Lafayette Gas Safety Risk Management

Lafayette Gas Safety Alliance Meeting

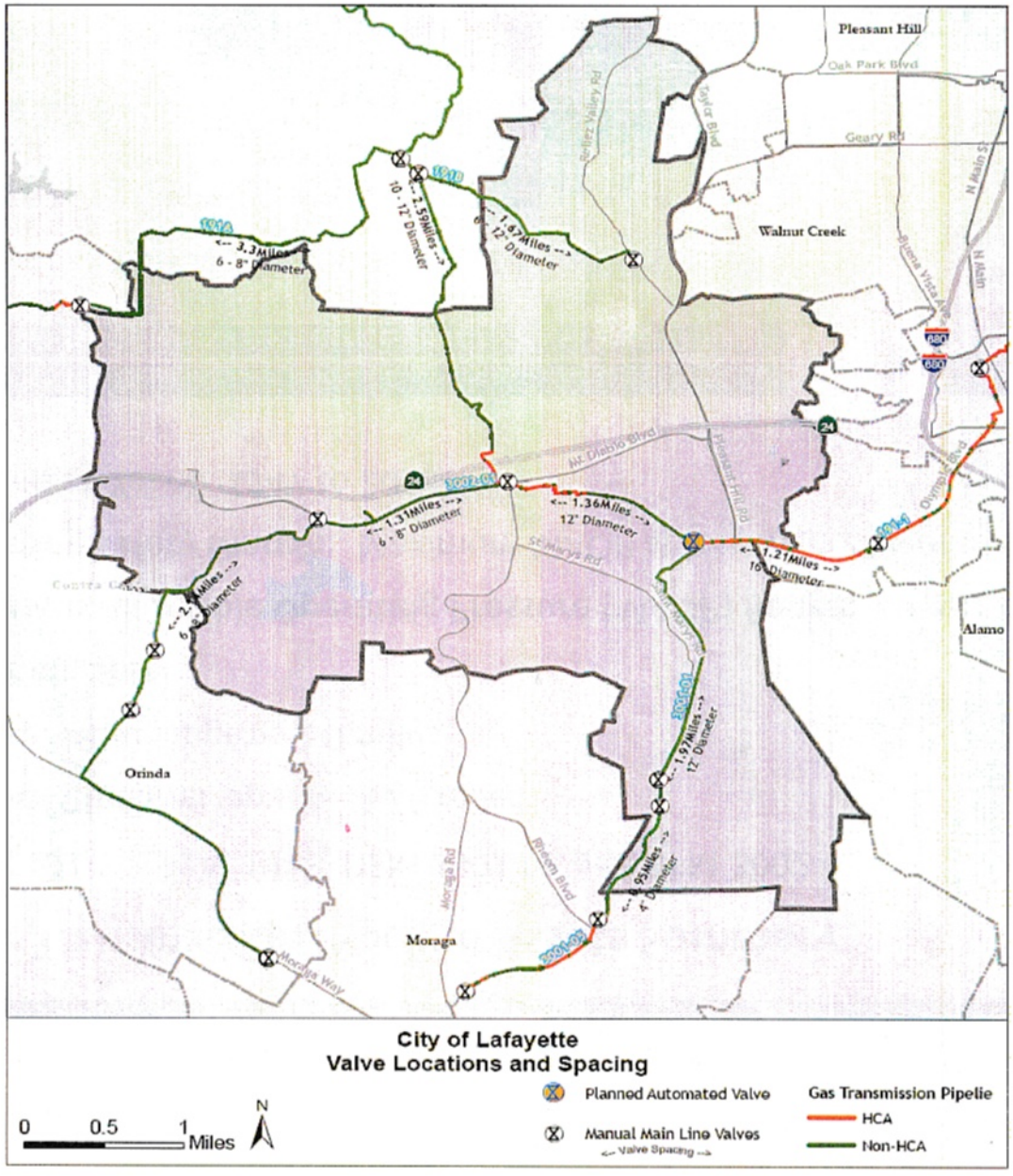
May 28, 2019

Together, Building
a Better California

Pipeline Safety Risk Management in Lafayette - Agenda

- Lafayette Transmission and Distribution Assets
- Review of PG&E risk informed work planning process
- Transmission Pipeline Threats, Risks and Risk Mitigation
- Distribution Asset Threats and Risks
  - Distribution Risk Mitigations held for future discussion

