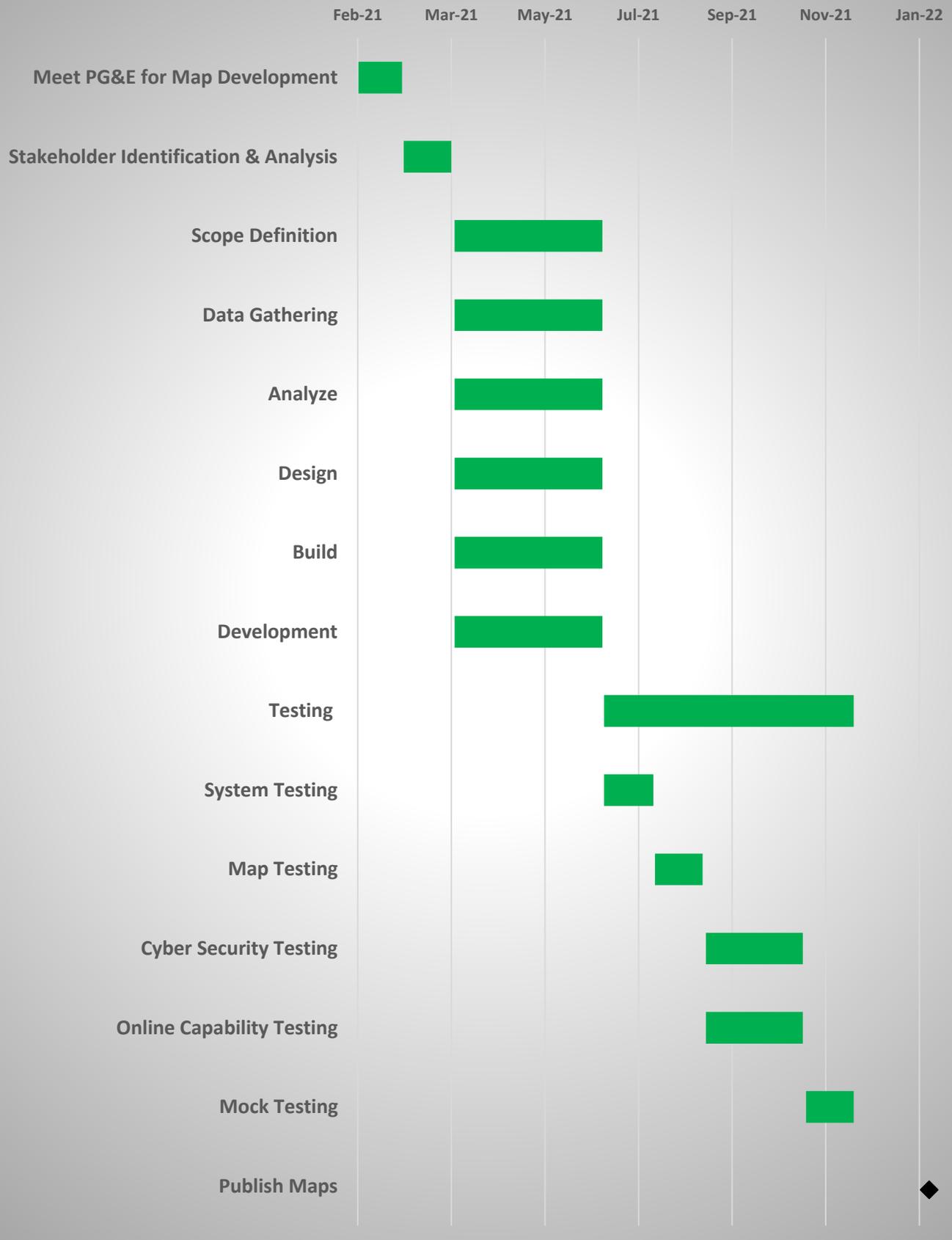


# Ch 19.

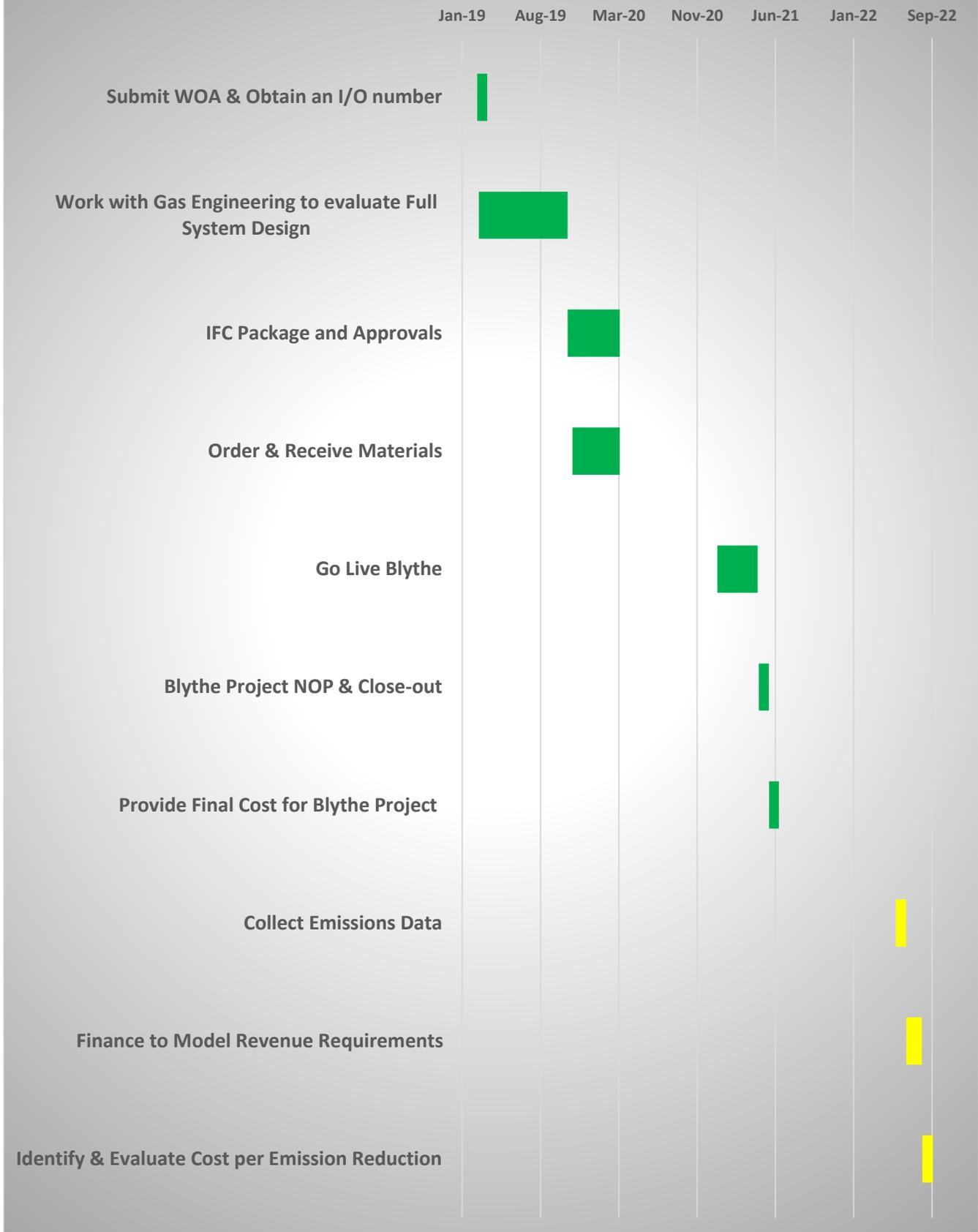
Nov-18 May-19 Nov-19 May-20 Nov-20 Jun-21 Dec-21 Jun-22 Dec-22



