2022 SB 1371

COMPLIANCE PLAN

Originally Submitted March 15, 2022
Amended August 12, 2022

Summary of Amendments to SDG&E's 2022 Natural Gas Leak Abatement Compliance Plan (August 2022)

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

Chapter	Page Number	Change Made
Intro	3	Updated calculated emission reductions, cost effectiveness factors, and emission reduction discussion based on May 2022 approval from RASA staff
1	12	Updated emission reduction estimates and cost effectiveness calculations
3	22	Corrected typos
4	27	Corrected typos
8	44	Corrected typos

Introduction

SDG&E 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) 3071-G are approved, with an expectation of 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. SDG&E 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 SDG&E. Therefore, SDG&E is providing a supplementary introduction to reflect the baseline's adjustments.

Emission Reductions from Official 2015 Baseline

The approved 2015 baseline for SDG&E's system is 177,334 MCF. This value includes 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 13,405 MCF. Therefore, the overall emissions of 2030 are estimated to be 163,929 MCF, a 7.56% reduction from the current approved 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 SDG&E's proposed major activities and estimated emission reductions proposed in the 2022 Compliance Plan based on the 2015 official baseline.

Table 1: Major Efforts to Reduce Emissions (updated 2015 baseline) – SDG&E

Chapter	2024 Emission Reduction, MCF	2025 Emission Reduction, MCF	2030 Emission Reduction, MCF	Standard Cost Effectiveness ($/MCF), (2023-2030)	Net Cost Effectiveness ($/MCF), (2023-2030)
Chapter 1 - Increased Leak Survey	7,301	7,301	7,301	432	410
Chapter 2 - Blowdown Reduction Activities	2,944	2,944	2,944	395	372
Chapter 3 - Damage Prevention Algorithm & Proactive Intervention	2,519	2,519	2,519	73	51
Chapter 14 - Aerial Monitoring*	641	641	641	N/A	N/A
Summary	**13,405**	**13,405**	**13,405**		
Percentage Reduction from Official 2015 Baseline	**7.56%**	**7.56%**	**7.56%**		

**Chapter 14 - Aerial Monitoring is still in its pilot phases. The emission reduction and cost data available is too premature to assess an accurate cost effectiveness value.*

Emission Reduction Estimation Assumptions

- For the 2015 value, SDG&E is using the corrected emissions value for Distribution Main & Services Pipeline Leaks System Category to reflect the results of correcting the numbers of leaks discovered by O&M vs. Survey activities. This change was communicated to the CPUC in an email sent on September 7, 2018. CPUC and CARB approved this methodology in May 2022
- SDG&E is using leaker-based emission factors for component leaks and component emission for the Distribution M&R Stations system category as it was approved in March 2021 for 2024, 2025, and 2030 emission estimations. CPUC and CARB approved this approach in May 2022
- SDG&E 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
- SDG&E is utilizing 2018 dataset to estimate Components Emissions and Components Leaks sources emissions of the Transmission Compressor Stations System Category as proposed by the utility 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

For SDG&E's 2021 Annual Emissions Report, almost 90% of emissions were based on population-, facility-, or component-based emission factors. SDG&E is planning to propose the Company-Specific Leaker-Based Emission Factors to estimate emissions from MSA at the CPUC's 2023 Winter Workshop. If approved, additional emission reductions will likely be demonstrated.

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, SDG&E is proposing to implement measures that maximize cost-effective emission reductions as reasonably as possible and then maintain the reduced emission levels through 2030. SDG&E awaits the results of the program evaluation scheduled for the end of 2022. SDG&E anticipates reassessing projects submitted in the 2024 Compliance Plan as a result of the program evaluation. As proposed research projects and pilots are completed, more accurate modeling may become available for activities, such as the 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 SDG&E's system, SDG&E 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 SDG&E's Annual Emissions Report but these activities support the state's climate goals and the spirit of Senate Bill 1371.

Calculating Cost Effectiveness

SDG&E 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:

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

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

Historical Cost Effectiveness with avoided Cap & Trade Costs:

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

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

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

Future Standard Cost Effectiveness:

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

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

Future Cost Effectiveness with avoided Cap & Trade Costs:

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

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

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

Common Assumptions for Cost Estimates

Below are the common assumptions SDG&E 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 SDG&E and Southern California Gas (SoCalGas), 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, SDG&E 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/MTCO2e, 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 MTCO2e to MCF results in a cost-benefit of $13.61/MCF
8. Loaded chapter costs include a 10% contingency, as noted in the SDG&E Advice Letter and each chapter cost summary section

SDG&E Table of Concordance

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SDG&E 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

Acronym	Definition
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
MTCO2e	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: Increased Leak Survey

Part 1. Evaluate the Current Practice Addressed in this Chapter

This Chapter addresses the following Best Practices:

Best Practice 15: Gas Distribution Leak Surveys
Utilities should conduct leak surveys of the gas distribution system every 3 years, not to exceed 39 months, in areas where G.O. 112-F, or its successors, requires surveying every 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.
Best Practice 16: Special Leak Surveys
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 according to the requirements in 49 CFR § 192.723. SDG&E 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, SDG&E increased the survey frequency for all Pre-1986 Aldyl-A pipe from five (5) year and three (3) year to annual. This activity was funded by the Distribution Integrity Management Program (DIMP).

In the 2018 Compliance Plan, SDG&E was approved to move Vintage Steel pipe from five (5) year to annual leak survey cycles, Post-1986 Plastic pipe from five (5) year to three (3) year survey cycles, and protected steel (Post-1950) pipe from five (5) year to three (3) year leak survey cycles. To support these efforts, SDG&E staffed the following dedicated employees:

- Three (3) Leak Patrollers
- One (1) Field Operations Supervisor
- One (1) Office Employee

SDG&E purchased vehicles and tools for the incremental employees, and they have completed required training. The leak survey department was also reorganized into North and South regions to support the larger work scope.

In addition to the mentioned surveying efforts above, additional labor was required for updating internal reporting and mapping systems (SAP & GIS) to update leak survey maps as a part of the increased survey cycle.

Emission Reductions Achieved

Emission reductions achieved in 2018 after one (1) year of annual survey performed on Pre-1986 Aldyl-A was 3,147 MCF, compared to the reduction of 529 MCF calculated in the 2020 Compliance Plan. This is a result of taking unknown leaks that shifted to known leaks into account, which now fall under leak inventory mitigation schedules for SDG&E. Since Vintage Steel and Protected Steel shifted from five (5) to three (3) year survey cycles starting in 2020; 2019 reflects partial reductions due to the implementation timing. The 2020 emission reductions for unknown leaks were 4,153 MCF for protected steel and Post-1986.

Historical Emission Reductions (MCF)

2018	2019	2020
N/A	3,147	4,153

Cost Effectiveness Evaluation of Historic Work

Historical Standard Cost Effectiveness ($/MCF)

Projected in 2020 Compliance Plan	Actual Cost Effectiveness
$444	$352

Part 2. Proposed New or Continuing Measure

SDG&E proposes to continue performing annual leak survey on Pre-1950 Vintage Steel Pipe and Pre-1986 Aldyl-A pipe, as well as three-year leak survey cycles on Post-1986 plastic pipe and protected steel pipe.

As result of the shift, the leak survey workload increased by 66% which materialized in the second quarter of 2021. Shifting from five (5) year to three (3) year and three (3) year to annually resulted in sporadic leak survey anniversary dates. SDG&E was able to shift the work the first year but, after taking a closer look at the ongoing effort to maintain the workload, it was determined that the survey team would require additional field employees. Along with sustaining the workload, SDG&E will levelize leak survey in order to have consistent and efficient work throughout the year. In 2021, SDG&E hired one (1) Field Operations Supervisor along with one (1) Office employee.

To support the ongoing workload, SDG&E wishes to hire three (3) additional patrollers in 2023 which will result in a total workforce of:

- 6 Patrollers
- 2 Field Supervisors
- 2 Office Employees

To support the incremental staff, SDG&E will purchase additional vehicles and equipment for the field employees and field supervisor. The cost breakdown can be seen in the cost assumption section of this chapter. The continued effort for leak survey are as follows:

- Pre-1950 Vintage Steel pipe from five year to annual leak survey cycles
- Post-1986 Plastic pipe from five year to three-year survey cycles
- Protected steel (Post-1950) pipe from five year to three year leak survey cycles
- Levelize distribution leak survey

As a continued effort to reduce methane emissions and further support emissions data, SDG&E will adopt the Large Leak Prioritization program in 2022. No cost is associated with the implementation of the program at this time as the training modules and updates to IT software have already been created for SoCalGas and will be mirrored over to SDG&E. This will not be used to accelerate leaks for repair as SDG&E does not carry a non-hazardous inventory year over year but used to improve emissions reporting. Collecting data for the 5 measurements fields for LLP will be part of a collection process that is already taking place when evaluating leaks for investigations and reevaluations.

Although SDG&E will not be shifting its leak survey cycles further, it will expand the efforts on replacing Population-Based emission factors with Company-Specific Leaker-Based emission factors by using PHMSA category criteria for above ground leaks similar to the SoCalGas proposal in Chapter 2. 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 their own emission factor based on the system-wide random sampling conducted through RD&D. SDG&E is still in its infancy stage of the program and wishes to further expand the program which will require system enhancements, and training for approximately 35 field employees.

Part 3. Abatement Estimates

SDG&E estimates that the emission reductions achieved by increasing leak survey cycles on Pre-1950 Vintage Steel Pipe and Post-1986 plastic pipe and protected steel to one-year and three-year leak survey cycles will result in a total emission reduction of 7,301 MCF year over year beginning 2021 and levelize moving forward for this Compliance Plan as below:

Forecast of Emission Reductions from Baseline (MCF)

2023	2024	2025	2026	2027	2028	2029	2030
7,301	7,301	7,301	7,301	7,301	7,301	7,301	7,301

The calculation methodology used to calculate the estimated emission reductions is the same methodology used to calculate emissions from the distribution system in the Annual Emissions Report. The calculation methodology is found below:

1. Derive the annual system leak rates by materials and facilities
2. Estimate the number of leaks detected and their associated emissions when shifting the survey cycle from five-year to three-year or annually
3. Project emission reductions in future years during and after implementation
4. Taking unknown leaks and shifting them to known leaks on accelerated survey cycles

Part 4. Cost Estimates

Cost estimates below include costs associated with annual survey cycles on Pre-1950 Vintage Steel and three-year survey cycles on protected steel and Post-1986 plastic pipe along with levelizing efforts for survey. SDG&E is not requesting funding for Pre-1986 Aldyl-A survey in this program.

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Leak Survey Field Employees	$514,680	$514,680	$2,258,652
Leak Survey Office Employees	$170,000	$170,000	$748,000
Leak Survey Supervisors	$200,000	$200,000	$880,000
Total	**$884,680**	**$884,680**	**$3,886,652**

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023 - 2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
Tools	$89,589	-	$108,403
Vehicle	$30,000	-	$36,300
Total	**$119,589**	**-**	**$144,703**

Total Revenue Requirement over Expected Life of Investment
$4.4 million
Average Annual Revenue Requirement
$2.0 million

Cost Assumptions:

- 6,114 feet surveyed per day
- Represented Employee Hourly Rate: $41.00
- Annual cost of six (6) Incremental Leak Survey Field FTEs
- Annual cost of two (2) Incremental Survey Supervisors
- Annual cost of two (2) Incremental Office Employees
- $100K annual salary for Supervisor
- 10% contingency is included in the total loaded O&M cost
- Vehicles for Field Employees
- Vehicle for Field Supervisor
- Tools and Equipment for 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
$352	$351	$330

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

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
$432	$431	$410

Part 6. Supplemental Information/Documentation

Attachment 1A: Historical Project Schedule for Increased Leak Survey

2022 SB 1371 Compliance Plan
Chapter 2: Blowdown Reduction Activities

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.
Best Practice 3: Pressure Reduction Policy
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.
Best Practice 4: Project Scheduling Policy
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.
Best Practice 5: Methane Evacuation Procedures
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.
Best Practice 6: Methane Evacuation Work Orders Policy
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.
Best Practice 7: Bundling Work Policy
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.

SDG&E 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 sections of pipe using stopples.