Lafayette Transmission Pipelines



Lafayette Transmission Pipeline Assets Summary

➢ Lafayette Transmission Pipeline Assets Summary

- **Lines:** 191-1, 191A, 191B, DFM 3001-01 and DFM 3002-01
- **Miles of Pipeline:** approx. 10.9 miles
- **Miles of HCA:** approx. 2.9 miles
- **Material:** Steel
- **Maximum Allowable Operating Pressure (MAOP) Range:** 60 psig to 338 psig
- **Operating Safety Margin:** Maximum MAOP at less than 23% of design
- **Pipe install Years:** 1947 to 2013

	Transmission Pipe Pressure by % Design (Miles)				
Diameter (inch)	> 0% to < 10%	≥ 10% to < 15%	≥ 15% to < 20%	≥ 20% to < 23%	Total
3.500	<0.01	0.02	0.00	0.00	0.02
4.500	0.14	0.00	0.71	0.00	0.85
6.625	1.63	<0.01	0.00	0.00	1.63
8.625	0.28	1.79	0.26	0.00	2.33
10.750	0.00	1.65	<0.01	0.00	1.65
12.750	<0.01	3.41	0.40	<0.01	3.81
16.000	0.00	0.00	<0.01	0.63	0.63
Totals:	**2.05**	**6.86**	**1.37**	**0.63**	**10.9**

Year Range	Miles
1947 - 1960	5.60
1961 - 1970	4.47
1971 - 1980	0.03
1981 - 1990	0.57
1991 – 2000	0.01
2001 – 2010	0.16
2011 - 2019	0.06
Total:	**10.9**

Lafayette Distribution Pipeline Assets Summary

➢ Lafayette Distribution System Assets Summary

Distribution Mains

– **Distribution Mains Materials:** Steel (~75%), Plastic

	Distribution Mains Diameter Ranges (inches)				
Material	Unknown	<=2	>2" to ≤ 4"	> 4" to ≤ 8"	Totals
Aldyl-A polyethylene	0.0	23.4	0.6	0.0	24.0
Other polyethylene	0.0	9.6	3.2	0.5	13.3
Steel, 1941-1972	0.0	76.8	16.2	7.7	100.7
Steel, post-1972	0.0	3.7	0.6	0.2	4.5
Steel, pre-1941	0.1	7.3	1.4	0.4	9.2
Totals	**0.1**	**120.8**	**22.1**	**8.8**	**151.8**