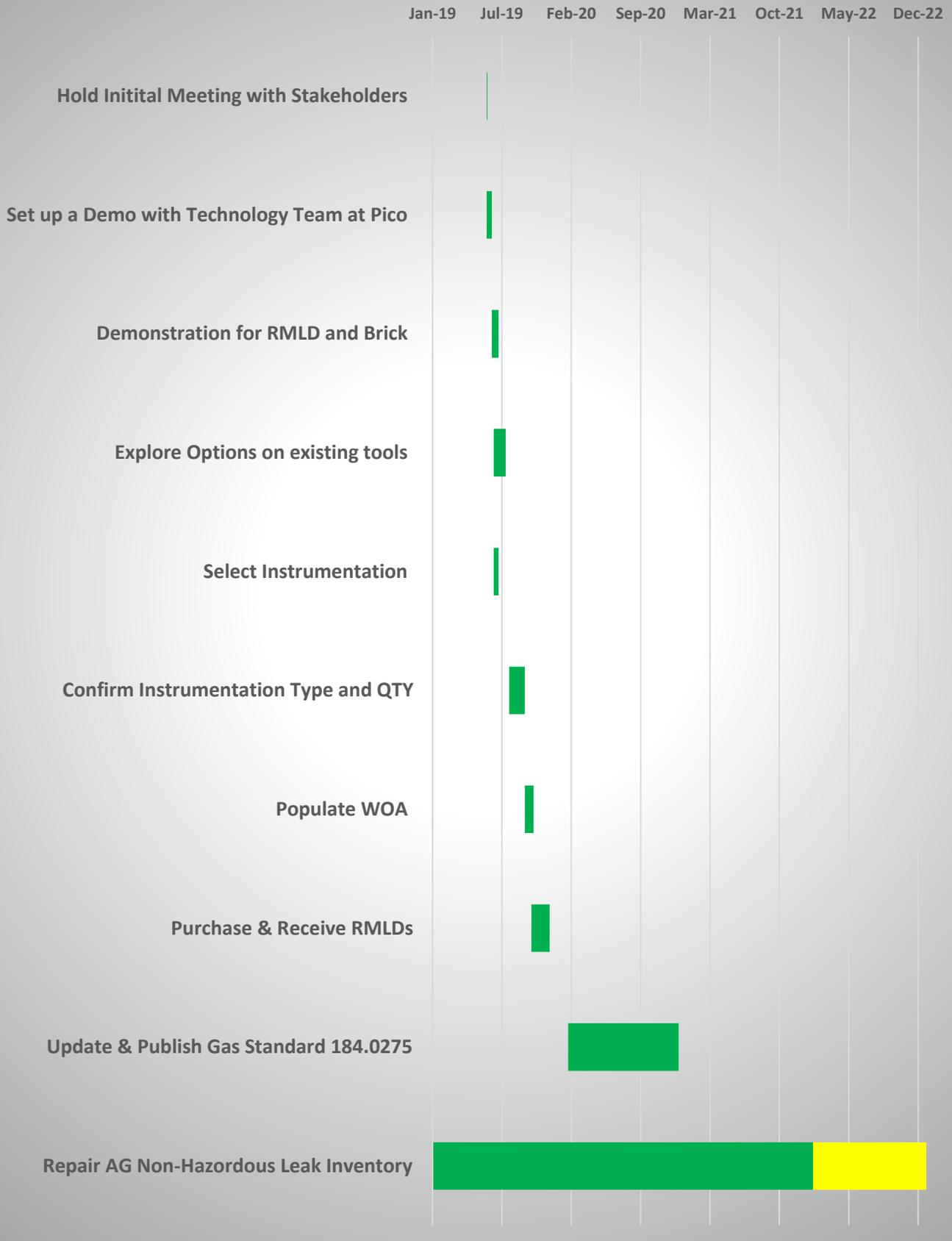
## Ch 20. Public Leak Maps



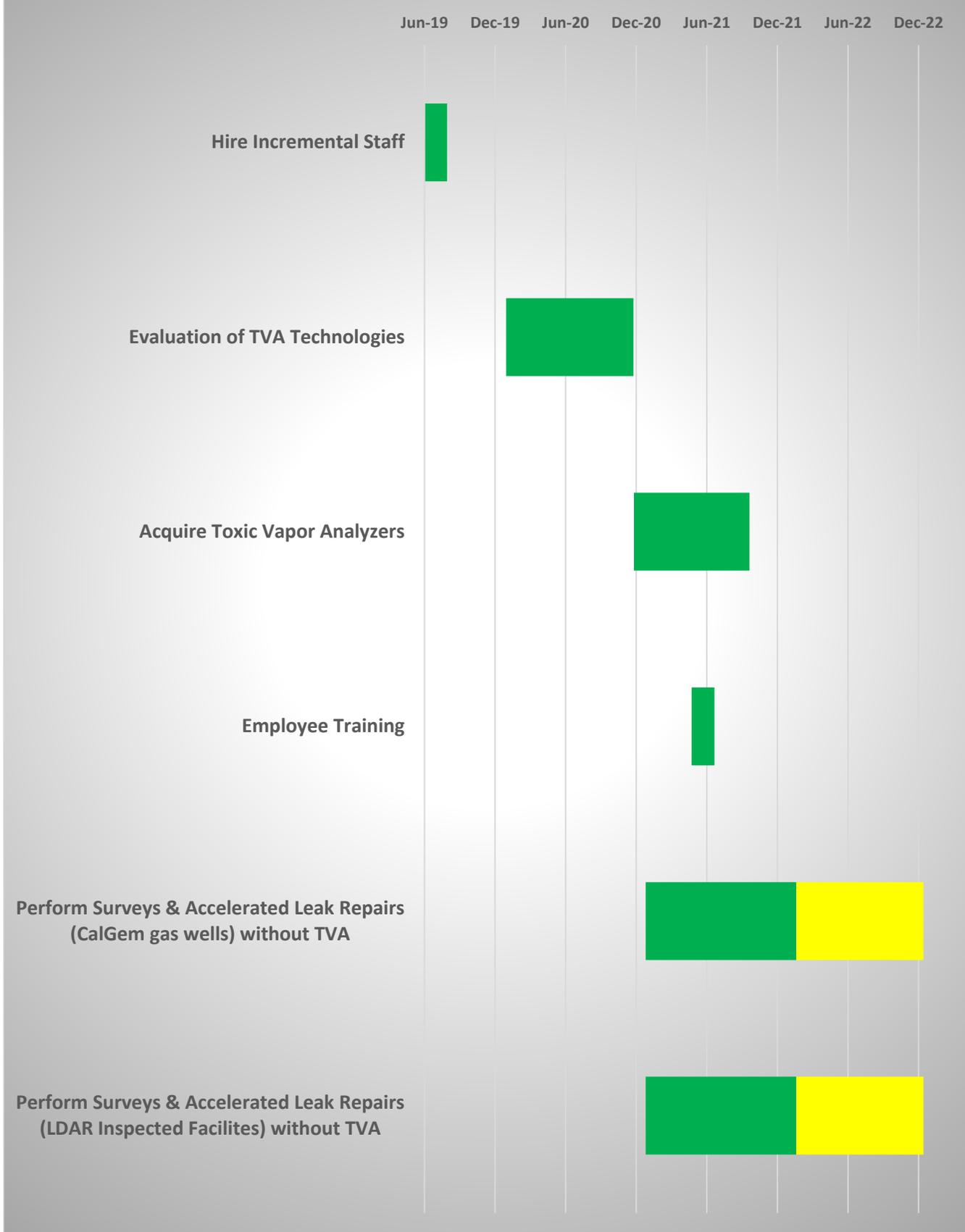
## Ch 22. Vapor Collections System



## Ch 23. Distribution Above Ground Leak Survey



# Ch 24. Storage Above Ground Leak Survey



# Ch 25. Distribution Above Groun Leak Repair

Jan-19 Apr-19 Jun-19 Sep-19 Dec-19 Mar-20 Jun-20 Sep-20 Dec-20

Repair AG Minor Leak Inventory



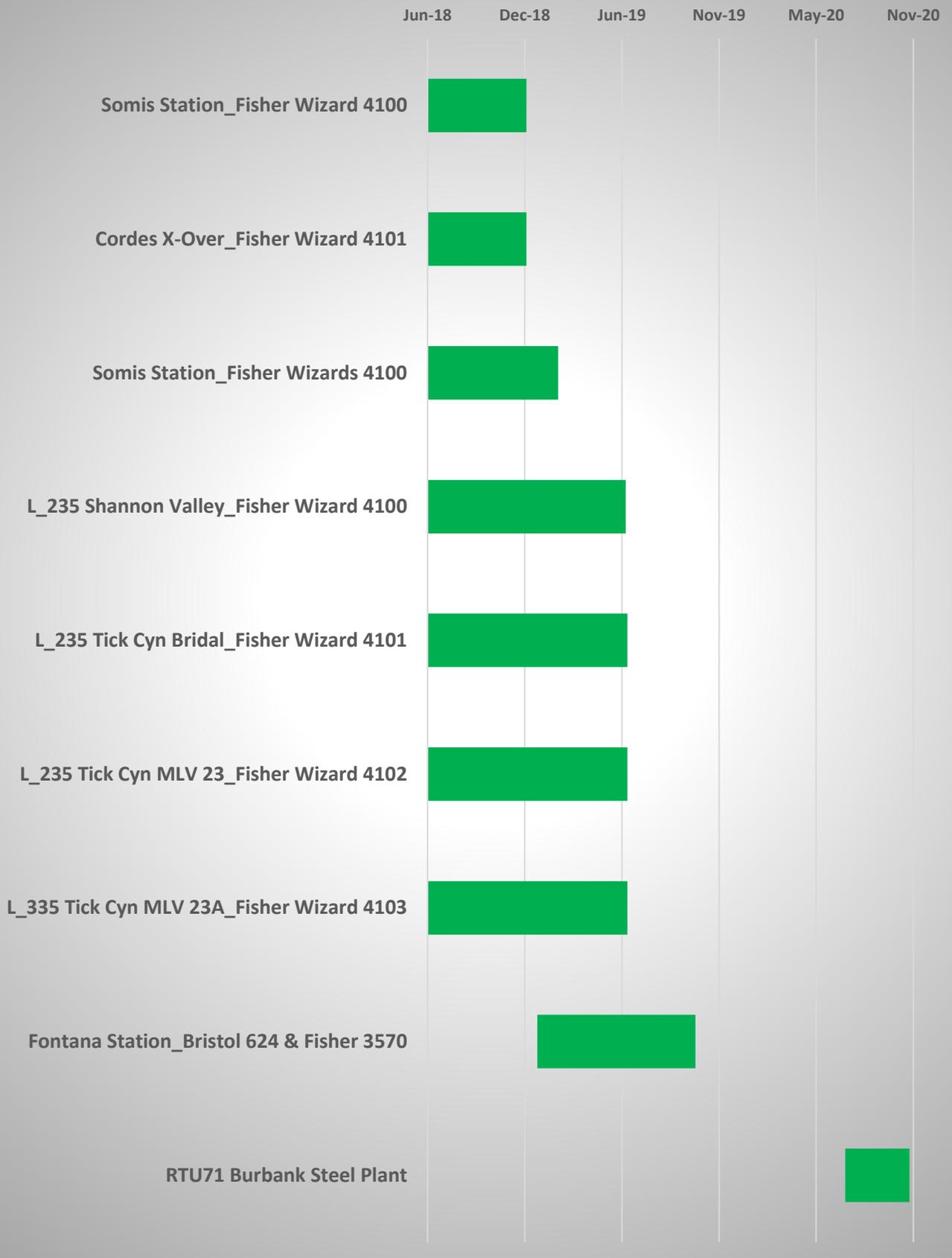
Repair AG Non-Hazardous Leak Inventory



Update & Publish Gas Standard 223.0126



## Ch 26. High Bleed Device Replacement



## Research, Development, & Demonstration Templates

Best Practice Addressed	RD&D Project	Subject
16, 17, 20a	16	Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth
17	17-1	Evaluation of New Technologies for Leak Detection, Localization, and Speciation
17, 20a	17-2	Aerial Leak Detection and Quantification Technologies
18	18	Evaluation of Stationary Methane Detectors
20a	20a-1	Develop Company-Specific Emission Factors
20a	20a-2	Evaluation of New Technologies for Leak Quantification
20a	20a-3	Quantification of Through-Valve Leakage on Large Compressor Valves
22	22	Investigate Designs, Specifications, Tolerances and Sealing Compounds for Threaded Fittings and Joints
23	23-1	Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions
23	23-2	Evaluate Component Emission Reductions Opportunities

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

<b>Best Practice 16: Special Leak Surveys</b>
Utilities shall conduct special leak surveys, possibly at a more frequent interval than required by G.O. 112-F (or its successors) or BP 15, for specific areas of their transmission and distribution pipeline systems with known risks for natural gas leakage. Special leak surveys may focus on specific pipeline materials known to be susceptible to leaks or other known pipeline integrity risks, such as geological conditions. Special leak surveys shall be coordinated with transmission and distribution integrity management programs (TIMP/DIMP) and other utility safety programs. Utilities shall file in their Compliance Plan proposed special leak surveys for known risks and proposed methodologies for identifying additional special leak surveys based on risk assessments (including predictive and/or historical trends analysis). As surveys are conducted over time, utilities shall report as part of their Compliance Plans, details about leakage trends. Predictive analysis may be defined differently for differing companies based on company size and trends.
<b>Best Practice 17: Enhanced Methane Detection</b>
Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.
<b>Best Practice 20a: Quantification</b>
Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth Failures.

Type of Objective(s) or Program Pilot:

- Improve understanding of natural gas migration in system territory operating environments, including soil types, to gain an understanding of leakage migration threats to pipelines and possibly anticipate hazardous operating conditions to better predict hi-flow rate and potentially hazardous leaks.
- Understanding of sub-surface methane behavior may result in better understanding of leak behavior and validation of current practices for below-ground methane threshold(s), resulting in increased leak detection efficiency.
- Reduce emissions and improve efficiencies by detecting, differentiating, and rapidly responding to higher flow rate leaks.
- These are continuing Research & Development projects to advance the understanding of how leaks evolve over time on various pipeline materials and operating environments.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is to study the sub-surface methane environment and determine factors that contribute to leak migration and emissions. Better understanding the degree of influence of each factor will be used to develop numerical models to predict gas migration behavior below ground. Additionally, this research is anticipated to verify the appropriate below-ground methane concentration threshold(s) to discriminate background methane levels from those that should trigger creation of leak record and investigation. This research objective is also to advance industry understanding of how leak rates tend to grow over time on Polyethylene (PE) pipe once a leak has initiated. Prior to this project, industry research in this area was focused on the process of crack initiation up until a leak occurred. This knowledge will assist in improving system leakage estimates and emission factors and help to optimize leak survey intervals based on projected leak emissions growth rates.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F			F			F	

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

**Lessons Learned:**

- A general sub-surface migration model has been developed and continues to be refined. Additional augmentations continue to be developed, such as simulation-optimization algorithms and methods. Additional data gathering is required to establish Company-Specific baseline values and to evaluate operational feasibility and application.
- Slow-Crack growth samples continue to be evaluated to develop a method to estimate emissions from PE pipelines. The next phase of research will continue time on test of current samples and focus on crack propagation under different environmental conditions, such as higher soil temperature environments.

**Part 4. Anticipated or Expected Results**

- Use acquired understanding to determine the appropriate below-ground methane concentration threshold(s) that should trigger creation of leak record and investigation.
- Use acquired understanding to enable pipeline operators to determine if belowground methane emissions are due to a leak from the natural gas piping system.