2022 SB 1371 Compliance Plan
Chapter 2: 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 there are no capital costs, and payback is immediate. The cost effectiveness of also 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, SDG&E was approved to continue blowdown reduction efforts. SDG&E was also authorized to increase the capabilities of blowdown gas capture. This includes purchasing compressors and cross compression equipment to reduce blowdown emissions, increase field operations staff to support the incremental time to reduce blowdown, and create a record keeping and compliance process to document that the requirements of the Best Practices were being met.

No incremental staffing was required at SDG&E for this implementation. SDG&E is utilizing SoCalGas' centralized blowdown reduction organization.

Two Gas Standards were identified to be updated to require blowdown reduction efforts as outlined in Best Practice Nos. 3 through 7. The Gas Standard G7909, *Purging Pipelines and Components,* has been updated and is included as an attachment in the Appendix of this Compliance Plan. The Gas Standard G8148 *Gas Loss Estimation – Pipeline,* were updated in 2020.

SDG&E has also initiated the exploration of potential emissions reduction activities through modifications to the Borrego Springs LNG facility to reduce leak and vented emissions.

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 3,518 MCF. Emissions from these categories in the calendar years 2018, 2019 and 2020 totaled 557 MCF, 1,588 MCF and 574 MCF respectively. This equates to an estimated reduction of 2,961 MCF for 2018, 1,930 MCF for 2019 and 2,944 MCF for 2020.

Historical Emission Reductions (MCF)

2018	2019	2020
2,961	1,930	2,944

Cost Effectiveness Evaluation on Historic Work:

Historical Standard Cost Effectiveness ($/MCF)

Projected in 2020 Compliance Plan	Actual Cost Effectiveness
$38	$41

Pipeline blowdown reduction activities have proven to be approximately as cost effective as originally anticipated. SDG&E has updated standards and practices in the company and has adopted blowdown reduction activities to the level expected when filing the 2020 Compliance Plan.

Part 2. Proposed New or Continuing Measure

SDG&E proposes to continue high pressure pipeline blowdown reduction efforts. SDG&E will continue to bundle work on high-pressure lines when and where it is practical to do so. SDG&E will also be exploring the expansion of blowdown reduction efforts into Distribution operations in 2022. If these efforts prove cost effective, SDG&E will expand its blowdown reduction efforts to large Medium Pressure Distribution projects. In order to support these efforts, two (2) additional FTEs (Field Technician and 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 capital work, including 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. SDG&E proposes to develop an electronic tool to plan blowdown reduction efforts and improve data aggregation and analysis.

Additional considerations for emission reductions for the Borrego Springs LNG facility will continue to be evaluated and potentially planned and executed. Based off the initial cost estimate to improve the structural and piping components of the facility, other alternatives besides modernizing the facility, including but not limited to decommissioning activities, will need to be evaluated to determine the most cost-effective method and maximizing emission reductions to its fullest extent.

Part 3. Abatement Estimates

SDG&E estimates that the emission reductions achieved by increasing blowdown reduction activities will result in a total emission reduction of 2,610 MCF from the 2015 baseline of 3,518 MCF. These emissions will be reduced from the Blowdown Emission Source Category within the Transmission Pipeline, Transmission M&R Stations, Transmission Compressor Stations and Distribution Mains & Services Categories.

Forecast of Emission Reductions from Baseline (MCF)

2023	2024	2025	2026	2027	2028	2029	2030
2,944	2,944	2,944	2,944	2,944	2,944	2,944	2,944

Blowdown emissions are a function of activity level. The emission reductions shown in the above table are estimated based on a wider adoption of new blowdown reduction technologies, assuming activity levels remain constant. SDG&E will continue evaluating opportunities to expand 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

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Blowdown Reduction in Transmission Operations	$60,000	$120,000	$235,620
Distribution Incremental Staff	$89,190	$89,190	$344,917
Blowdown Reduction Projects in Distribution Operations	$480,000	$600,000	$1,413,720
Total	**$629,190**	**809,190**	**$1,994,257**

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023 - 2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
Blowdown Reduction in Transmission Operations	$300,000	$360,000	$863,940
Blowdown Reduction Projects in Distribution Operations	$900,000	$1,020,000	$2,513,280
Borrego Springs	$5,000,000	-	$6,050,000
Total	**$6,200,000**	**$1,380,000**	**$9,427,220**

Total Revenue Requirement over Expected Life of Investment
$12.5 million
Average Annual Revenue Requirement
$1.2 million

Cost Assumptions:

- Annual cost of $100K per management FTE
- Average rate of $41.47 per Field FTE
- Distribution Operations:
    - Three (3) Supervisors (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
$41	$40	$19

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

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
$395	$393	$372

Part 6. Supplemental Information/Documentation

Attachment 2A: Historical Project Schedule for Blowdown Reduction Activities

2022 SB 1371 Compliance Plan
Chapter 3: Damage Prevention Algorithm and Proactive Intervention

Part 1. Evaluate the Current Practice Addressed in this Chapter

This Chapter addresses the following Best Practice(s):

Best Practice 24: Dig-Ins and Public Education Program
Expand existing public education program to alert the public and third-party excavation contractors to the Call Before You Dig – 811program. In addition, utilities must provide procedures for excavation contractors to follow when excavating to prevent damaging or rupturing a gas line.
Best Practice 25: Dig-Ins and Company Standby Monitors
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.
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.

The State of California mandates a pre-construction meeting with excavators requesting Locate and Mark support and requires continuous monitoring of excavations within ten feet of high-pressure pipelines pursuant to Cal. Gov. Code § 4216.2. Therefore, the requirements of Best Practice 25 are already met. SDG&E's Public Awareness Program is driven by the requirements of 49 C.F.R. § 192.616, Public Awareness Programs for Pipeline Operators, API RP 1162, and program expansion recommendations by regulators. SDG&E was approved to begin expanding the standby program to other areas where there could be challenges to controlling a damage, as proposed in the 2018 Compliance Plan. This implementation was pending the completion of a risk algorithm analyzing the location of 811 tickets and prioritizing them to trigger expanded standby. In 2019, this algorithm was completed and piloted. SDG&E has determined through the algorithm development that, rather than expanding standby, it would be more efficient to perform more field interventions for these higher-risk excavations. Rather than having an employee stand by and observe an excavation, which can often take multiple days, it would be more efficient to have that employee visit multiple excavators within the same timeframe to discuss damage prevention at their excavation sites.

Since implementation, using the prioritized results from the risk analysis algorithm, company personnel can initiate communication with excavators to discuss the project and remind them of the importance of locating and protecting the natural gas pipe within their projects delineated area. The form of communication can be a phone call, text message, email, or job site visit, prior to the date of excavation. These proactive interventions were implemented in the field and the company personnel were able to effectively address a larger number of excavation projects than just performing standby.

In 2020, outreach for excavation safety continued. However, the COVID-19 pandemic caused a decrease in construction work and an increase in homeowners staying at home with more DIY home projects incurring damages, shifting damages occurring from commercial to residential projects. Despite these impacts, the proactive excavation interventions enabled SDG&E to minimize methane emissions from preventable damages.

Emission Reductions Achieved:

The estimated emission reductions of 840 MCF achieved through proactive intervention for all districts with the one (1) DPA from the previous compliance period are calculated in the equation below.

Emission Reductions = 9,328.84 MCF * 27% * (1/3) = 840 MCF

Cost Effectiveness Evaluation on Historic Work:

Historical Standard Cost Effectiveness ($/MCF)

Projected in 2020 Compliance Plan	Actual Cost Effectiveness
$102	$446

The actual cost effectiveness of the project is higher than the projected cost effectiveness because the actual emission reductions were less than the forecasted emission reductions. Emission savings may vary, as emissions resulting from damages are calculated based on damage severity and the damaged asset dimensions and pressure. Additionally, the COVID-19 pandemic has caused adverse effects, such as a decrease in construction work and reduced in-person interactions with excavators and developers.

Part 2. Proposed New or Continuing Measure

SDG&E proposes continuing developing the damage prevention risk analysis algorithm described above; this information is used to trigger proactive interventions. Proactive interventions include activities that SDG&E 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 education with the excavators, stopping work that is not compliant 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 SDG&E with prompt visibility into high-risk dig sites and mark out locations. SDG&E 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 SDG&E to prioritize and conduct appropriate and timely interventions before damages occur. The analysis and algorithms will also provide SDG&E automated visibility into repeat offenders who continue to cause excavation damages.

Project Milestones:

- Hire and train incremental staff: Expected to be completed by Q2 2023
- Collect data and perform proactive interventions: Continuous

Part 3. Abatement Estimates

Emission reductions are estimated based on the 2020 results of implementation out in the field for all operational districts within SDG&E. During implementation, SDG&E achieved an average annual reduction in damages per 1,000 tickets of approximately 27%. The results are summarized in the table below.

Damages per 1,000 Tickets

Company Wide	2017	2018	2019	2020
Distribution Tickets	135,460	133,304	148,350	163,174
Damages (below ground distribution)	389	369	333	341
Damages per 1000 tickets	2.87	2.77	2.24	2.09
Percent Reduction in Emissions	27%			

As proposed in the previous compliance period, system wide implementation would require three (3) damage prevention analysts for this program. Rather than implementing on a such a large scale, SDG&E initially staffed one (1) analyst (funded through another program) and based on the emissions reductions from current data, SDG&E proposes to fulfill the remaining two DPA positions. SDG&E reported damage emissions from Distribution Main & Services in 2020 at 9,328.84 MCF. Applying an estimated 27% reduction based on the SDG&E results, prorated by the staffing level, SDG&E estimates an annual emission reduction of 2519 MCF per year with systemwide implementation.

Emission Reductions = 9,328.84 MCF * 27% * (3/3) = 2,519 MCF

Forecast of Emission Reductions from Baseline (MCF) with 3 DPAs

2023	2024	2025	2026	2027	2028	2029	2030
2,519	2,519	2,519	2,519	2,519	2,519	2,519	2,519

Estimated emission reductions are calculated assuming savings will be the same year over year. As more data becomes available, SDG&E may be able 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 as the analysts will be able to perform more interventions. Emission savings may vary, as emissions resulting from damages are calculated based on damage severity and the damaged asset dimensions and pressure. A decrease in damages will not necessarily achieve a proportional decrease in emissions due to this variability.

The methodology is based on following assumptions:

- SDG&E's Annual Emissions Report in 2020 were reported at 9,328 MCF
- 27% * 9,328.84 MCF* 3/3 analysts = 2,519 MCF
- Damages reduced will be proportional to interventions performed
- Emission reductions achieved will be proportional to damage reductions

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Labor to Maintain Software Solution	$85,500	$85,500	$376,200
Total	**$85,500**	**$85,500**	**$376,200**

Total Revenue Requirement over Expected Life of Investment
$0.4 million
Average Annual Revenue Requirement
$0.2 million

Cost Assumptions:

- Cost estimate is calculated as 9% of cost per year for incremental labor to support software enhancements

Cost Benefits

- Repair Savings of $163,787
- Repair Cost Per Damage: $1,600 per damage * 51 prevented damages * 2 years

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
$447	$446	$425

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

Standard Cost Effectiveness	With Cap and Trade Cost Benefits	Net Cost Effectiveness
$73	$72	$51

Part 6. Supplemental Information/Documentation

Attachment 3A: Historical Project Schedule for Damage Prevention Algorithm and Proactive Intervention

2022 SB 1371 Compliance Plan
Chapter 4: 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 reports generation a time-consuming manual process. An additional challenge was that the electronic systems were not designed for generating reports for emissions, but rather for billing, maintenance, or operational record keeping. As a result, the records included varying types of nomenclature relevant to specific departments. Therefore, SDG&E developed a Data Lake with automated interfaces from various source systems to fully support capturing of the data elements required for emissions 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 emissions reporting templates as they evolve annually to include additional data because 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 fully support the capture of the data elements required for emissions 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
- Modified and enhanced the reporting for annual changes to emissions report templates

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

SDG&E 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, and Transmission. 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, SDG&E 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, SDG&E performed Asset Verification projects at its Transmission Facilities, which 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.

Milestones Proposed:

- Field verification of Transmission 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. SDG&E 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 disturbed to the end of 2025 to comply with regulatory accounting requirements. The tool enabled SDG&E to improve maintenance/performance practices of its assets in Transmission and Distribution 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 digital 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 all the deficiencies started in 2021 with the software module updates of the work management system The second part of this enhancement is to digitize forms and add mobile and spatial capabilities, which 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 2022.