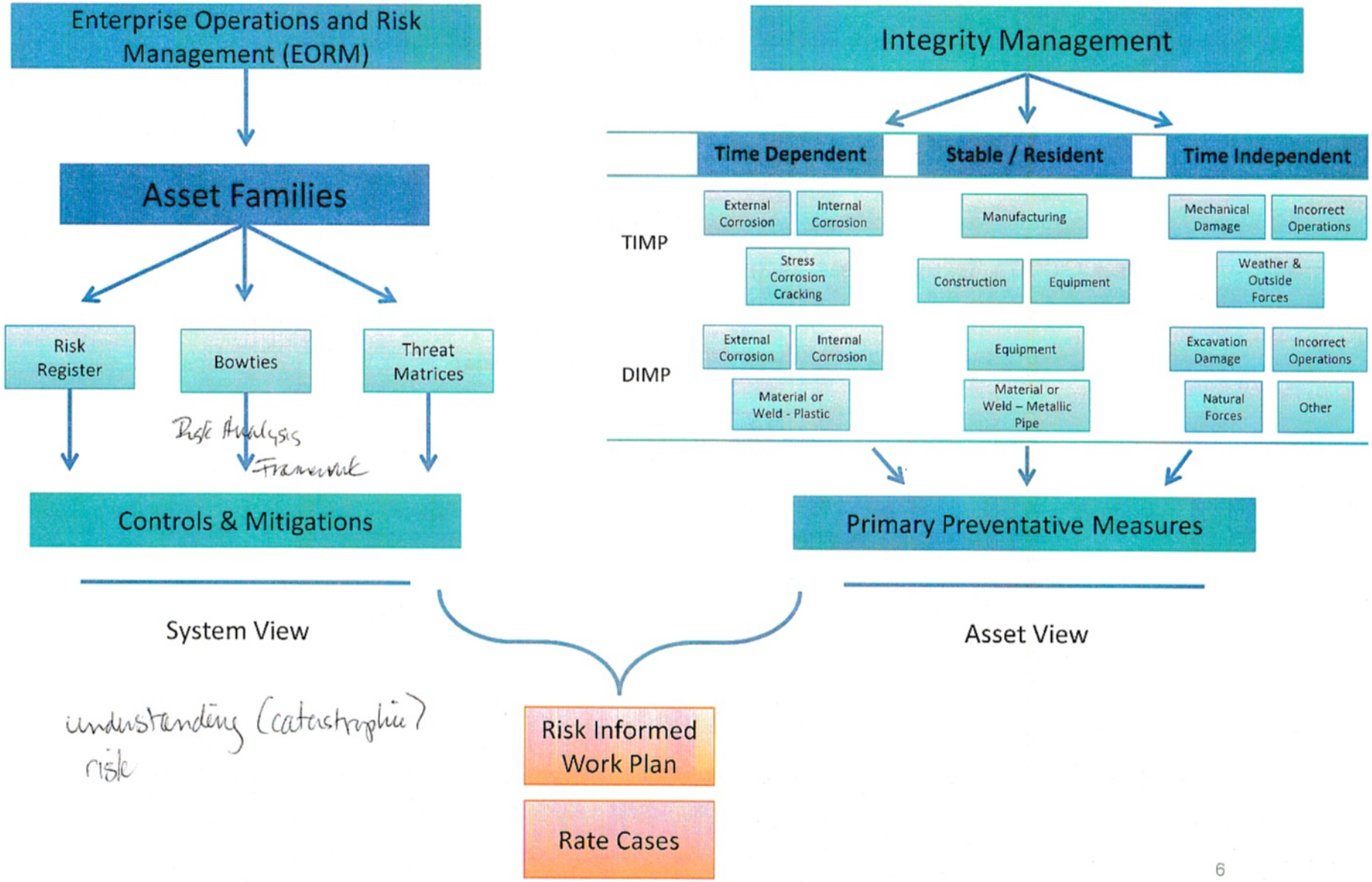
Distribution Services

– **Distribution Services Materials:** Plastic (~56%), Steel (~44%), Copper (~0.1%)

Distribution Services	
Material	Count
Plastic	5,425
Copper	19
Steel	4,267
Total	**9,710**

	Install Year									
Asset Type	Pre-1940	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	Totals
Main Mileage	7.2	33.2	37.2	26.9	17.4	14.1	6.6	3.2	6.0	151.8
Counts of Services	2,794	261	1,358	1,160	671	621	754	376	1,714	9,710