- Increase understanding of the impact on methane emissions from the leak growth rate due to cracks in the Polyethylene (PE) pipeline.

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**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

**Part 5. Emissions Impact**

- Knowledge of the below ground methane threshold may reduce both false positives (recording a leak when there is no leak) and false negatives (not recording a leak when one exists), which increases operational efficiency and resulting in overall shorter leak duration and emissions reduction.
- The knowledge gained from this study will assist in management and estimation of methane emissions from PE pipelines. Leak rates can be projected from the time of discovery and repairs can be prioritized using this knowledge to prevent leaks from developing into large emitters. This knowledge can also be applied to future methane emissions studies in the development of improved Emissions Factors and methane emissions inventory reporting.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. PHMSA Tools for Predicting Gas Migration (PHMSA #748)  
 This project is managed by PHMSA with Academia as the performer and includes involvement and participation of selected Utilities. This project developed tools for predicting gas migration and mitigating its occurrence/consequence.
  - Project Complete.
2. Below Ground Methane "Background" Concentration Study Research Projects (SCG-2018-003)  
 Investigate pipeline variables, operating environment and pedology that may need to be considered for pipeline operators to decide whether below ground methane measurements are indicative of a leak from the natural gas piping system. This project will leverage results from the PHMSA #748 project.
  - Anticipated Project Close Out: Q4 2022.<sup>1</sup>
3. Optimal Decision-Making Algorithm for Improving Pipeline Safety During Gas Leakage Events (NYSEARCH M2020-009)  
 This project scope includes development of NYSEARCH approved methods and protocols for a sensor network and simulation-optimization algorithm. A simulation-optimization algorithm will be evaluated for field application which will first undergo simulated field experimentation.
  - Anticipated Project Close Out: Q3 2022.
4. PE Leak Growth Rate from Slow Crack Growth Research Project (OTD 7.15.c)  
 Evaluate how leaks evolve over time due to slow crack growth on polyethylene (PE) pipe to gain a better understanding of how this contributes to methane emissions from PE pipelines.
  - Anticipated Project Close Out: Q4 2023.<sup>1</sup>

<sup>1</sup>Project was delayed due to COVID related policy restrictions

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

New Proposed Projects<sup>2</sup>:

1. Field Validations of Analytical Model – Company-Specific
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Predictive analytics for distribution leaks and risk management
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
3. Analysis of distribution buried leaks based on pipeline material
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
4. PE Leak Growth Rate from Slow Crack Growth (continuing)
  - Anticipated Start Date: Q4 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, that can include one or more of the following:

- a) Field Measurements
  - Data gathered during leak survey is used to roughly confirm output of analytical tool.
  - A grid of surface concentration measurements is used to demonstrate capability of analytical tool and provide feedback to developers for required enhancements to performance.
  - Surface flux measurements (using Hi Flow Sampler™ or equivalent) will be used to demonstrate capability of analytical tool and provide feedback to developers for required enhancements to performance.
- b) Modeling and Verification
  - Measurements of the gas concentration in the soil (barhole) will be used to demonstrate capability of analytical tool and provide feedback to developers for required enhancements to performance.
  - Direct measurement of the emission rate, after excavation, (using Hi Flow Sampler™ or equivalent) will be used to demonstrate capability of analytical tool and provide feedback to developers for required enhancements to performance.
  - Using data and conditions from laboratory tests, develop a model to estimate emissions growth rate from cracks in PE pipe.
  - Verify the model with field leak measurements between time detected and at point of repair.
  - Demonstrate model capability for intended applications, which meet Company specifications.
  - Correlate with leak repair data and types of plastic leaks.
  - Test statistical validity of the model.
  - Re-Evaluate/update the model and repeat verification, if needed.
  - Estimate emission reduction, cost reduction, and cost avoidance benefits.

<sup>2</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$373,655	\$474,346

**SDG&E**

2023	2024
\$36,955	\$46,913

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$1,135,410
SDG&E	\$112,293

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. Tools for Predicting Gas Migration and Mitigating its Occurrence/Consequence, available at <https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=748>.
- b. OTD Project No. 7.15.c Summary Report.<sup>3</sup>

<sup>3</sup>Confidential/non-public document

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 17: Enhanced Methane Detection**

Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Evaluation of New Technologies for Leak Detection, Localization, and Speciation.

Type of Objective or Program Pilot:

- Improve efficiency and reduce cost of operation.
- Reduce emissions and improve efficiencies by detecting, differentiating, and rapidly responding to large leaks.
- Pilot studies to validate actual costs and leak detection, pin-pointing, and system capabilities of next generation.