Milestones:

- 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 Q3 of 2022

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 assets' 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 assets data
- Capturing regulatory reporting requirements updates and changes
- Continuous operating systems updates and changes
- Develop internal emission dashboard

Measure 2: Historizing Emission Sensor Data (HESD)

Under other company initiatives, emissions-related sensors are being purchased and deployed in various locations throughout SDG&E's 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.

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 information 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, 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, assets data, and maintenance data. ERAT will be developed to identify emission sources, associated assets, and maintenance processes and frequencies. Industry benchmarks data and statistical techniques can be employed to determine the emission reductions that can be achieved by modifying maintenance and operational practices. Other initiative plans 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 SDG&E and 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. 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 2023
- Data storage and report creation by Q4 2023
- Create metrics dashboard in support of analytics for decision making and resource planning by Q1 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.

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Data Lake	$30,000	$30,000	$132,000
ERAT	-	$9,990	$12,088
Project Manager/Project Engineer	$12,000	$13,800	$56,760
Internal IT Support	$3,600	-	$7,920
Contractor Support	$132,000	-	$159,720
Total	**$177,600**	**$53,790**	**$368,488**

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
Data Lake	$139,860	$99,900	$379,210
Historization	$79,920	$79,920	$252,806
ERAT	$92,400	$39,960	$204,706
Total	**$312,180**	**$219,780**	**$836,722**

Total Revenue Requirement over Expected Life of Investment
$1.4 million
Average Annual Revenue Requirement
$0.4 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 4A: Historical Project Schedule for Recordkeeping IT Project

2022 SB 1371 Compliance Plan
Chapter 5: Geographic Tracking

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. Exact wording TBD by the company and approved by the CPUC, in consultation with CARB, as part of the Compliance Plan filing.
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.

To improve capabilities of leak surveys performed at complex high-pressure facilities, SDG&E modeled and created the digital twin for the existing facility to enable a quick query of its facility. The intelligence found in the 3D model and the P&IDs will enable engineering 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 SDG&E database systems.

In the 2020 Compliance period,[1] SDG&E will complete the digitizing and mechanical walkdown of 15 Piping & Instrumentation Diagrams (P&IDs) and one (1) 3D modeling for its facilities. These intelligent P&IDs will allow engineering to locate tags for equipment or instrumentation that is currently found in these facilities. SDG&E will be able 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.

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.

[1] 2020 Compliance Plan described scope and work conducted for SoCalGas instead of SDG&E. This scope has been corrected for SDG&E in this statement for the time frame 2020-2022.

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

SDG&E completed the updates of P&IDs and back modeling of its complex high-pressure facilities. The intelligence found in the 3D model and the P&IDs will enable engineering and operations to identify, track and keep proper documentation linked within the two applications in AVEVA 3D Modeling and AVEVA P&ID. 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 SDG&E database systems. This will enable increased ability to calculate blowdown and bundle projects for blowdown, repair leaks more quickly, and identify materials with repeated leaks, indicating requirements for replacement.

Project Milestones:

No new milestones are proposed.

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

SDG&E is not requesting funding for this program in this Compliance Plan.

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 5A: Historical Project Schedule for Geographic Tracking

2022 SB 1371 Compliance Plan
Chapter 6: 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.

SDG&E developed a mobile application for the Electronic Leak Survey (ELS) process. Leak surveyors will carry iPads loaded with a mobile application to use GIS-generated leak survey routes instead of paper maps. Leak survey instrumentation will be used to track leaks, and leak data will be electronically uploaded into GIS. Breadcrumb (GIS Location) data will be collected for the survey path walked. Requirements gathering and vendor selection for mobile application were completed in 2018 and system design activities were completed in 2019. Development of mobile application and supporting portal applications were completed in 2021. Required hardware (iPad mini, accessories, storage) and support software has been acquired to conduct system integration testing to validate integration paths and end to end functionality. Application rollout to districts and deployment activities for all distribution districts will be initiated in 2022. A change management team has started engaging stakeholders to provide information on the mobile application through Digi Boards, district locations, intranet articles, and district visits.

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

There is an expectation that new enhancement requests will become apparent as the solution is deployed and employees begin utilizing it in the field. Software packages will go through upgrade cycle and the underlying product will be upgraded by a vendor to provide additional functionality and stability. After the deployment cycle is complete, SDG&E 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 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
- WO order 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

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 order 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.

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Travel – Patrol	-	$60,750	$73,508
Travel – Transmission	-	$60,750	$73,508
Total	**-**	**$121,500**	**$147,015**

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023 - 2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
Hardware - Patrol	$75,000	-	$90,750
Internal Labor - Patrol	$191,425	$191,425	$842,270
Software - Transmission	-	$50,000	$60,500
Hardware - Transmission	-	$75,000	$90,750
Internal Labor - Transmission	-	$382,850	$842,270
Total	**$266,425**	**$699,275**	**$1,926,540**

Total Revenue Requirement over Expected Life of Investment
$5.5 million
Average Annual Revenue Requirement
$0.2 million

Cost Assumptions:

- Travel cost estimate covers travel expenses to conduct employee training
- Software purchase includes vendor license and software upgrades for enterprise license
- Hardware purchase includes server cabinets, devices, and accessories
- Internal labor will cover multiple FTEs conducting various tasks, such as project management, coordination with contractors, and internal departments, 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 6A: Historical Project Schedule for Electronic Leak Survey

2022 SB 1371 Compliance Plan
Chapter 7: Damage Prevention Public Awareness

Part 1. Evaluate the Current Practice Addressed in this Chapter

This Chapter addresses the following Best Practice(s):

Best Practice 24: Dig-Ins and Public Education Program
Expand existing public education program to alert the public and third-party excavation contractors to the Call Before You Dig – 811program. In addition, utilities must provide procedures for excavation contractors to follow when excavating to prevent damaging or rupturing a gas line.
Best Practice 25: Dig-Ins and Company Standby Monitors
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.
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 five (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.

SDG&E has a federally mandated Public Awareness Program, as prescribed in 49 CFR § 192.616, which contributes to enhanced public safety. In addition, California mandates a pre-construction 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. Code § 4216.2. The Public Awareness Program is driven by the technical requirements of 49 C.F.R. § 192.616, the public awareness programs for Pipeline Operators, API RP 1162, and program expansion recommendations by regulators.

SDG&E conducted the following incremental outreach and education activities in the 2020 Compliance period:

- *Paradigm Excavator Outreach Meetings* – Additional excavator safety outreach meetings throughout service territory
- *Online Survey* Pilot – Half of the DPAC survey
- *Signage in Retail Stores* – Putting damage prevention signage in retail stores where contractors frequent
- *Solar/Electrical mail/email list, printing & postage* – Stand-alone solar/electrical contractor mailer for pipeline safety
- *SDG&E Community Relations Pilot Partnership* – Damage prevention/public awareness partnerships with major nonprofit organizations utilizing Community Relation's relationships

- *SDG&E Public Affairs Pilot Partnership* – Support for damage prevention/public awareness outreach with local nonprofits, cities, municipalities utilizing RPA's relationships
- *811 Damage Prevention Float at Rose Parade* - Damage Prevention outreach of 811 messaging at the 2020 Rose Parade
- *Social Media Boosts* - social media boosts that target certain areas in the service territory.
- *Padres Outreach* - Damage prevention messaging at Padres Stadium for 811 Day. Airing of new SDG&E safe digging video during game with 811 signage throughout stadium
- *Incremental media includes NSDM* - Damage prevention messaging during month of April. Campaign includes damage prevention and 811 digital contents with social media influencers
- *811 Day* - Damage prevention messaging during timeframe to include 811 Day. Campaign includes damage prevention and 811 digital contents on ads, billboards, radio
- *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 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.

Emission Reduction and Cost Effectiveness Evaluation on Historic Work

There is insufficient data to evaluate emission reductions or cost effectiveness for work funded through this program. However, SDG&E can demonstrate that its Public Awareness Program has increased the frequency of 811 calls and reduced the count of damages resulting in emissions savings as shown below:

Metric	2017	2018	2019	2020
Number of Distribution 811 Tickets	135,460	133,304	148,350	163,174
Damages Resulting in Emissions	389	369	333	341
Damages per 1000 tickets	2.87	2.77	2.24	2.09

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

SDG&E 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 number of Full Time Employees (FTE) hired to support the Public Awareness Program. Continued activities to support this measure include, but are not limited to:

- Analyze 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
- Analyze the effectiveness of pipeline safety communications and engagement strategies; use data and analysis to develop strategies to increase effectiveness for continuous improvement plans
- Conduct focus groups and refine messaging and strategies based on findings
- Work with other departments to analyze repeat offender data and develop strategies to reduce damages
- Be a point of contact for assisting with education services for pipeline and public awareness programs or concerns

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, as shown below. Thus, an increase in public awareness campaigns should result in decreased damages and, therefore, lower emissions.

SDG&E 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, SDG&E 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 SDG&E to increase focus on minimizing emissions. This measure will require partial time of two (2) existing employees, equivalent to ½ of an FTE. 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 because the efforts overlap with Chapter 3. The Damage Prevention Public Awareness Program does supports efforts outlined in Chapter 3 by increasing the awareness of 811 and educating the general public and ultimately result in lowering the number of third-party damages. Refer to Chapter 3 for the emission reduction estimates forecasted for damage prevention activities.

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Marketing Material/Programs	$500,000	$500,000	$1,210,000
1/2 FTEs	$50,000	$50,000	$220,000
Total	**$550,000**	**$550,000**	**$1,430,000**

Total Revenue Requirement over Expected Life of Investment
$1.5 million
Average Annual Revenue Requirement
$0.7 million

Cost Assumptions:

- Annual cost estimate of $100K per FTE for one half (1/2) FTE
- 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 7A: Historical Project Schedule for Damage Prevention Public Awareness

2022 SB 1371 Compliance Plan
Chapter 8: 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.

SDG&E has a Supply Management department that works with vendors in purchasing materials that meet SDG&E Material Specification Properties (MSP) requirements for all components. When materials are received, samples are inspected at a warehouse facility to verify requirements are met. 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, SDG&E hired a third-party consultant to analyze the company's quality control process and MSP standards to identify consistent requirements across component categories. The results from the third-party review 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 manufacturer tolerances and thread quality. In 2021, SDG&E hired a project manager to create a project plan necessary to drive the project to completion. Within the project plan, the scope was separated into two (2) phases. Phase 1 of the project is focused on updating all the material specification and quality control inspection instruction standards. A third-party consultant was hired to assist with updating all standards. Phase 2 of the project is focused on implementing the updated standards during the inspection process (QC), shipping and handling, and construction/ installation. Due to the COVID-19 pandemic, full implementation of the program has proven to be difficult because of the lack of in person inspection and training.

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

SDG&E continuous improvements in the inspection of threaded components will be supported by the improved test setups and testing efficiency and verifying that the checks being performed on the materials are adequate. SDG&E will continue to work with component manufacturers to align gauging practices and developing process controls to maintain high material thread quality standards. Due to these additional tasks and changes in the MSP, supplemental contractor support will be needed along with an incremental inspector 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, SDG&E will continue to evaluate additional feasible solutions based on results of material QC analysis.

Project Milestones:

- Update material specs, if necessary: Estimate of 12 months
- Implement Quality Control inspection process: Estimate of nine (9) months
- Implement inspection process at 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.

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Implementation	$200,000	$200,000	$880,000
Inspector	$110,000	$110,000	$484,000
Contractor Inspectors	$374,400	$374,400	$906,048
Total	**$684,400**	**$684,400**	**$2,270,048**

Total Revenue Requirement over Expected Life of Investment
$2.3 million
Average Annual Revenue Requirement
$1.2 million

Cost Assumptions:

- Cost estimate is for contract support to implement QC Process improvements at $200,000/year
- Annual cost of $110K for one (1) Quality Control Inspector
- Annual estimated cost of $90 per hour for 2,080 hours per Inspector for two (2) contractor Inspectors (Total: $374,400)

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 Pipe Fitting Specifications

2022 SB 1371 Compliance Plan
Chapter 9: 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 26 (BP 26) developed 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 4), which enables automated regulatory reporting. There were technical challenges in sharing data in real time with robust data security across six (6) automated systems, with some systems 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 automated claim creation. The implementation of Repeat Offenders IT System commenced in Q4 of 2020.