Review of Risk Informed Work Planning



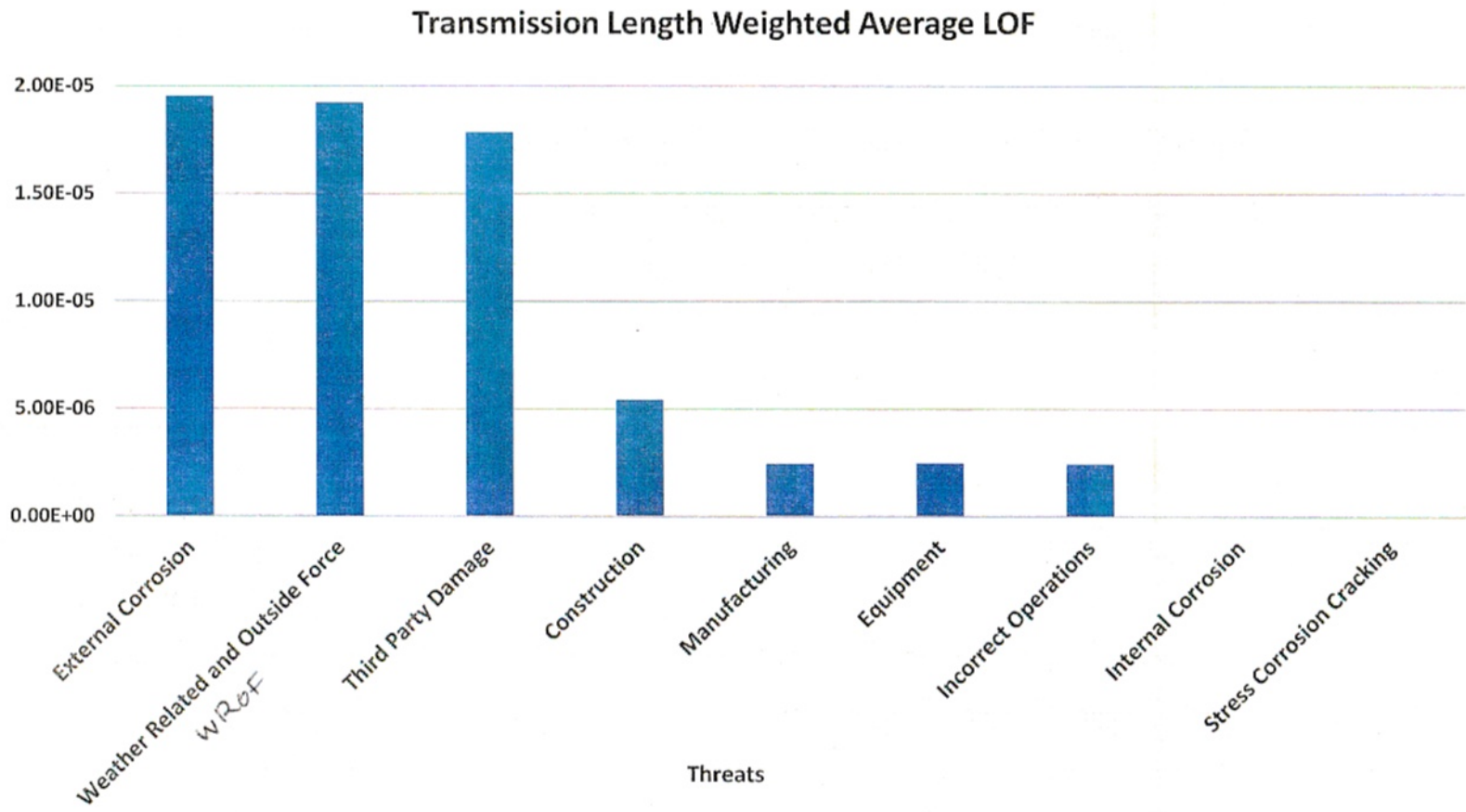
Transmission Pipeline Threats

Steel Pipe External Corrosion (EC)	Steel Pipe Internal Corrosion (IC)	Steel Pipe Stress Corrosion Cracking (SCC)	Steel Pipe Manufacturing and Construction	Steel Pipe Equipment and Incorrect Operations	Steel Pipe Third-Party Damage (TPD)	Steel Pipe Weather-related and Outside Forces (WROF)		Plastic Pipe threats
External Corrosion	Internal Corrosion	High-pH Axial SCC Near Neutral-pH Axial SCC Circumferential SCC	Manufacturing Seam defect Manufacturing Body defect Construction defect	Over-pressure due to Equipment Failure Over-pressure due to Incorrect Operations	Excavation Damage	Seismic Fault Crossing Slope Instability Liquefaction Erosion Lightning Frost Heavy Rain or Floods	Subsidence Vegetation Impact (Tree root) Tsunami Wind Impact Vehicular Damage Vandalism Arc Strike	Manufacturing Construction Equipment Third-Party damage Incorrect Operations Weather-related and Outside Forces (WROF)

Distribution Pipe Threats

Corrosion	Excavation	Material & Weld	Incorrect Operation	Natural Force	Other Outside Force	Equipment Failure	Other
Internal	Excavation	Plastic material failure	Crossbore	Earth Movement	Fire/explosion	Equipment malfunction	Other
External		Metallic material failure	Fusion failure	Earthquake	Rodents	Pipe Dope	
Atmospheric		Compression coupling	Weld failure	Flood	Previous damage		
			Incorrect operation	Lightning	Electrical facilities		
			Construction defect	Root damage	Third party		
				Tsunami	Vandalism		
				Other natural forces	Vehicle		

Transmission Pipe Risks - Lafayette



- Between 1986 and 2018 there were no PHMSA reportable incidents on Transmission in Lafayette.