**Part 3. R&D Objective: What do you expect to learn?**

This research objective is to identify instruments and/or methods to improve the efficiency and output of the leak detection processes. Evaluate the performance and features of new instruments and/or methods and perform comparative analysis to existing methods for leak detection, source localization, and speciation of natural gas.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F	F,v	F,v	F	F	F	F,v	F,v

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

- Handheld ppb-detection capable instruments have not yet shown significant advantages over traditional ppm-detection instruments in leak detection capabilities. The next generation of this technology will attempt to improve detection capabilities (e.g., true positive rates), source attribution, leak localization, and precision of emission quantification.
- Mobile ppb-detection capable instruments have shown improved detection capabilities over ppm-detection instruments. However, the hardware technology alone does not produce adequate true positive detection rates. Further software-based innovations (e.g.,

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**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

filtering algorithms) are needed. The next generation of this technology will attempt to improve detection capabilities (e.g., true positive rates), leak localization, quantification efficiency, and source attribution, which increase cost effectiveness.

**Part 4. Anticipated or Expected Results**

- Identify more accurate, precise, reliable, and/or cost-effective instruments and methods for leak detection, localization, and speciation processes.

**Part 5. Emissions Impact**

- Reduce emissions by improving detection, leak localization and quantification efficiency. Leaks detected and repaired earlier in the lifecycle will result in a reduction of emissions, leak detection and localization efficiency will reduce operational costs.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Gas Imaging- Testing of Multi-Sensor Gas Imaging Camera (NYSEARCH M2018-002)  
 Develop and evaluate Multi-Sensor Gas Imaging Camera on underground leaks. Establish the detection limit and demonstrate the ability to image and quantify emissions flux.
  - Project Complete.
2. First Pass Leak Detection Optimization (NYSEARCH T-784)  
 Develop and evaluate walking survey approach using various instruments to enhance walking leak survey detection and localization of leaks.
  - Anticipated Project Close Out: Q4 2022.
3. Integrate Mobile Methane Mapping w/ Mobile Leak Survey Research Project (SCG-2018-005)  
 Evaluate possibility of integrating GIS and wind (speed & direction) data into traditional mobile leak survey applications where mobile leak survey is conducted directly over the pipeline right-of-way. Increase the leak detection capabilities of mobile methane mapping by integrating multiple methane detection systems to increase lower detection limit and minimize false-positive indications.
  - Anticipated Project Close Out: Q1 2022.
4. Back Pack & Handheld Methane Detection Tools (Sensor) & Systems Research Projects (a.k.a. Next Generation Walking Leak Survey) (SCG-2018-004)  
 Evaluate and develop the use of portable ppb-detection capable instruments to enhance walking leak survey detection and localization of leaks.
  - Anticipated Project Close Out: Q2 2022.

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**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

5. Algorithm for Improved Mobile Methane Mapping (SCG-2021-009)  
 Evaluate algorithms to identify which mobile methane measurements have a high likelihood of being associated with natural gas emissions over multiple drives.
  - Anticipated Project Close Out: Q4 2022

New Proposed Projects<sup>4</sup>:

1. Evaluate new handheld leak detection, localization, and speciation technologies
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Evaluate new mobile leak detection, localization, and speciation technologies
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
3. Evaluate new leak detection, localization, and speciation technologies for personnel monitoring
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, that can include one or more of the following:

- a) Manufacturer Demonstration
  - Data gathered during manufacturer demonstration is used to identify potential capabilities that can be leveraged for Company leak detection, speciation, and localization.
- b) Laboratory Evaluation
  - Data gathered during laboratory evaluation is used to demonstrate capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
  - Use results of laboratory data to guide simulated field-testing plan.
- c) Evaluate Cost of Implementation
  - Estimate cost to conduct simulated field evaluation.
  - Estimate emission reduction, cost reduction, and cost avoidance benefits (Go/No-Go Decision).
- d) Simulated Field Evaluation (Controlled Environment)
  - Data gathered during simulated field evaluation is used to demonstrate capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
  - Use results of simulated field evaluation data to guide pilot study plan.
  - Evaluate integration of instrument data into Enterprise Data Management Systems and business process workflows.
  - Re-evaluate/update the estimated implementation costs and benefits (Go/No-Go Decision).

<sup>4</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

## e) Pilot Study

- Verify capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
- Re-evaluate/update the estimated implementation costs and benefits (Go/No-Go Decision).

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$379,786	\$389,280

**SDG&E**

2023	2024
\$37,561	\$38,500

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$1,024,571
SDG&E	\$101,331

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. Southern California Gas Company – Pico Rivera. “Southern California Gas Company’s Verification Study of the Methane Mapping of Four California Cities by the Environmental Defense Fund and Colorado State University” Southern California Gas Company. Southern California Gas Company, August 2016, available at [https://www.socalgas.com/regulatory/documents/r-15-01-008/EDF\\_4-Cities\\_Methane\\_Mapping\\_Report\\_Final\\_081916.pdf](https://www.socalgas.com/regulatory/documents/r-15-01-008/EDF_4-Cities_Methane_Mapping_Report_Final_081916.pdf).
- b. <https://primis.phmsa.dot.gov/rd/mtgs/091118/Ed%20Newton.pdf>.
- c. “Mobile Guard Advance Mobile Leak Detection,” available at <https://Heathus.com/Wp-Content/Uploads/MobileGuard.pdf>.
- d. Leifer, I., and I. MacDonald. 2003. Dynamics of the gas flux from shallow gas hydrate deposits: Interaction between oily hydrate bubbles and the oceanic environment. Earth and Planetary Science Letters 210(3/4):411-424.

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**RD&D Summary #16**  
**Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth**

- e. Leifer, I. and J. Clark. 2002. Modeling trace gases in hydrocarbon seep bubbles. Application to marine hydrocarbon seeps in the Santa Barbara Channel. *Russian Geology and Geophysics* 43(7):613-621.
- f. University of California - Santa Barbara. "Methane emissions higher than thought across much of U.S.." ScienceDaily. ScienceDaily, 15 May 2013, available at [www.sciencedaily.com/releases/2013/05/130515165021.htm](http://www.sciencedaily.com/releases/2013/05/130515165021.htm).
- g. Aclima: <https://www.aclima.io/>.
- h. RKI: <https://www.rkiinstruments.com/>.
- i. Heath Consultants: <https://heathus.com/>.
- j. ABB: <https://new.abb.com/products/measurement-products/analytical/laser-gas-analyzers/advanced-leak-detection>.
- k. Aeris Technologies: <https://aerissensors.com/>.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

<b>Best Practice 17: Enhanced Methane Detection</b>
Utilities shall utilize enhanced methane detection practices (e.g. mobile methane detection and/or aerial leak detection) including gas speciation technologies.
<b>Best Practice 20a: Quantification</b>
Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Aerial Leak Detection and Quantification Technologies.

Type of Objective of Program Pilot:

- Reduce emissions and improve efficiencies by detecting, differentiating, and rapidly responding to large leaks.
- Pilot studies to validate actual costs and leak detection, pin-pointing, and system capabilities of next generation.

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is to continue evaluating next generation aerial emissions detection technologies and to better understand actual capabilities of new technologies and methods available for detecting and locating methane emissions by aerial means (Satellite, Manned and Unmanned Aircraft) and the relative benefits, shortcomings, costs and short-notice availability of each application.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F,v	F,v	F,v	F,v	F,v	F,v	F,v	F,v

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Post-Meter (Customer Emissions)			
Yard Line	House Line	Incomplete Combustion	Vented Emissions
F	F	V	V

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**Aerial Leak Detection and Quantification Technologies**

Lessons Learned:

- Manned Aircraft technology showed promising results during the previous compliance plan period. The next generation of this technology will attempt to improve detection capabilities (e.g., true positive rates), quantification estimates in populated areas, and source attribution, which increase cost effectiveness.
- Satellite and Unmanned Aircraft technology continue to be evaluated as incremental leak detection methods.
- The complexity of the distribution operating environment presents a more difficult challenge for aerial detection technologies relative to that of transmission due to embedded sources of methane from vehicles, biogenic sources, naturally occurring petrogenic sources, and oil & gas production. Temporal variation along with sources that are mobile (such as transportation vehicles and small engine equipment) result in non-stationary and transient sources that are difficult to track.

**Part 4. Anticipated or Expected Results**

- Using acquired understanding, improve the efficiency of current Manned Aircraft operations.
- Using acquired understanding, determine the usefulness of each application to both small scale and large-scale needs in the practical applications of gas utility routine or emergency operations.
- Using acquired understanding, determine the feasibility of applying these technologies to both routine operations in difficult-to-access locations or for emergency response.
- Develop capability for quick response to assess emissions from the natural gas system during routine operational requirements or emergency response.

**Part 5. Emissions Impact**

- It is difficult to estimate the incremental reduction in emissions that could result from improvements to aerial methodologies. Aerial technologies facilitate more rapid deployment possibilities and access to locations restricted from the ground and will likely result in better leak detection and reduced duration between detection and repair.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. NYSEARCH- sUAS Technology (M2014-001)
  - Project Complete.
2. Aerial Methane Mapping (SCG-2019-012)
 

Pilot studies were conducted in several Distribution service areas and conditions to measure system capability for methane emissions detection, localization and

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**Aerial Leak Detection and Quantification Technologies**

- quantification. As result of this study, additional insight was gained as to the varied sources of methane emissions in the Distribution operating environment.
- Completed pilot study assessing capabilities of detection in various environments.
  - System wide implementation began in 2021.
  - Anticipated Project Close Out: Q4 2022.
3. Aerial (sUAS) Leak Detection Research Projects (SCG-2016-001)  
 This SoCalGas project has been executed in parallel with, and been used in support of, the progressive development of drone and sensor instrument by the respective manufacturers.
- Continuing evaluation of new methane sensors for UAV applications.
  - Anticipated Project Close Out: Q4 2022.
4. Aerial Leak Detection Satellite (SCG-2021-005)  
 Evaluate and demonstrate the capabilities of technologies for leak detection, localization and pin-pointing in Distribution applications using satellite systems, and to evaluate the cost effectiveness in reducing natural gas emissions.
- Anticipated Project Close Out: Q4 2022.