Milestones Completed:

- Converted the legacy paper form known as the Company Property Damage Report to electronic form
- The electronic form eCPDR is available on Customer Service and Distribution mobile solutions to capture and update damage information
- The electronic form eCPDR was integrated with mobile solution
- The eCPDR data was integrated with other SDG&E 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.

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 Dig-Ins and Repeat Offender measure will continue evaluating the digitized process and will ensure integration in case of new operational systems and/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

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
IT Labor to Maintain System	$15,000	$15,000	$66,000
Total	$15,000	$15,000	$66,000

Total Revenue Requirement over Expected Life of Investment
$0.07 million
Average Annual Revenue Requirement
$0.03 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 9A: Historical Project Schedule for Repeat Offenders IT System

2022 SB 1371 Compliance Plan
Chapter 10: Gas Speciation

Part 1. Evaluate the Current Practice Addressed in this Chapter

This Chapter 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.

SDG&E currently has a robust laboratory known as the Environmental Analysis Laboratory (EAL). When a methane source is in question, the EAL will dispatch a mobile gas speciation van to identify the chemical content of the gas and identify its source.

SDG&E expanded the capacity of the EAL to respond to requests from Operations for leak speciation where 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. SDG&E hired an additional employee and purchased additional gas speciation tools in 2019 to support the increase of gas speciation work. The van, tools, and equipment were installed and in operation by 2021. All milestones have been met.

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

SDG&E proposes continuing to fund the incremental lab technician, hired as part of the 2018 Compliance Plan, to continue to maintain the expanded capacity of the EAL to respond 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 SDG&E to maintain the expansion of these resources.

Project Milestones:

No new milestones are proposed. This is an ongoing effort.

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

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Technician	$100,000	$100,000	$440,000
Total	**$100,000**	**$100,000**	**$440,000**

Total Revenue Requirement over Expected Life of Investment
$0.4 million
Average Annual Revenue Requirement
$0.2 million

Cost Assumptions:

- Annual cost of $100K for one (1) Technician

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 Gas Speciation

2022 SB 1371 Compliance Plan
Chapter 11: 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 2020, SDG&E developed and published publicly available geographic maps of Distribution Main and Services leaks information, e.g., zip codes & volume of emissions. The list of the Distribution Main and Services leaks is also available to the public under Appendix 4 of the Annual Emissions Reports. SDG&E updates the leaks' 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[1], via zip codes and view the current and historic volume of emissions associated with the zip code.

Emissions 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

SDG&E 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: Q3 Annually

[1] https://www.sdge.com/sdge-distribution-mains-services-methane-emissions-map

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

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023 – 2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Labor	$15,000	$15,000	$66,000
Total	$15,000	$15,000	$66,000

Total Revenue Requirement over Expected Life of Investment
$0.07 million
Average Annual Revenue Requirement
$0.03 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 11A: Historical Project Schedule for Public Leak Maps

2022 SB 1371 Compliance Plan
Chapter 12: Accelerated Leak Repair - Transmission

Part 1. Evaluate the Current Practice Addressed in this Chapter

This Chapter addresses the following Best Practice(s):

Best Practice 21: Find It, Fix It
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.

SDG&E has historically repaired transmission leaks to meet requirements of 49 C.F.R. Part 192 and CPUC's G.O. 112-F 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 was not correlated to emission volumes.

In the 2020 Compliance Plan, SDG&E was approved to fund accelerated leak repairs beyond the normal repair timeframes. From 2018 to 2021, SDG&E did not have the opportunity to accelerate any leaks for repair on Transmission assets.

Emission Reductions Achieved:

The emission reductions for this program were not evaluated because SDG&E did not request any funding for this period.

Part 2. Proposed New or Continuing Measure

SDG&E proposes to accelerate leak repairs on Transmission assets when practical. Due to improvements in outage coordination, SDG&E 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.

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

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023 - 2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
Accelerated Leak Repair Projects in Transmission	$500,000	$525,000	$1,443,200
Total	**$500,000**	**$525,000**	**$1,443,200**

Total Revenue Requirement over Expected Life of Investment
$4.1 million
Average Annual Revenue Requirement
$2.1 million

Cost Assumptions:

- Assuming 1 accelerated leak repair 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 13: Distribution Above Ground Leak Surveys

Part 1. Evaluate the Current Practices Addressed in this Chapter

This Chapter addresses the following Best Practice:

Best Practice 19: Aboveground Leak Surveys
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 leak 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 Station leak inspections are performed using soap tests and by monitoring for indications using sight, sound, and smell.

In the 2018 Compliance Plan, SDG&E requested and was approved funding to provide M&R Technicians with instrumentation to begin performing and recording instrumented leak surveys. SDG&E purchased the required instruments to perform instrumented survey. SDG&E also updated Gas Standard T8172 *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.

No incremental staffing was required to implement this measure. Training of existing M&R Technicians on the new instruments were completed at the end of 2020 along with using the purchased equipment to measure and document emissions found at regulator stations.

In 2020, SDG&E was approved to go from population-based emission factors to leaker-based emission factors for M&R. As a result of using leaker-based emission factors, the instrumentation purchased in the 2018 Compliance Plan continues to play a key role in gathering leak indications on M&R stations. Leaks detected on regulator stations can now be recorded and measured.

Emissions Reduction and Cost Effectiveness Evaluation

Due to constraints presented by the COVID-19 pandemic, including limited training for new employees, there is insufficient data to determine the emission reductions and cost effectiveness achieved by this measure at this time because 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.

Part 2. Proposed New or Continuing Measure

SDG&E will continue performing instrumented above ground leak surveys along with the current process of site, sound, and smell. The required instruments to perform above ground leak surveys have already been purchased and training to use the tools has been completed. SDG&E is not requesting additional funding in this Compliance period.

Part 3. Abatement Estimates

The CPUC approved transitioning to leaker-based emission factors to estimate Distribution M&R Stations Emissions. SDG&E 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. The CPUC has yet to approve adjustment to the 2015 Baseline.

Part 4. Cost Estimates

SDG&E is not requesting funding for this measure during this Compliance period.

Part 5. Cost Effectiveness/Benefits

SDG&E is not requesting funding for this measure during this Compliance period.

Part 6. Supplemental Information/Documentation

Attachment 13A: Distribution Above Ground Leak Surveys

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):

Best Practice 16: Special Leak Surveys
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.
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.
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 agreement on a similar methodology to improve emissions quantification of leaks to assist in the demonstration of actual emissions reductions.

As discussed in Chapter 1, leak survey on distribution lines has historically been performed according to the requirements in 49 C.F.R. § 192.723. SDG&E pipelines are typically leak surveyed at intervals of one or three 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. Survey is typically performed by walking over the pipeline and using handheld infrared methane detection tools, or by driving over the pipeline using optical methane detection. While these tools can detect pipeline leaks, they do not have the capability to measure the leak flux rate, referred to as leak quantification in this Chapter.

Part 2. Proposed New or Continuing Measure

In 2022, SDG&E will perform a Research, Development and Demonstration (RD&D) evaluation of Bridger Photonics Gas Mapping LiDAR™ (GML) leak detection and quantification technology. If the findings from the evaluation demonstrate cost-effective emission reductions, SDG&E proposes to enhance its leak survey program by implementing an aerial leak monitoring and leak quantification program starting 2023. Aerial monitoring will be performed using GML technology mounted to a helicopter and will be performed on vintage pipelines that have higher leak rates per mile and are more prone to leakage.

Proposed Milestones:

- Secure vendor contract: Estimated Q1 2023
- Hire and train Incremental FTEs: Estimated Q1 2023
- Determine scope of work: Estimated Q1 2023
- Update leak survey maps: Estimated Q1 2023
- Begin performing aerial monitoring: Estimated Q2 2023

Part 3. Abatement Estimates

Distribution Main & Services

SDG&E estimates emission reductions achieved by performing aerial monitoring at 641 MCF reduced from Distribution Main and Services (DM&S).

This estimate was generated by making the following assumptions:

- Based on historical leak findings and the aerial monitoring pilots, SDG&E anticipates finding approximately 36 emissions sources on its DM&S system
- The number of miles flown per year is estimated to be 3,975 (Mains and Services)

Forecast of Emission Reductions from Baseline (MCF)

2023	2024	2025	2026	2027	2028	2029	2030
641	641	641	641	641	641	641	641

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:

- Based on SoCalGas's AMM implementation, SDG&E anticipates finding approximately 138 post-meter leaks on Customer facilities each year
- Based on SoCalGas's AMM implementation, SDG&E anticipates finding approximately 159 emissions sources due to incomplete combustion from Customer equipment each year

SDG&E has limited available data to evaluate how emissions reduced will change over time as a result of this implementation. It is also challenging to account for how this technology will improve over time. As such, emission forecasts are estimated to be linear. SDG&E 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 achievable in future Compliance Plans.

Part 4. Cost Estimates

O&M Cost Estimates			
Activity	**2023**	**2024**	**2023-2024**
	Direct	**Direct**	**Total Loaded O&M Cost with Contingency**
Customer Service Field Techs	$99,840	$103,840	$448,096
Customer Service Analytics	$124,800	$129,792	$560,102
Distribution Project Management	$100,000	$100,000	$440,000
Vendor Service	$3,401,700	$3,401,700	$8,232,114
Project Management Organization	$100,000	$100,000	$440,000
Gas Operations & Scheduling	$252,150	$252,150	$1,109,460
Total	**$4,078,490**	**$4,087,482**	**$11,229,772**

Capital Cost Estimates			
Activity	**2023**	**2024**	**2023-2024**
	Direct	**Direct**	**Total Loaded Capital Cost with Contingency**
IT Enhancements	$1,477,273	$1,477,273	$6,500,000
Distribution Tools and Trucks	$162,750	-	$196,928
Total	**$1,640,023**	**$1,477,273**	**$6,696,928**

Total Revenue Requirement over Expected Life of Investment
$20.0 million
Average Annual Revenue Requirement
$7.1 million

Cost Assumptions:

- Average Represented Employee Hourly Rate: $46/hour
- Two (2) FTEs for Distribution leak investigation
- One (1) FTE for customer leak investigation
- Two (2) Project Managers, $100K annual salary
- One (1) Data Analyst for customer leak investigations
- 10% contingency is included in the total loaded O&M and Capital costs

Vendor costs for aerial monitoring are based on preliminary numbers. A contract has not been generated with a fixed cost for the proposed scope of work. Actual costs may differ at the time of contract.

The cost estimate for data analysis and leak response is based on high level assumptions. The initial technology evaluation is planned to begin approximately in March 2022; therefore, the information is not available at this time to thoroughly evaluate the costs for implementing system changes to operationalize this measure. Actual costs and cost estimates may vary as more information becomes available.