New Proposed Projects<sup>5</sup>:

1. Evaluate next generation manned aircraft systems for detecting large leaks (appx. 10+ cfh) system-wide.
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Satellite methane detection technologies for super emitters (appx. 100+ cfh).
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
3. Aerial (sUAS) Leak Detection Research Projects continued.
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, that can include one or more of the following:

- a) Manufacturer Demonstration
  - Facilitate demonstrations of aerial technologies, unmanned vehicle, methane sensors, and/or payload components (cameras, instrumentation, black box) for the purpose of determining capability and applicability to the gas infrastructure in both SoCalGas and SDGE.
- b) Laboratory Evaluation
  - Establish baseline performance for sensors and other quantification instruments.
- c) Comparative evaluation to manufacturer specification

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**Aerial Leak Detection and Quantification Technologies**

- Evaluate the sensors and other quantification instruments to Company requirements for intended applications.
- d) Simulated Field Evaluation (Controlled Environment)
  - Evaluate each prototype system (e.g., sUAS with payload) in a simulated field environment utilizing controlled natural gas releases. Compare against Company's specifications for the intended application, and test for repeatability.
- e) Field Demonstrations
  - Demonstrate aerial systems in actual field environments. May include controlled natural gas releases and evaluation for false positives and false negatives.
- f) Pilot Study
  - Conduct pilot studies of viable aerial technologies for specific intended applications. Evaluate implementation costs and calculate potential emissions reduction.

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$999,775	\$1,024,770

**SDG&E**

2023	2024
\$98,879	\$101,351

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$2,697,197
SDG&E	\$266,756

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. NYSEARCH 2014-001 Project Report<sup>6</sup>
- b. Bridger Photonics: <https://www.bridgerphotonics.com/>.
- c. Percepto: <https://percepto.co/oil-gas-drones/>.
- d. Seek-Ops: <https://www.seekops.com/>.
- e. Satelytics: [www.satelytics.com](http://www.satelytics.com).
- f. Ventus OGI: <https://sierraolympic.com/product-in-home-slider/ventus-ogi/>.

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**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

- g. AiLF U-10: [http://ailf.com.cn/product\\_detail\\_en\\_793075.html](http://ailf.com.cn/product_detail_en_793075.html).
- h. PRCI Multi-sensor platform: Report Title: PR-271-173903-R01 Evaluation of Current ROW Threat Monitoring, Application & Analysis Technology – website: <https://www.prci.org/Research/SurveillanceOperationsMonitoring/SOMProjects/ROW-6-2/56648/171730.aspx>.
- i. Title: PR-680-183907-R01 Use of Aerial LiDAR for Geohazard Assessment Website: <https://www.prci.org/Research/SurveillanceOperationsMonitoring/SOMProjects/GHZ-1-01/101481/169042.aspx>.

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**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

<b>Best Practice 18: Stationary Methane Detectors for Early Detection of Leaks</b>
Utilities shall utilize Stationary Methane Detectors for early detection of leaks. Locations include: Compressor Stations, Terminals, Gas Storage Facilities, City Gates, and Metering & Regulating (M&R) Stations (M&R above ground and pressures above 300 psig only). Methane detector technology should be capable of transferring leak data to a central database, if appropriate for location.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Evaluation of Stationary Methane Detectors.

Type of Objective or Program Pilot:

- Reduce emissions by quicker leak detection and repair.
- Pilot studies to be initiated based on results of instrument evaluations. Pilot studies will validate actual costs and emissions reductions.

**Part 3. R&D Objective: What do you expect to learn?**

This research objective is to develop and/or evaluate stationary methane sensors for early detection of leaks.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F	F,V	F,V			F,V	F,V	F,V

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

**Lessons Learned:**

- Stationary methane detection instruments showed promising results during the previous compliance plan period; however, cost effectiveness evaluations demonstrated that significant emissions would be needed at a facility to justify use of the technology over the alternative of more frequent facility inspection. The next generation of this technology will attempt to lower cost while improving detection capabilities (e.g., true positive rates), leak localization, emission quantification precision, and source attribution.
- For Distribution M&R facilities stationary methane sensors were capable of detecting leaks of sufficient size; however, all systems tested were not cost-effective due to the relatively low emissions present at these facilities and the lower cost alternative of inspecting the

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**Aerial Leak Detection and Quantification Technologies**

facility more frequently.

**Part 4. Anticipated or Expected Results**

- Accurate assessment of the performance of stationary sensors enables field deployment leading to quicker leak detection and repair and emissions reductions.

**Part 5. Emissions Impact**

- Work is currently underway to develop leaker-based emissions factors where facility-based factors are currently specified; therefore, true facility-specific emissions currently cannot be estimated. Since leaks vary in flow rate, growth rate, and number for various applications and types of facilities, and since the ability to repair or mitigate emission sources can also be constrained due to system reliability, safety, environmental and other operational issues, the reduction of emissions by quicker detection and repair of leaks as detected by stationary sensors cannot be estimated at this time.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Stationary Methane Sensor Evaluation (SCG-2017-011)  
Evaluate sensors for comparison with manufacturer's specifications, measurement accuracy, efficiency, and repeatability as compared to similar sensors.
  - Project Complete.
2. Residential Methane Detector – PHASE III (OTD 1.14.g.4)  
Evaluate residential methane detectors (RMDs) that detect at 10% LEL. Detectors evaluated after one-year pilot field study.
  - Project Complete.
3. Develop Remote Sensing and Leak Detection Platform with Multiple Sensors (OTD 7.20.a)  
To improve and deploy additional instances of a defensive pipeline right-of-way (ROW) Monitoring System based on stationary sensors mounted on and near the pipeline. Sensor data from multiple locations along the pipe is wirelessly forwarded to a central location for processing. Analytics at the central location correlates data from multiple sensors to rapidly alert operators to events occurring in the ROW. One prototype system is currently deployed; the project seeks to deploy two more instances with improved field hardware and Machine Learning (ML) analytics.
  - Anticipated Project Close Out: Q2 2022.
4. Residential Methane Detector (SCG-2021-003)  
Evaluate application of residential methane detectors (RMDs) that detect at 10% LEL to indoor and difficult to reach meter locations. Detectors evaluated after one-year pilot field study.
  - Anticipated Project Close Out: Q1 2023.

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5. Stationary Methane Sensor Evaluation for Transmission M&R (SCG-2021-010)  
 The objective of this project is to evaluate additional stationary methane sensor technologies and perform a pilot study at Transmission M&R stations.
  - Anticipated Project Close Out: Q4 2022.

New Proposed Projects<sup>7</sup>:

1. Evaluate New and/or prototype stationary methane sensor technologies
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, that can include one or more of the following:

- a) Manufacturer Demonstration
  - Data gathered during manufacturer demonstration is used to identify potential capabilities that can be leveraged for Company leak detection, speciation, and localization.
- b) Laboratory Evaluation
  - Data gathered during laboratory evaluation is used to demonstrate capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
  - Use results of laboratory data to guide simulated field-testing plan.
- c) Evaluate Cost of Implementation
  - Estimate cost to conduct simulated field evaluation.
  - Estimate emission reduction, cost reduction, and cost avoidance benefits (Go/No-Go Decision).
- d) Simulated Field Evaluation (Controlled Environment)
  - Data gathered during simulated field evaluation is used to demonstrate capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
  - Use results of simulated field evaluation data to guide pilot study plan.
  - Evaluate integration of instrument data into Enterprise Data Management Systems and business process workflows.
  - Re-Evaluate/update the estimated implementation costs and benefits (Go/No-Go Decision).
- e) Pilot Study
  - Verify capability for intended applications, and that the technology, practices and/or procedures can meet Company specifications (Go/No-Go Decision).
  - Re-Evaluate/update the estimated implementation costs and benefits (Go/No-Go Decision).

<sup>7</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

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**Aerial Leak Detection and Quantification Technologies**

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$296,390	\$303,799

**SDG&E**

2023	2024
\$29,313	\$30,046

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$926,801
SDG&E	\$91,662

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. PA Gross, T Jaramillo and B Pruitt, Cyclic-Voltammetry-Based Solid-State Gas Sensor for Methane and Other VOC Anal. Chem. 2018, 90, 10, 6102-6108.
- b. Develop Remote Sensing and Leak Detection Platform with Multiple Sensors: <https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=851>.
- c. New Cosmos: <https://www.newcosmos-global.com/news/2701/>.
- d. SOOFIE: <https://www.scientificaviation.com/soofie/>.
- e. Aclara Technologies: <https://www.aclara.com/>.
- f. eLichens: <https://www.elichens.com/>.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 20a: Quantification**

Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Develop Company-Specific Emission Factors.

Type of Objective of Program Pilot:

- Company-Specific EFs will result in more accurate quantification of emissions than current methods.
- Facilitates reduction of emissions through defining leak-based emission factors and reduction in time to repair and increased frequency of leak survey.
- Pilot studies to evaluate and advance above ground methane quantification technologies.

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is to develop Company-Specific emission factors based upon SCG and SDGE data. These emission factors will replace current “Facility” or “Population” based Emission Factors.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F	F,V		F		F,V		

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

- Geographic evaluation and tracking of systems leaks has been improved through improvements in asset management and structuring leak data to meet the new reporting requirements. Technology improvements with the implementation of Aerial Methane Mapping is also leading to better localization and tracking of post-meter sources of methane emissions.

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- Several Company-Specific emission factors were developed (or are being developed) during the previous Compliance Plan period, including EFs for leaks at Transmission M&R Stations, Transmission Compressor Stations, Distribution Main & Service Pipelines (Buried Leaks), Distribution M&R Stations, and Customer Meters (Above-Ground Leaks). The next phase of emission factor development will focus on Company-Specific leaker-based EFs for above ground leaks using an alternative concentration method; Company-Specific EFs or engineering estimate methodology for transmission pipeline leaks; and estimating emissions from post-meter leaks and incomplete combustion on Customer-owned facilities.

**Part 4. Anticipated or Expected Results**

- Emission factors based upon present day conditions and local leak measurements will improve emission estimates and support better strategic decisions.
- The relationship between leak concentration and leakage rates will be determined based on the results of a field leak measurement study of above ground leaks. New technologies and equipment will also be developed. The results from this study will be used to improve and simplify the soap-bubble methodology for Leak-Based emission factors.

**Part 5. Emissions Impact**

- Leaker based emission factors will enable more accurate emissions reporting. Accurate emissions inventory also facilitates proper planning and resource allocation to the emissions sources that provide for greater emissions reductions.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Develop Customer Meter EFs based on soap test (SCG-2018-005)  
 Develop Company-Specific emission factors for customer meter facilities (60 PSI or less) for both SoCalGas & SDG&E.
  - Anticipated Project Close Out: Q1 2022.
2. Compressor Station Emission Factor Study (SCG-2021-000)  
 Obtain top-down emissions profiles from compressor stations. This data can be used to develop emissions factors for these facilities.
  - Anticipated Project Close Out: Q1 2022.
3. Methane Emissions Studies (Distribution Main & Services additional Sampling - SCG & SDG&E) (SCG-2019-011)  
 Develop Company-Specific emission factors for buried Mains and Services.
  - Anticipated Project Close Out: Q4 2022.

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4. Transmission M&R Station Emission Factor Study (SCG-2021-002)  
 Obtain aerial (top-down) and ground level (bottom-up) emissions profiles from transmission M&R stations. This data can be used to develop emissions factors for these facilities while also evaluating the accuracy of top-down quantification.
  - Anticipated Project Close Out: Q4 2022.

New Proposed Projects<sup>8</sup>:

1. Develop Company-Specific Leak-Based Emission Factors for Above Ground Leaks Using Concentration Method
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Develop Leak-Based Emission Factors for Transmission Pipelines
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
3. Develop Company-Specific Emission Factors for Customer Emissions
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
4. Develop Quality Control Techniques for Company-Specific Emission Factors
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the Company-Specific emission factors will involve a series of planned evaluations, that can include one or more of the following:

- a) Laboratory Evaluation
  - Establish baseline performance testing for asset leaks.
  - Evaluate the test matrices to Company requirements for intended applications.
- b) Simulated Field Evaluation (Emissions Sources)
  - Evaluate each test matrix, in a simulated field environment utilizing controlled natural gas releases.
  - Compare to currently approved Gas Standards.
- c) Pilot Study
  - Determine statistically significant number of samples needed based on population of facilities and annual number of leaks as well as conduct leak measurements on a statistically random basis.
  - Evaluate leak quantification method in an actual field environment, which may include controlled natural gas releases.
- d) Statistically Analyze Leak Data
- e) Develop Company-Specific Emission Factors

<sup>8</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

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**Aerial Leak Detection and Quantification Technologies**

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$397,888	\$407,835

**SDG&E**

2023	2024
\$39,352	\$40,335

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$1,026,213
SDG&E	\$101,494

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. GHG Emission Factor Development for Natural Gas Compressors, PRCI Catalog No. PR-312-16202-R02, April 18, 2018.
- b. Methane Emission Factors for Compressors in Natural Gas Transmission and Underground Storage based on Subpart W Measurement Data, PRCI Catalog No. PR-312-18209-E01, October 17, 2019.

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**Aerial Leak Detection and Quantification Technologies**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 20a: Quantification**

Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Evaluation of New Technologies for Leak Quantification.

Type of Objective of Program Pilot:

- Improve efficiency and reduce cost of operation
- Reduce emissions and improve efficiencies by differentiating, and rapidly responding to large leaks.
- Pilot studies to validate actual costs and leak quantification, and system capabilities of next generation

**Part 3. R&D Objective: What do you expect to learn?**

The R&D objective is to develop and evaluate technologies and methods to quickly and accurately quantify emissions.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
F	f	f	F	f	F	f	f

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

- For buried leaks the Surface-Expression (tenting method) is the gold standard for estimating leakage flux rates with a reliable precision of  $\pm 10\%$ . Standardization of methods, procedures, and equipment plus improvements in equipment, technologies and methods have demonstrated the capability for even greater precision. For leaks on above-ground facilities the bagging method has similar results with similar potential improvements. All leak flux quantification methods that attempt to do so remotely or down-wind from the leak (laser scanning and atmospheric plume modeling) struggle to

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improve upon a precision better than an order of magnitude tolerance for individual leak flux estimation (up to 376% absolute error).

- Leak quantification instruments are critical to obtaining accurate methane emissions estimates and guiding abatement strategies. Current technology is expensive and in low supply, making acquisition of this equipment difficult. The next generation of this technology will attempt to improve quantification accuracy, equipment costs, equipment ease of use, and equipment availability.

**Part 4. Anticipated or Expected Results**

- The expected R&D benefit is to develop more accurate and efficient methods to quantify emissions leaks. More accurate measurements would produce a more accurate emission inventory and better prioritization of system leaks for repair (i.e., repair largest leaks first and reduce emissions). More efficient methods would reduce cost of operation and allow measurement of isolated leaks.

**Part 5. Emissions Impact**

- More-timely and/or accurate quantification of leak emissions may result in reducing the time to repair leaks, and improve the operational efficiency of the process thereby reducing implementation costs

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan)

1. Develop Screening Method & Process for Detection of Large Leaks and Improve Leak Flow Measurement Technology (SCG-2017-009)  
 Develop a screening method for routine leak survey to identify and differentiate potential non-hazardous leaks with large emission rates (greater than 10 cfh). In parallel, optimize the equipment and protocol used for leak flow measurement.
  - Project Complete.
2. Open-Source High Flow Sampler Development (SCG-2018-005)  
 Develop open-source High Flow sampler for leak quantification.
  - Anticipated Project Close Out: Q2 2022.
3. Standardization of NYSEARCH's Methane Emissions Validation Process (NYSEARCH M2020-006)  
 Develop a standard for methane emission validation process that follows the guidelines developed and proven in the earlier phase M2014-004 Ph IV. The standard will require participation in a standardization effort within a nationally recognized organization (AGA, ASTM, API).
  - Anticipated Project Close Out: Q3 2022.

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4. Low Flow Sampler (SCG-2021-001)  
Provide an alternative to the High Flow Sampler by developing a compact portable system for quantification of localized leaks on above-ground assets.
5. Anticipated Project Close Out: Q4 2022 New Mobile Methane Quantification Technologies Research Projects (SCG-2018-010)  
Evaluation of new or advanced technologies for mobile emission speciation. Independent assessment of four mobile based methane quantification technologies.
  - Anticipated Project Close Out: Q1 2022.
6. Standard of Surface Expression Eq. Project (NYSEARCH M2019-002)  
Explore ways of improving measurement of flow rate from buried Distribution system leaks, including tools and equipment, procedures and technologies.
  - Anticipated Project Close Out: Q4 2022.
7. System Emissions Using Mass Balance with Advanced Meter Technology Research Project (SCG-2018-006)  
This project is to assess the feasibility of developing algorithms designed for early detection of Distribution System Leaks using a mass-balance approach and leveraging consumption data from the Advanced Meter (AM) network within a defined study area.
  - Anticipated Project Close Out: Q4 2024.
8. Validation of Remote Sensing and Leak Detection Technologies Under Realistic and Differing Operating Conditions (OTD 7.20.b)  
Advance the use of unmanned aerial systems (UAS, UAV, drone) integrated remote sensing technologies. These technologies will be used to move integrity threat and leak detection methods toward realistic validation, under real-world operational conditions, found within natural gas transmission and distribution pipeline systems. The project will focus on key validation testing components that should occur after completing extensive leak facility testing.
  - Anticipated Project Close Out: Q1 2022.