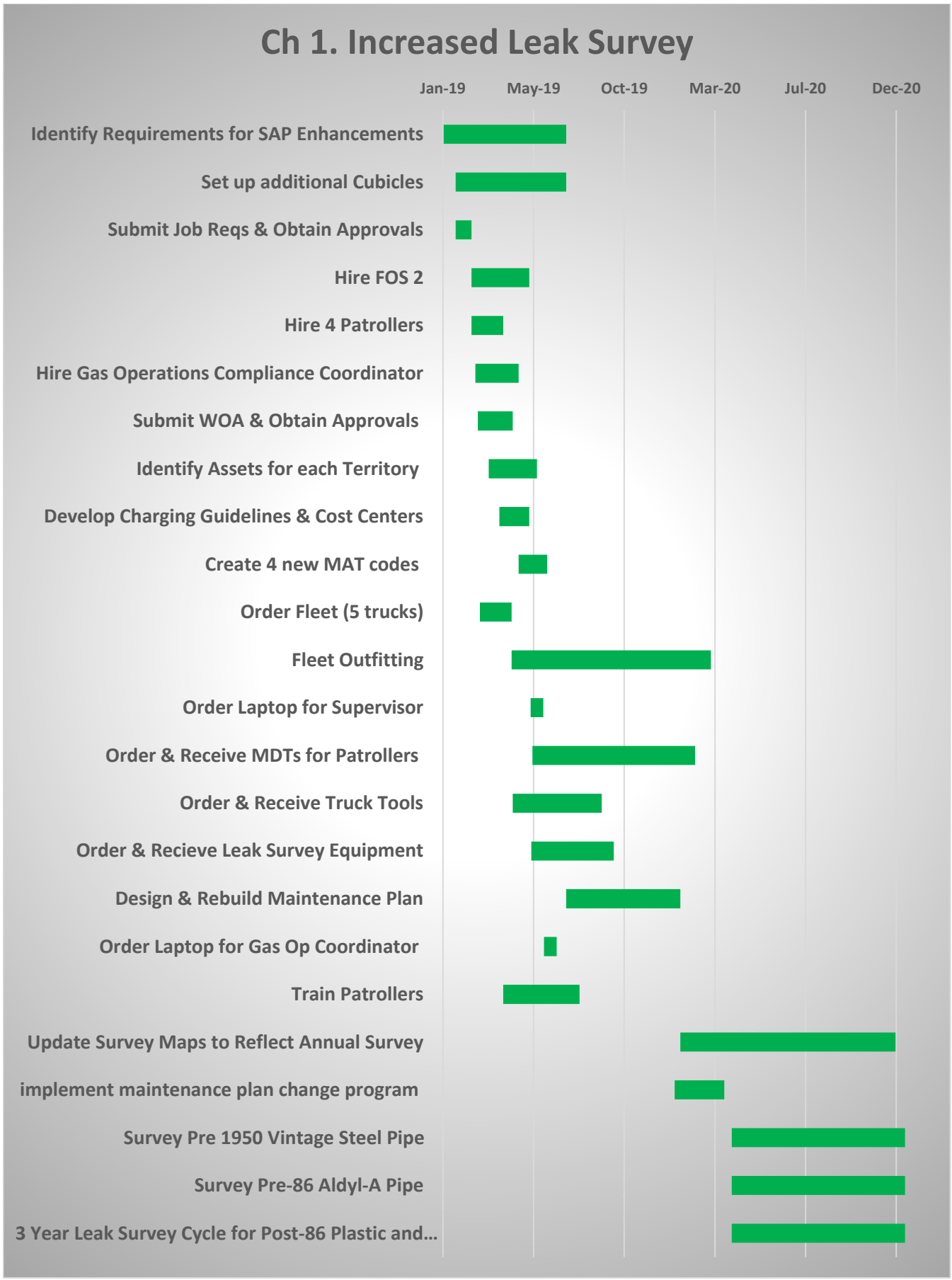
Part 5. Cost Effectiveness/Benefits

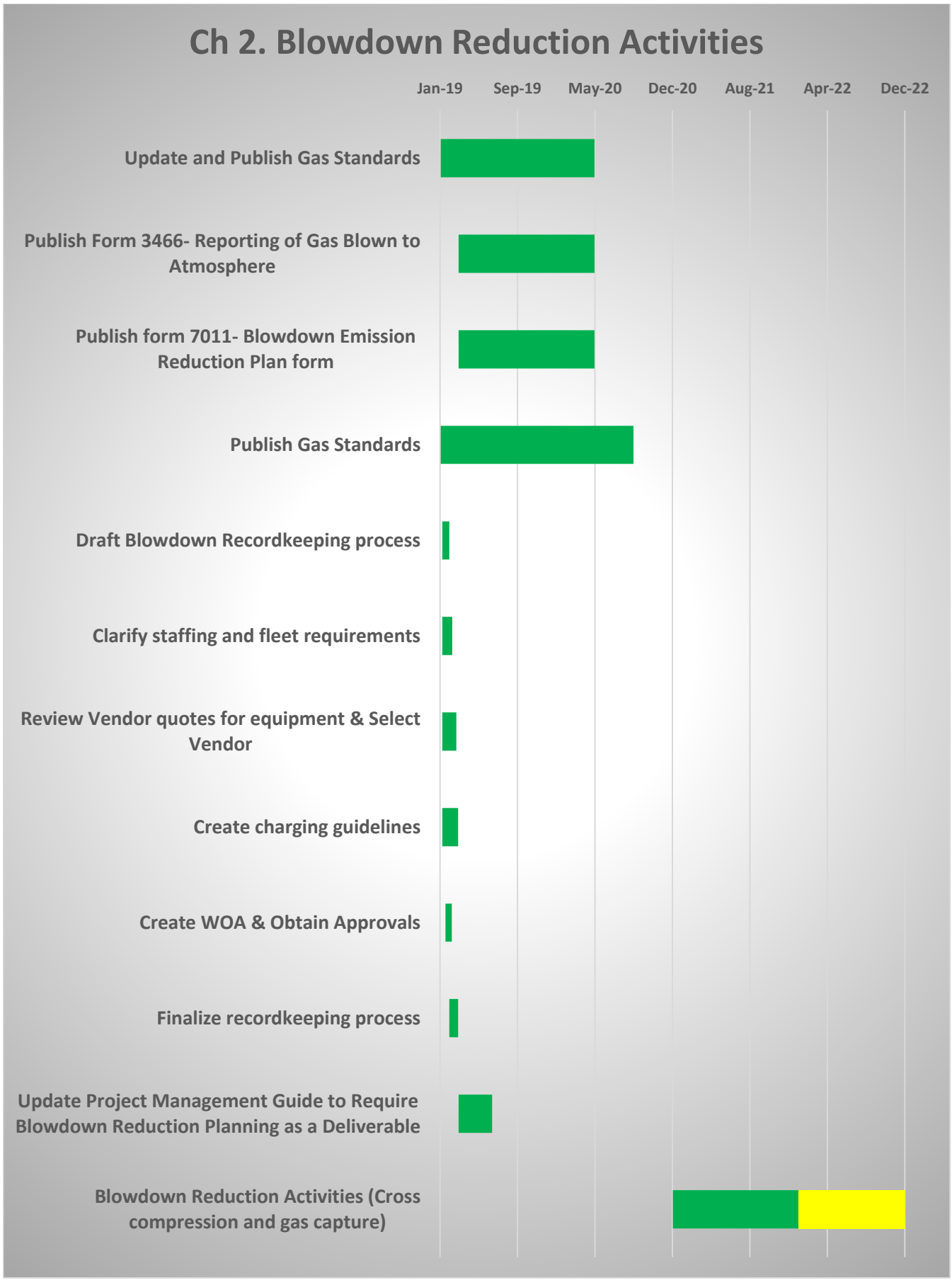
There is insufficient data to reasonably calculate emission reductions and cost-effectiveness from these activities, and SDG&E anticipates that after implementation and recording activities, there should be sufficient data to calculate emission reductions and cost-effectiveness.