New Proposed Projects<sup>9</sup>:

1. Evaluate new leak quantification technologies and methodologies
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024
2. Evaluate next generation manned aircraft systems for quantifying large leaks (appx. 10+ cfh) system-wide
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, of the technologies and methods of interest that can include one or more of the

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

following:

- a) Laboratory Evaluation
  - Evaluate technologies and methods in a laboratory environment utilizing controlled natural gas releases to assess their capabilities
  - Compare to existing measurement methods
  - Determine operating range
  - Determine leak rate measurement accuracy and precision over operating range
  - Determine ancillary equipment requirements
- b) Simulated Field Evaluation (Controlled Environment)
  - Evaluate technologies and methods in a simulated field environment utilizing controlled natural gas releases
  - Compare to existing leak measurement methods
  - Determine leak rate measurement accuracy and precision over operating range
  - Determine ancillary equipment requirements
  - Identify practical implementation issues and refine technologies and methodologies
- c) Pilot Study
  - Evaluate technologies and methods in an actual field environment.
  - Compare to existing buried leak measurement methods
  - Identify practical implementation issues and refine technologies and methodologies

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$701,469	\$719,005

**SDG&E**

2023	2024
\$69,376	\$71,110

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$1,956,154
SDG&E	\$193,466

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #17-2**  
**Aerial Leak Detection and Quantification Technologies**

**Part 11. References**

- a. 2022 SB 1371 Compliance Plan, RD&D Project #17-2 “Aerial Leak Detection and Quantification Technologies”
- b. Bacharach: <https://www.mybacharach.com/wp-content/uploads/2015/08/0055-9017-Rev-7.pdf>.
- c. RKI: <https://www.rkiinstruments.com/>.
- d. Heath Consultants: <https://heathus.com/>.
- e. ABB: <https://new.abb.com/products/measurement-products/analytical/laser-gas-analyzers/advanced-leak-detection>.
- f. Aeris Technologies: <https://aerissensors.com/>.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #20a-3**  
**Quantification of Through-Valve Leakage on Large Compressor Valves**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 20a: Quantification**

Utilities shall develop methodologies for improved quantification and geographic evaluation and tracking of leaks from the gas systems. Utilities shall file in their Compliance Plan how they propose to address quantification. Utilities shall work together, with CPUC and ARB staff, to come to an agreement on a similar methodology to improve emissions quantification of leaks to assist the demonstration of actual emission reductions.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Quantification of Through-Valve Leakage on Large Compressor Valves.

Type of Objective of Program Pilot:

- Improve quantification of through-valve leaks on large natural gas compressor valves prone to leakage (i.e., blowdown valves and isolation valves) by identifying and/or developing appropriate measurement methods (i.e., instruments and measurement procedures).
- Reduce natural gas emissions by identifying and repairing large through-valve leaks on large compressor valves.

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is to evaluate current and new through-valve leakage emissions measurement methods and determine the best method(s) for accurate quantification.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
		F, V					F, V

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

- Though-valve leakage was identified by SoCalGas as an emission source that was not well understood or correctly represented in the baseline emissions inventory<sup>c</sup>. Measurement methods for through-valve leakage emissions showed promising results during the previous Compliance Plan period. The next generation of this technology will be evaluated

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #20a-3**  
**Quantification of Through-Valve Leakage on Large Compressor Valves**

**Part 4. Anticipated or Expected Results**

- Accurate through-valve leakage measurements will lead to the ability to prioritize repair of large through-valve leaks on large compressor valves.

**Part 5. Emissions Impact**

- The current method to measure through-valve leakage emissions from compressor blowdown valves and isolation valves is an acoustic technology, which historically measures with a low bias (often measures a false zero). Evaluation of the SoCalGas 2015 baseline emissions data indicates a low bias in the blowdown and isolation valve measurements, and an adjustment of the 2015 emissions using best available data is appropriate. The identification and implementation of best method(s) for accurate measurements will allow quicker mitigation of previously undetected or under-quantified large leaks.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Leak Detection for Isolation Valves at Compressor Stations ("Improved GHG Fugitive Leak Detection", CPS-14-04A, PRCI)  
 Evaluation of IR, ultrasonic, and acoustic leak detection technologies for isolation valves at compressor stations. Available leak detection/measurement technologies will be evaluated to identify preferred instrumentation and methods for pinpointing isolation valve leakage. It is possible that different valve types and diameters will present different challenges, and instrument evaluation will provide proof-of-concept for different applications.
  - Anticipated Project Close Out: Q1 2023.

New Proposed Projects<sup>10</sup>:

1. Improved GHG Fugitive Leak Detection Pilot Study
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Identify best practice methods and procedures to identify effective emission measurement methods
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

<sup>10</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #20a-3**  
**Quantification of Through-Valve Leakage on Large Compressor Valves**

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series planned evaluations that can include one or more of the following:

- a) Screening evaluation of measurement methods for through-valve leakage emissions.
- b) Identify most promising measurement methods from the screening study and evaluate these methods under controlled conditions over a range of valve types and sizes, operating pressures, leak configurations, leak sizes, etc.
- c) Identify the best practice measurement method(s) and/or need for further evaluation.

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$351,041	\$374,595

**SDG&E**

2023	2024
\$34,718	\$37,048

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$918,942
SDG&E	\$90,884

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. GHG Emission Factor Development for Natural Gas Compressors, PRCI Catalog No. PR-312-16202-R02, April 18, 2018.
- b. Methane Emissions from the Natural Gas Industry, Volume 8: Equipment Leaks, GRI-94/0257.25, EPA-600/R-96-080h, June 1996.
- c. Appendix 3 – Compressor Emission Measurement Frequency, Winter Workshop Presentation, January 22, 2021

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #22**  
**Investigate Designs, Specifications, Tolerances, and Sealing Compounds for Threaded Fittings and Joints**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

<b>Best Practice 22: Pipe Fitting Specification &amp; Tolerances</b>
Utilities shall eliminate or greatly reduce emissions from metal pipe and fitting threaded connections most commonly used on aboveground facilities, such as on customer meter set assemblies and meter and regulation stations. This is accomplished with improved quality control inspection of supplier's threaded products and the application of high-performance thread sealant compounds during construction.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Investigate Designs, Specifications, Tolerances, and Sealing Compounds for Threaded Fittings and Joints.

Type of Objective of Program Pilot:

- Reduce emissions by reducing fugitive gas loss at threaded connections.
- Pilot studies to be initiated based on results of sealant evaluations. Pilot studies will validate actual costs and emissions reductions.

**Part 3. R&D Objective: What do you expect to learn?**

Evaluate the sealing performance of pipe thread specifications, tolerances, and sealing compounds (spray-on, brush-on, putty, or epoxy leak sealant products) for threaded fittings to lock and prevent gas leakage under varying environmental conditions, internal pressures and external loading. Identify the technologies that can seal low pressure (7 IWC or 2 PSIG) thread leaks on existing MSAs and conduct a thorough evaluation of these products.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
f	f	f	F	f	F	f	f

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

- Threaded connections remain an area of fugitive emissions that require further research to preemptively mitigate. Reducing the frequency of leak occurrence and simplifying the repair process are critical to reducing these emissions in a cost-effective manner.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #22**  
**Investigate Designs, Specifications, Tolerances, and Sealing Compounds for Threaded Fittings and Joints**

**Part 4. Anticipated or Expected Results**

- Company use of high-performance thread sealants may help eliminate fugitive methane emissions.
- Revising Company pipe thread specifications to ensure tighter tolerance and better-quality threads will help reduce fugitive methane emissions.
- Implement a threaded fitting replacement program for threaded components identified to have significant thread leaks.
- The project will identify the most economical thread sealants that resist leakage when exposed to varying combinations of pipe size, pressure, and temperature changes; movement; and general environmental conditions, and that provide an emissions cost-benefit when considering implementation costs of any required changes to operational practices. For example, Spray-on and brush-on type sealants will blow off by the force of the low-pressure leaks. The putty type sealants will take more time to apply but will stop low-pressure leaks. Ease of application, amount of time to apply, minimum surface preparation, and no service disruption are advantages over standard MSA dismantle and reassembly.
- Leak testing of NPT and ANPT quality pipe and fitting threads will provide performance data that will determine if company pipe fitting specifications need to be revised.

**Part 5. Emissions Impact**

- Reduce or eliminate fugitive methane emissions from aboveground threaded connections on Customer MSAs and Meter and Regulation Stations.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Study Quality of Existing Pipe Fitting Inventory Research Project (NYSEARCH M2018-001)  
 To understand the influence thread quality has on sealing performance by evaluating the thread specifications from National Pipe Taper (NPT) and Aeronautical NPT and test representative samples for sealing performance.
  - Anticipated Project Close Out: Q4 2022.

New Proposed Projects<sup>11</sup>:

1. Study Quality of Existing Pipe Fitting Inventory Research Project (continued)
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Pipe Thread Sealant Performance in Storage Applications
  - Anticipated Start Date: Q1 2023.

<sup>11</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #22**  
**Investigate Designs, Specifications, Tolerances, and Sealing Compounds for Threaded Fittings and Joints**

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series planned evaluations, that can include one or more of the following:

- a) Laboratory Evaluation
  - Data gathered during laboratory evaluation will be utilized to establish performance baselines and to determine which sealants proceed to the field evaluation.
- b) Simulated Field Evaluation (Controlled Environment)
  - Data gathered during field evaluation will be used to compare to Company specifications and guide the Pilot Study.
- c) Evaluation Cost of Implementation
  - Estimate cost to conduct pilot studies.
  - Estimate emissions reduction cost reduction, and cost avoidance benefits (Go/No-Go Decision).
- d) Pilot Study
  - Data gathered during pilot study will be utilized to determine candidates for implementation. Screening evaluation of measurement methods for through-valve leakage emissions.

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$210,996	\$216,272

**SDG&E**

2023	2024
\$20,868	\$21,390

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$553,382
SDG&E	\$54,730

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #22**  
**Investigate Designs, Specifications, Tolerances, and Sealing Compounds for Threaded**  
**Fittings and Joints**

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. NYSEARCH Project M2018-001 Project Report.<sup>12</sup>

<sup>12</sup>Confidential/non-public document

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-1**  
**Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 23: Emissions from Operations, Maintenance and other Activities**

Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e. low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions.