Part 6. Supplemental Information/Documentation

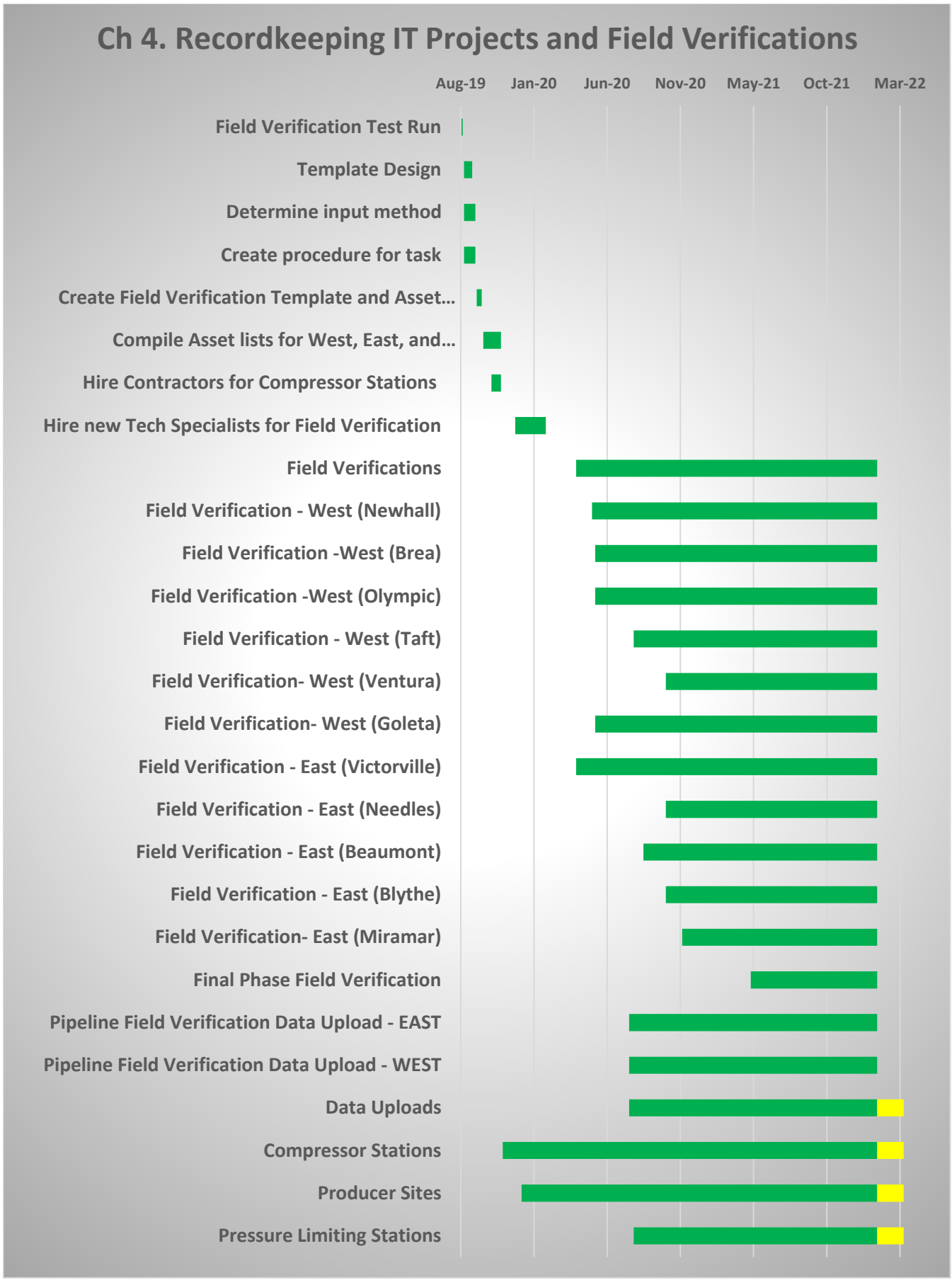
N/A

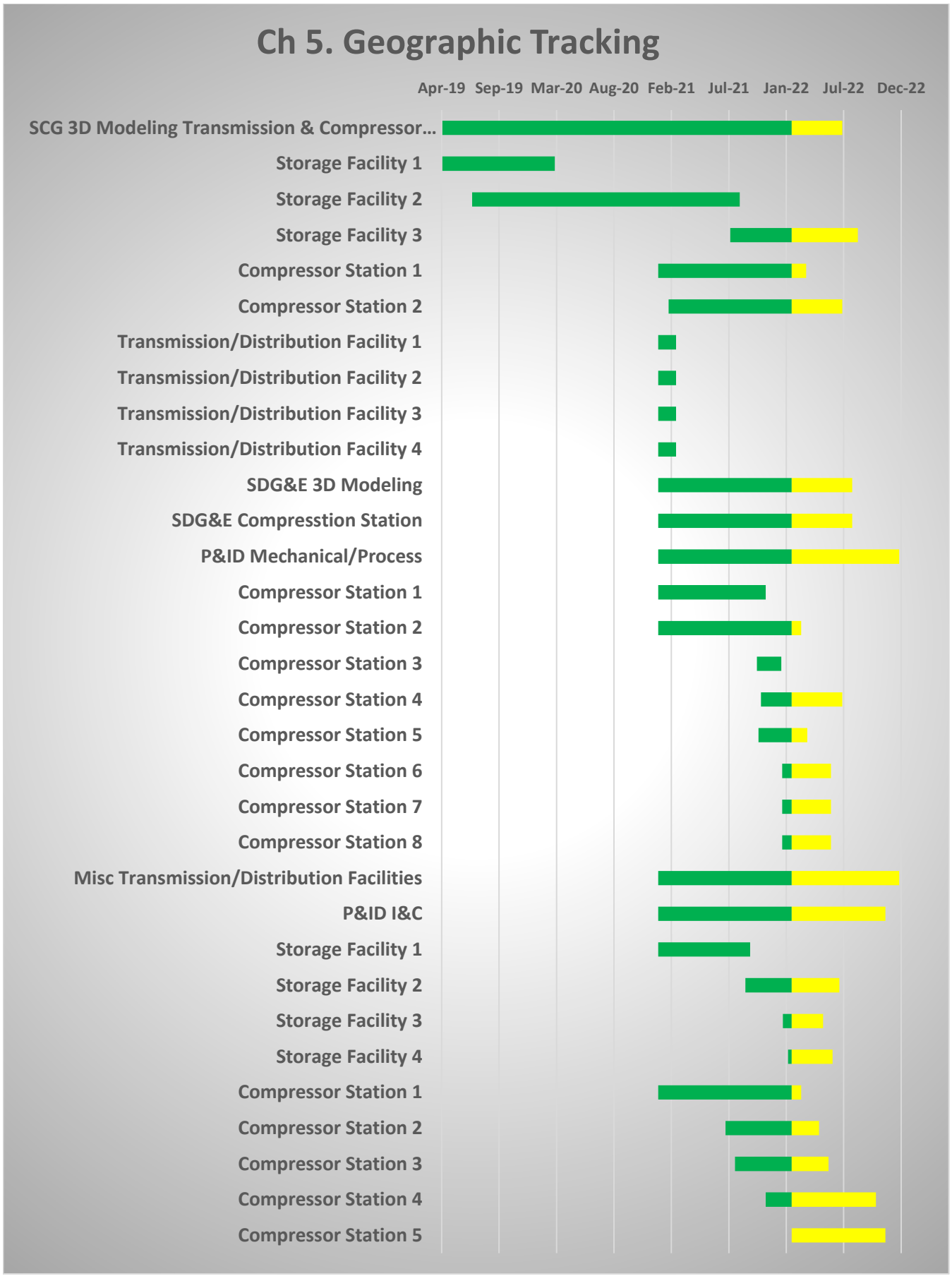
ATTACHMENTS

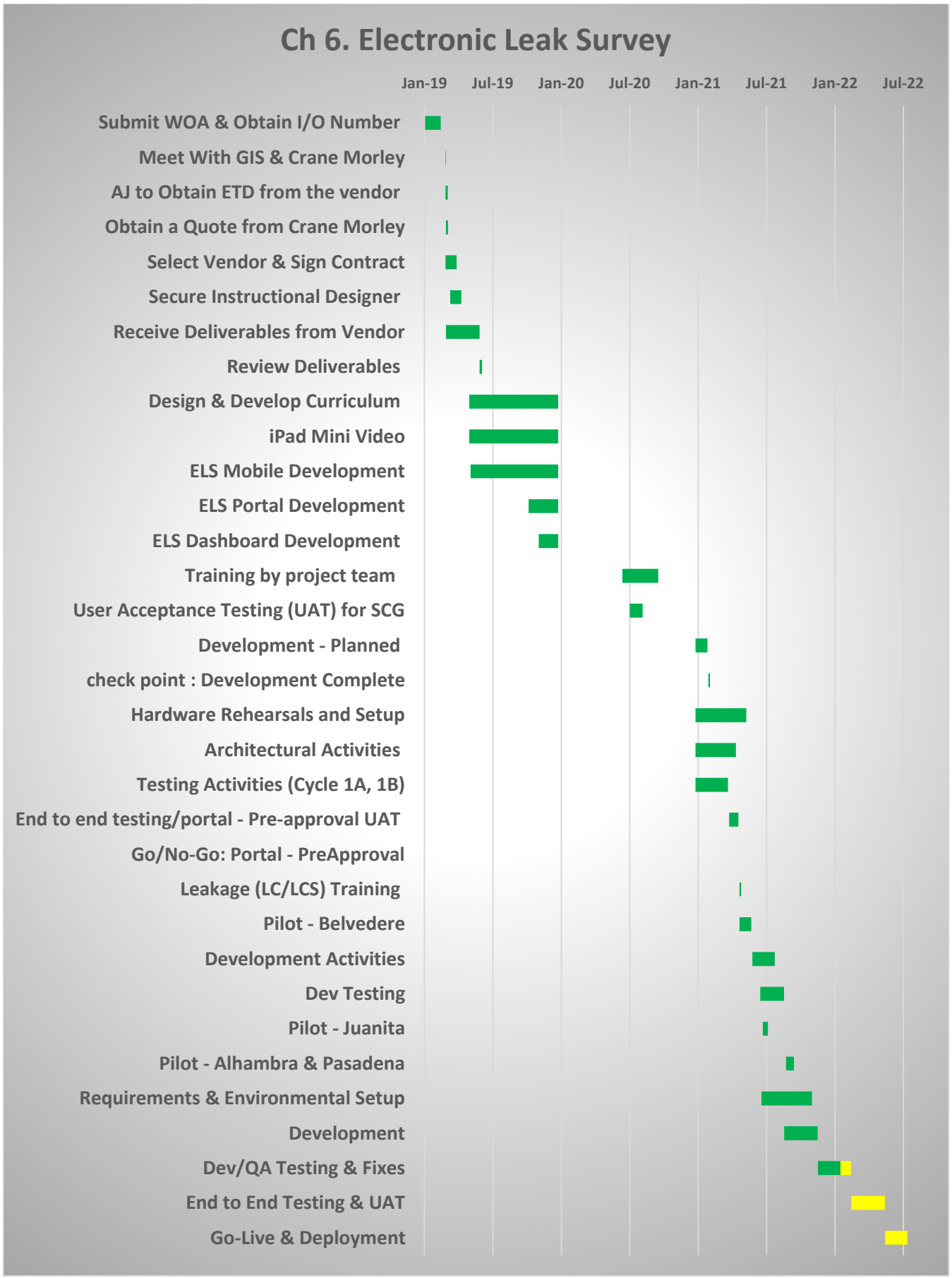

Ch 1. Increased Leak Survey
Jan-19
May-19
Oct-19
Mar-20
Jul-20
Dec-20
Identify Requirements for SAP Enhancements
Set up additional Cubicles
Submit Job Reqs & Obtain Approvals
Hire FOS 2
Hire 4 Patrollers
Hire Gas Operations Compliance Coordinator
Submit WOA & Obtain Approvals
Identify Assets for each Territory
Develop Charging Guidelines & Cost Centers
Create 4 new MAT codes
Order Fleet (5 trucks)
Fleet Outfitting
Order Laptop for Supervisor
Order & Receive MDTs for Patrollers
Order & Receive Truck Tools
Order & Recieve Leak Survey Equipment
Design & Rebuild Maintenance Plan
Order Laptop for Gas Op Coordinator
Train Patrollers
Update Survey Maps to Reflect Annual Survey
implement maintenance plan change program
Survey Pre 1950 Vintage Steel Pipe
Survey Pre-86 Aldyl-A Pipe
3 Year Leak Survey Cycle for Post-86 Plastic and...

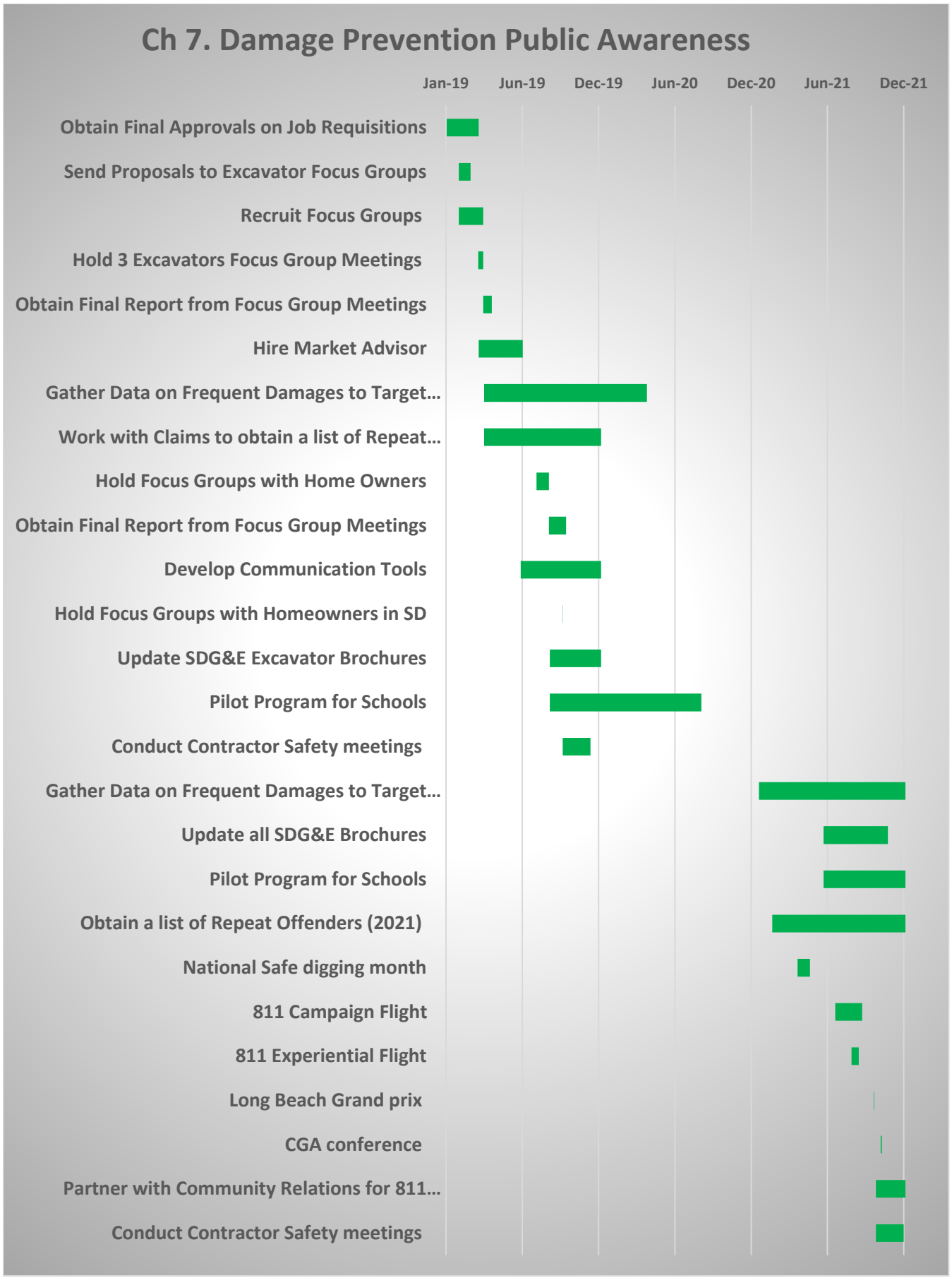

Ch 2. Blowdown Reduction Activities
Jan-19
Sep-19
May-20
Dec-20
Aug-21
Apr-22
Dec-22
Update and Publish Gas Standards
Publish Form 3466- Reporting of Gas Blown to Atmosphere
Publish form 7011- Blowdown Emission Reduction Plan form
Publish Gas Standards
Draft Blowdown Recordkeeping process
Clarify staffing and fleet requirements
Review Vendor quotes for equipment & Select Vendor
Create charging guidelines
Create WOA & Obtain Approvals
Finalize recordkeeping process
Update Project Management Guide to Require Blowdown Reduction Planning as a Deliverable
Blowdown Reduction Activities (Cross compression and gas capture)

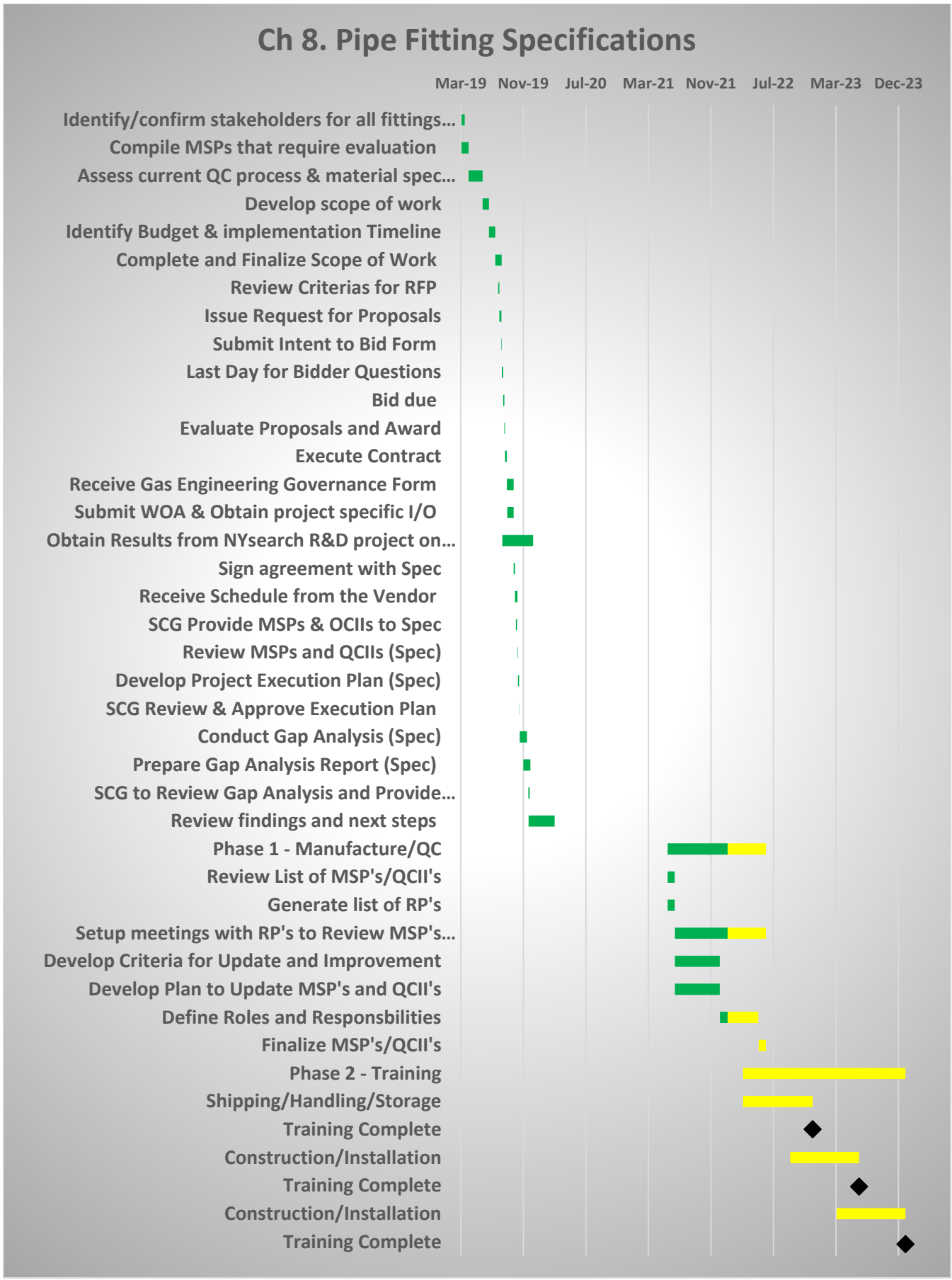

Ch 3. Damage Prevention Algorithm & Proactive Intervention
Jan-19
Sep-19
May-20
Dec-20
Aug-21
Apr-22
Dec-22
Develop a Methodology for Risk Ranking one...
Develop & Test the Algorithm
Research Vendors
SoCalGas Agreement with Urbint
Phase I- Project Kickoff
Phase I- Gather Data
Model Training
Preliminary Analysis Presentation
On-the-ground Validation Kick-off
Mid-Validation Sync & No-call In Analysis...
Phase 2- Initial Model Creation (phase 2)
Initial Model Results Delivery (Phase 2)
Iteration & Validation of AI model (phase 3)
Final Presentation (phase 3)
Expanded standby at medium pressure systems...
Evaluate pilot results
Hire and train incremental FTEs
Update gas standards
Implement expanded standby program on...
Hire and train incremental FTEs
On-going analysis and evaluating model
Test and validate model
Develop Process for identifying repeat offenders
New Model into Production
On-going analysis and evaluating model
Evaluate Results
Propose Changes
Calculate Emission Reductions

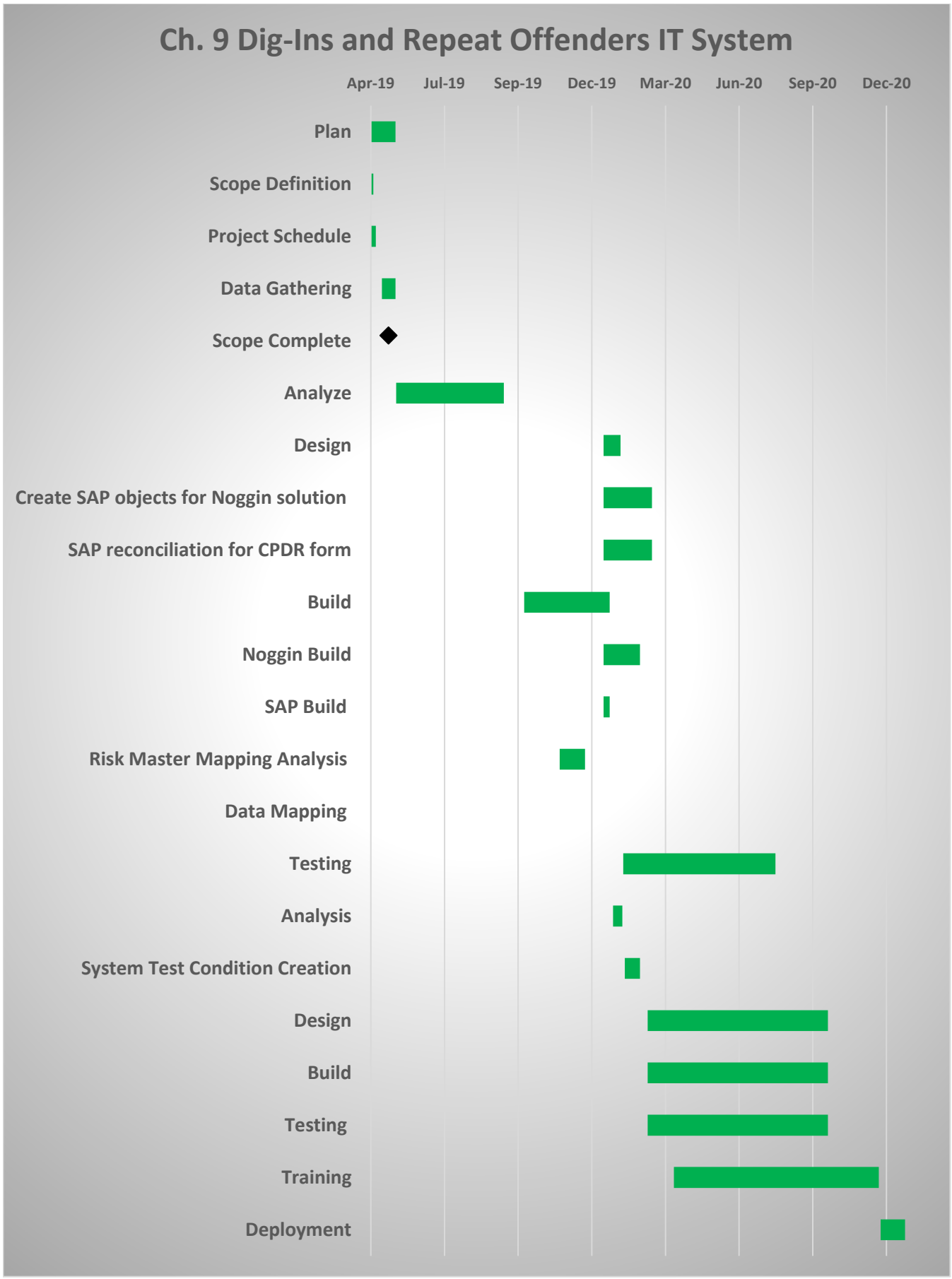

Ch 4. Recordkeeping IT Projects and Field Verifications
Aug-19
Jan-20
Jun-20
Nov-20
May-21
Oct-21
Mar-22
Field Verification Test Run
Template Design
Determine input method
Create procedure for task
Create Field Verification Template and Asset...
Compile Asset lists for West, East, and...
Hire Contractors for Compressor Stations
Hire new Tech Specialists for Field Verification
Field Verifications
Field Verification - West (Newhall)
Field Verification -West (Brea)
Field Verification -West (Olympic)
Field Verification - West (Taft)
Field Verification- West (Ventura)
Field Verification- West (Goleta)
Field Verification - East (Victorville)
Field Verification - East (Needles)
Field Verification - East (Beaumont)
Field Verification - East (Blythe)
Field Verification- East (Miramar)
Final Phase Field Verification
Pipeline Field Verification Data Upload - EAST
Pipeline Field Verification Data Upload - WEST
Data Uploads
Compressor Stations
Producer Sites
Pressure Limiting Stations


Ch 5. Geographic Tracking
Apr-19
Sep-19
Mar-20
Aug-20
Feb-21
Jul-21
Jan-22
Jul-22
Dec-22
SCG 3D Modeling Transmission & Compressor...
Storage Facility 1
Storage Facility 2
Storage Facility 3
Compressor Station 1
Compressor Station 2
Transmission/Distribution Facility 1
Transmission/Distribution Facility 2
Transmission/Distribution Facility 3
Transmission/Distribution Facility 4
SDG&E 3D Modeling
SDG&E Compresstion Station
P&ID Mechanical/Process
Compressor Station 1
Compressor Station 2
Compressor Station 3
Compressor Station 4
Compressor Station 5
Compressor Station 6
Compressor Station 7
Compressor Station 8
Misc Transmission/Distribution Facilities
P&ID I&C
Storage Facility 1
Storage Facility 2
Storage Facility 3
Storage Facility 4
Compressor Station 1
Compressor Station 2
Compressor Station 3
Compressor Station 4
Compressor Station 5