Type of Objective of Program Pilot:

- This is an emissions reduction effort through mitigation of natural gas release which is currently part of the operation. This will also result in operational efficiencies.
- Perform pilot projects to demonstrate effectiveness and establish basis for cost estimates of technology implementation.

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is to:

- Evaluate the effectiveness of various technologies (new or as discovered during records search) to mitigate vented emissions and gas blowdowns.
- Review relevant operating procedures where gas is currently released as part of the operation to identify opportunities to reduce methane emissions by changing current practices and utilizing new technology, tools and equipment, and/or practices.
- Perform pilot projects to demonstrate effectiveness and establish basis for cost estimates of technology implementation.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
V	V			V		V	V

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

Lessons Learned:

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-1**  
**Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions**

next generation of this technology will attempt to reduce system size and cost, which will increase cost effectiveness for non-high pressure applications.

**Part 4. Anticipated or Expected Results**

- The evaluation of various technologies to mitigate gas blowdowns and vented emissions will result in recommendations to reduce blowdown events and a reduction in vented emissions.
- Opportunities that are identified in the operating procedure review may result in an evaluation and subsequent recommendation to change existing practices or to utilize new practices, tools and equipment or technology.

**Part 5. Emissions Impact**

- Reduce planned facility blowdown or venting of natural gas to the atmosphere and/or other operational venting by employing one or more viable options.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Gas Powered Pipeline Evacuation Systems (SCG-2021-008)
  - Evaluate a gas-powered pipeline evacuation system to avoid purging methane to atmosphere during distribution pipeline repair and maintenance.
    - Anticipated Project Close Out: Q3 2022.

New Proposed Projects<sup>13</sup>:

1. Field demonstrations and evaluation of mitigation technologies
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Evaluate impact of utilizing new technology, tools and equipment on practices and procedures
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective for technology, tool or equipment will involve a series of planned evaluations, that can include one or more of the following:

- a) Manufacturer/In-house Demonstration
  - Facilitate demonstrations by manufacturers or set-up in-house prototypes of new technologies, tools, or equipment.

<sup>13</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan****RD&D Summary #23-1****Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions**

## b) Laboratory Evaluation

- Establish baseline performance for technologies, tools or equipment that are evaluated.
- Comparative evaluation to manufacturer specifications and currently approved methods.
- Evaluate the technologies, tools, or equipment to Company requirements for intended applications.
- Simulated Field Evaluation (Controlled Environment)
- Evaluate technologies, tools, or equipment in a simulated field environment
- Compare to currently approved technologies, tools, or equipment

## c) Pilot Study

- Evaluate technologies, tools or equipment in an actual field environment, including controlled natural gas releases.
- Compare to currently approved technologies, tools, or equipment.

The R&D approach to meet the objective for procedural evaluations includes:

- a) Identify relevant operating procedures where gas is currently released as part of the operation.
- b) Review Procedures.
  - Identify opportunities to reduce methane emissions.
- c) Evaluate cost of implementation and prioritize opportunities.
- d) Execute demonstrations/evaluations on prioritized opportunities.

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$217,553	\$222,993

**SDG&E**

2023	2024
\$21,516	\$22,054

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$575,983
SDG&E	\$56,965

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-1**  
**Evaluation of Technologies to Mitigate Gas Blowdowns & Equipment Vented Emissions**

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. <https://www.energy.ca.gov/solicitations/2019-10/gfo-19-502-storage-monitoring-smartshutoff-and-3d-mapping-technologies-safer>.
- b. ZEVAC: <https://www.tpemidstream.com/zevac>.
- c. GOVAC: <https://onboarddynamics.com/govac-system/>.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-2**  
**Evaluate Component Emission Reductions Opportunities**

**Part 1. Evaluate the Current Practice Addressed in this Chapter**

This project addresses the following Best Practice(s):

**Best Practice 23: Emissions from Operations, Maintenance and other Activities**

Utilities shall minimize emissions from operations, maintenance and other activities, such as new construction or replacement, in the gas distribution and transmission systems and storage facilities. Utilities shall replace high-bleed pneumatic devices with technology that does not vent gas (i.e. no-bleed) or vents significantly less natural gas (i.e. low-bleed) devices. Utilities shall also reduce emissions from blowdowns, as much as operationally feasible.

**Part 2. Name And Type of RD&D Objective or Program Pilot**

Name: Evaluate Component Emission Reductions Opportunities.

Type of Objective of Program Pilot:

- Reduced emissions from equipment and component leaks and develop operational efficiency improvement through improved monitoring systems, improved performance, and changes in practices, designs, materials or novel solutions.
- Pilot studies to be executed on successful areas of improvement to validate actual costs and emissions reductions.

**Part 3. R&D Objective: What do you expect to learn?**

The research objective is two-fold:

- Evaluate the maintenance history of Compressor and M&R Station components to identify components prone to leakage (valve stems, through-valve in closed positions, lube port, etc.). Identify opportunities to improve leak detection through monitoring systems and/or improve system performance through changes in maintenance practices, component designs, new materials, or novel solutions.
- Evaluate emissions from system components designed to have vented emissions. Identify opportunities to reduce vented emissions through monitoring systems or improved maintenance practices, component designs, new materials, or novel solutions.

**Areas Targeted**

Transmission			Distribution			Storage	
Pipeline	M&R	Compressor	Pipeline	M&R	MSA	Well/Lat	Compressor
V	F, v	F, v	V	F, v	f, v	F, V	F, V

Primary Area of Focus: F – Fugitive; V – Vented

Secondary Area of Focus: f – Fugitive; v – Vented

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-2**  
**Evaluate Component Emission Reductions Opportunities**

Lessons Learned:

- Various component emission reduction technologies showed promising results during the current Compliance Plan period. The next generation of this technology will focus on improved valve maintenance practices and/or replacing existing equipment/materials/components with new designs that reduce emissions.

**Part 4. Anticipated or Expected Results**

- Reduce methane emissions by improved valve maintenance practices and/or replacing existing equipment/materials/components with new designs that reduce emissions.

**Part 5. Emissions Impact**

- This research objective is estimated to result in emissions reduction; however, the magnitude of this emissions reduction cannot yet be determined.

**Part 6. Milestone (Expected Start Date, Finish Date, Other Key Dates Planned)**

Current Projects (2020 Compliance Plan):

1. Field Trial of Solar Turbines Fugitive Methane Recompression System for DGS and Process Vents (CPS-17-05)  
 Conduct field trial of solar fugitive gas recovery and recompression system. This system is intended to decrease GHG emissions and reduce compressor methane emissions to near-zero levels.
  - Anticipated Project Close Out: Q1 2022.
2. Rod Packing Study (SCG-2020-003)  
 Perform a study on compressor rod packing emissions, where a team will be examining multiple stations and collecting data in different operating conditions. In addition, the team will conduct a survey of the equipment and current operating practices. The data collection of this project will support multiple projects on the implementation side (e.g. valve maintenance procedures).
  - Anticipated Project Close Out: Q1 2022.
3. Linear Compressor (OTD 7.20.L)  
 Design, build, and test a high-pressure linear motor leak recovery compressor for cost effective recovery of methane leaks within the transmission, storage, gathering, and processing sectors of the natural gas value chain. The compressor will be designed and built using a proven linear motor compressor architecture.
  - Anticipated Project Close Out: Q1 2023.

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-2**  
**Evaluate Component Emission Reductions Opportunities**

New Proposed Projects<sup>14</sup>:

1. Evaluate and revise current practices to utilize new technology, tools, equipment, and procedures
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.
2. Study alternatives to reduce component leakage and vented emissions
  - Anticipated Start Date: Q1 2023.
  - Anticipated End Date: 2024.

**Part 7. Data Collection and Analysis Plan – Appropriate to the type of project**

The R&D approach to meet the objective will involve a series of planned evaluations, that can include one or more of the following:

- a) Evaluate maintenance histories to identify components prone to leakage.
- b) Implement lessons learned regarding valve maintenance and improved leak detection.
- c) Evaluate emissions from system components with vented emissions.
- d) Identify opportunities to reduce vented emissions.
- e) Select opportunities based on emissions reductions and cost efficiency and evaluate on site.
- f) Create Standard Operating Procedures, training programs, tracking plans.
- g) Develop materials, novel solutions as identified.

**Part 8. Expected Utility Total Cost (if co-funded, what is total cost?)**

Incremental Cost Estimates (Provided in 2021 Dollars and Direct Costs)

**SoCalGas**

2023	2024
\$268,025	\$274,725

**SDG&E**

2023	2024
\$26,508	\$27,171

**Part 9. Rate-Recoverable Loaded Costs Submitted in the Advice Letter, 1-Way Account**

Utility	Total Loaded Costs
SoCalGas	\$710,361
SDG&E	\$70,255

<sup>14</sup>Anticipated end dates have greater uncertainty due to COVID-19 constraints

**2022 SB 1371 Compliance Plan**  
**RD&D Summary #23-2**  
**Evaluate Component Emission Reductions Opportunities**

**Part 10. Other Related Advice Letter costs for the program if any**

There are no other advice letter costs directly related to this template.

**Part 11. References**

- a. GHG Emission Factor Development for Natural Gas Compressors, PRCI Catalog No. PR-312-16202-R02, April 18, 2018.
- b. Methane Emission Factors for Compressors in Natural Gas Transmission and Underground Storage based on Subpart W Measurement Data, PRCI Catalog No. PR-312-18209-E01, October 17, 2019.