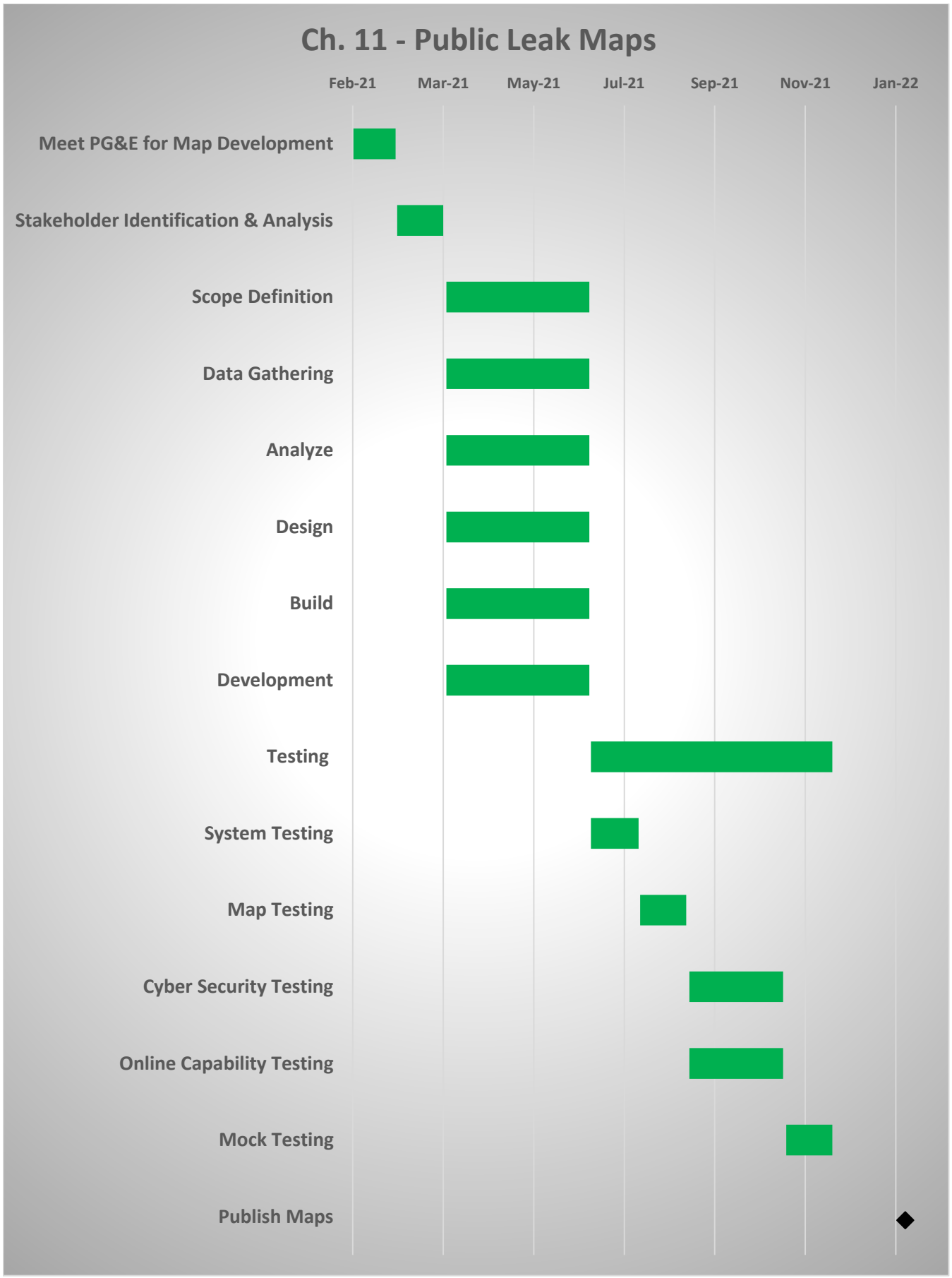

Ch 6. Electronic Leak Survey
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Submit WOA & Obtain I/O Number
Meet With GIS & Crane Morley
AJ to Obtain ETD from the vendor
Obtain a Quote from Crane Morley
Select Vendor & Sign Contract
Secure Instructional Designer
Receive Deliverables from Vendor
Review Deliverables
Design & Develop Curriculum
iPad Mini Video
ELS Mobile Development
ELS Portal Development
ELS Dashboard Development
Training by project team
User Acceptance Testing (UAT) for SCG
Development - Planned
check point : Development Complete
Hardware Rehearsals and Setup
Architectural Activities
Testing Activities (Cycle 1A, 1B)
End to end testing/portal - Pre-approval UAT
Go/No-Go: Portal - PreApproval
Leakage (LC/LCS) Training
Pilot - Belvedere
Development Activities
Dev Testing
Pilot - Juanita
Pilot - Alhambra & Pasadena
Requirements & Environmental Setup
Development
Dev/QA Testing & Fixes
End to End Testing & UAT
Go-Live & Deployment

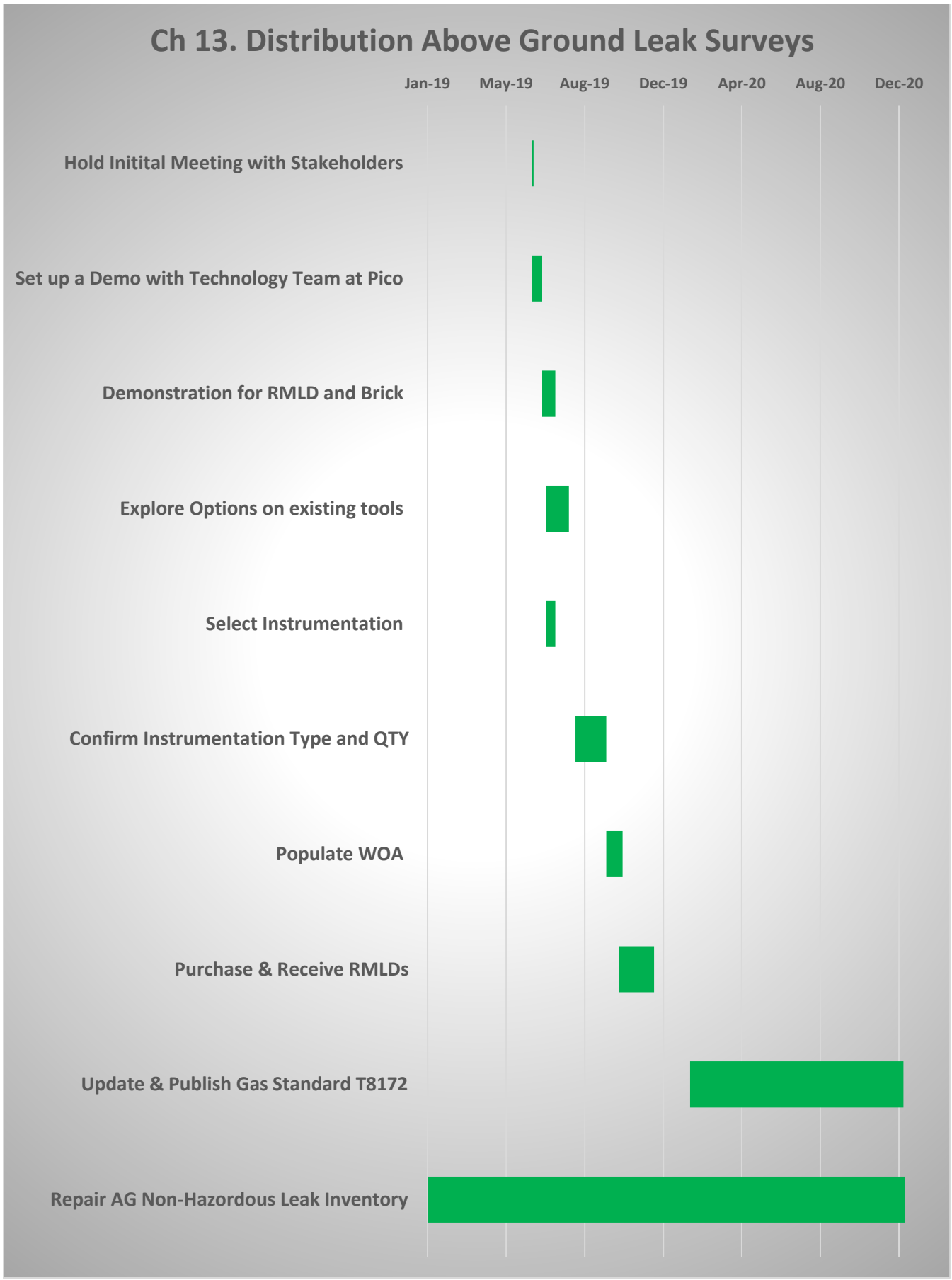

Ch 7. Damage Prevention Public Awareness
Jan-19
Jun-19
Dec-19
Jun-20
Dec-20
Jun-21
Dec-21
Obtain Final Approvals on Job Requisitions
Send Proposals to Excavator Focus Groups
Recruit Focus Groups
Hold 3 Excavators Focus Group Meetings
Obtain Final Report from Focus Group Meetings
Hire Market Advisor
Gather Data on Frequent Damages to Target...
Work with Claims to obtain a list of Repeat...
Hold Focus Groups with Home Owners
Obtain Final Report from Focus Group Meetings
Develop Communication Tools
Hold Focus Groups with Homeowners in SD
Update SDG&E Excavator Brochures
Pilot Program for Schools
Conduct Contractor Safety meetings
Gather Data on Frequent Damages to Target...
Update all SDG&E Brochures
Pilot Program for Schools
Obtain a list of Repeat Offenders (2021)
National Safe digging month
811 Campaign Flight
811 Experiential Flight
Long Beach Grand prix
CGA conference
Partner with Community Relations for 811...
Conduct Contractor Safety meetings


Ch 8. Pipe Fitting Specifications
Mar-19
Nov-19
Jul-20
Mar-21
Nov-21
Jul-22
Mar-23
Dec-23
Identify/confirm stakeholders for all fittings...
Compile MSPs that require evaluation
Assess current QC process & material spec...
Develop scope of work
Identify Budget & implementation Timeline
Complete and Finalize Scope of Work
Review Criterias for RFP
Issue Request for Proposals
Submit Intent to Bid Form
Last Day for Bidder Questions
Bid due
Evaluate Proposals and Award
Execute Contract
Receive Gas Engineering Governance Form
Submit WOA & Obtain project specific I/O
Obtain Results from NYsearch R&D project on...
Sign agreement with Spec
Receive Schedule from the Vendor
SCG Provide MSPs & OCIIs to Spec
Review MSPs and QCIIs (Spec)
Develop Project Execution Plan (Spec)
SCG Review & Approve Execution Plan
Conduct Gap Analysis (Spec)
Prepare Gap Analysis Report (Spec)
SCG to Review Gap Analysis and Provide...
Review findings and next steps
Phase 1 - Manufacture/QC
Review List of MSP's/QCII's
Generate list of RP's
Setup meetings with RP's to Review MSP's...
Develop Criteria for Update and Improvement
Develop Plan to Update MSP's and QCII's
Define Roles and Responsbilities
Finalize MSP's/QCII's
Phase 2 - Training
Shipping/Handling/Storage
Training Complete
Construction/Installation
Training Complete
Construction/Installation
Training Complete


Ch. 9 Dig-Ins and Repeat Offenders IT System
Apr-19
Jul-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Plan
Scope Definition
Project Schedule
Data Gathering
Scope Complete
Analyze
Design
Create SAP objects for Noggin solution
SAP reconciliation for CPDR form
Build
Noggin Build
SAP Build
Risk Master Mapping Analysis
Data Mapping
Testing
Analysis
System Test Condition Creation
Design
Build
Testing
Training
Deployment

Ch. 10 - Gas Speciation


Ch. 11 - Public Leak Maps
Feb-21
Mar-21
May-21
Jul-21
Sep-21
Nov-21
Jan-22
Meet PG&E for Map Development
Stakeholder Identification & Analysis
Scope Definition
Data Gathering
Analyze
Design
Build
Development
Testing
System Testing
Map Testing
Cyber Security Testing
Online Capability Testing
Mock Testing
Publish Maps


Ch 13. Distribution Above Ground Leak Surveys
Jan-19
May-19
Aug-19
Dec-19
Apr-20
Aug-20
Dec-20
Hold Initital Meeting with Stakeholders
Set up a Demo with Technology Team at Pico
Demonstration for RMLD and Brick
Explore Options on existing tools
Select Instrumentation
Confirm Instrumentation Type and QTY
Populate WOA
Purchase & Receive RMLDs
Update & Publish Gas Standard T8172
Repair AG Non-Hazordous Leak Inventory

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):

Best Practice 16: Special Leak Surveys
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.
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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: 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.

2022 SB 1371 Compliance Plan
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.[1]
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.[1]

[1]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[2]:

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.

[2]Anticipated end dates have greater uncertainty due to COVID-19 constraints

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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.[3]

[3]Confidential/non-public document

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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.,

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.

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[4]:

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).

[4]Anticipated end dates have greater uncertainty due to COVID-19 constraints

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.
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.

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.
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/.

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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.
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: 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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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

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[5]:

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

- 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[6]
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.
f. Ventus OGI: https://sierraolympic.com/product-in-home-slider/ventus-ogi/.

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g. AiLF U-10: 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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Part 1. Evaluate the Current Practice Addressed in this Chapter

This project addresses the following Best Practice(s):

Best Practice 18: Stationary Methane Detectors for Early Detection of Leaks
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

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.

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[7]:

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.

[7]Anticipated end dates have greater uncertainty due to COVID-19 constraints

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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/.

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

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[8]:

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

[8]Anticipated end dates have greater uncertainty due to COVID-19 constraints

2022 SB 1371 Compliance Plan
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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
$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.

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 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 ±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

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.

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 2022New 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[9]:

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

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 #16
Sub-Surface Migration Model and Plastic Piping Slow-Crack Leak-Rate Growth

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[c]. 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 on full-scale compressor valves under controlled conditions. Pilot studies will follow as deemed necessary to further evaluate emissions reductions and/or cost efficiency.

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[10]:

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.

[10]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):

Best Practice 22: Pipe Fitting Specification & Tolerances
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[11]:

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.

[11] 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

- Anticipated End Date: 2024.

[11] 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.[12]

[12]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

- Compressor-based technologies show promising potential for mitigating vented emissions and gas blowdowns for high pressure pipelines. The size and cost of these technologies, however, make it unfeasible for medium and low pressure applications. The

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[13]:

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 cam 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.

[13]Anticipated end dates have greater uncertainty due to COVID-19 constraints

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

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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.

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New Proposed Projects[14]:

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

[14]Anticipated end dates have greater uncertainty due to COVID-19 constraints

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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.