2 parts per million per manufacturing event

Threat Matrix (Transmission Pipe)

Approved: 07/17/18

	Primary Causes of Failures		Primary Prevention Measures (highest impact on risk reduction - from left to right)
Time Dependent Threats	External Corrosion TRA1	• Inadequate coating • Inadequate CP • Corrosive Environment • DC/AC interference • Sea level rise inundation • Interacting third party damage	Cathodic Protection; Pipe Coating; Electrical Interference Program (DC); Atmospheric Corrosion Inspection Program; Electrical Interference Program (AC); Casing Monitoring; ILI; ECDA; Assessment Pressure Test; Leak Survey; CPSI (EC + WROF); CIS/ RMDA Program (Non-HCA); Public Awareness & Damage Prevention (EC + TPD)
	Internal Corrosion TRA8	• Poor gas quality • Water intrusion	Gas Quality; ILI; Operational Pigging; Internal Corrosion Site Specific Plans (Liq. Sampling/NDE); ICDA; Assessment Pressure Test; Leak Survey
	Stress Corrosion Cracking TRA9	• High operating temperature • High operating/residual stress • Mechanical Damage • Hard Spots • CP in SCC voltage ranges • Pressure cycling	Pipe Coating; Assessment Pressure Test; ILI; SCCDA; Discharge Temperature; Leak Survey
Stable Threats	Manufacturing TRA4, 21	• Long seam defects/SSWC • Pipe defects • Pressure cycling	Supplier Approval; Pipe Specification; Fitting Specification; Product Inspection; Design Standards; Post-Construction Pressure Test; ILI *; Assessment Pressure Test
	Construction/ Fabrication TRA3, 30, 37	• Girth weld defects • Coupled/pressure welds • Wrinkle bends • Saddle type connection • External loading	Construction Practices; Inspection during construction; ILI; Vintage Pipe Replacement Program
	Equipment TRA16, 25, 26	• Equipment age / obsolescence • Incorrect sizing / design • Deferred maintenance • Poorly manufactured equipment • Pipeline debris	Preventive maintenance; Inspection during maintenance
Time Independent Threats	1st, 2nd, & 3rd Party Mechanical Damage TRA6, 14, 19, 23, 39	• Vandalism • Terrorism • Shallow cover • Ineffective public awareness	Public Awareness & Damage Prevention; Cyber Security; Patrolling / Continuing Surveillance; Locate and Mark; ILI; Shallow Pipe Program; Pipeline Markers
	Incorrect Operations TRA11, 22, 35, 36, 37, 38	• Incorrect procedure • Human error	Operating Procedures; SCADA / Network Visibility; OQ / Training and Development; Audits
	Weather & Outside Forces TRA10, 12 , 20, 29, 32	• Water crossings • Unstable soil/erosion • Heavy rains/floods • Seismic activity • Subsidence • Landslide (includes soil creep)	Patrolling/ Continuing Surveillance; Fault Crossing Program; Vintage Pipe Replacement Program (WROF + Construction); Geotechnical Hazard Monitoring Program; CPSI; Levee & Water Crossing Program; ILI
Reliability	Failure to Meet Customer Demand	• Inadequate capacity	Hydraulic Models for all Transmission Systems; Long Term Investment Planning
Emergency Response	Major Emergency or Disaster	• Inadequate/Incorrect EOC response • Inadequate/Incorrect first responder response • Inadequate/Incorrect gas control response • Inadequate/Incorrect dispatch response • Inadequate/Incorrect training	Online Pipeline Simulation Rupture Detection; Valve Automation; Transmission Control Center; Business Continuity Plans; Gas Emergency Response Plan (GERP); SCADA Outage Manual Operations Plan; Company Emergency Plan; GERP-Based Exercises

availability and the quality of the asset data

complete | partial | weak

= Mitigation for Interacting Threat

TRA# - Risk Register Name

Mitigation Color Key

- Green = Meets or exceeds industry best practices AND controls are adequate
- Amber = Partially meets industry best practices OR controls are being strengthened
- Red = Does not meet industry best practices AND current controls are not adequate
- White = Pending Evaluation *Not yet implemented

2019 GT&S Risk Placemat (Transmission)

2019 GT&S Rate Case - Risk Mitigation Summary "Placemat"

Risk Category	Loss of Containment				Loss of Supply & Service		Inadequate Response & Recovery
Threat / Work Classification	Time-Dependent Threats *"The threat level may grow over time if unchecked"*	Stable / Resident Threats *"The threat is inherent but does not grow over time unless acted upon by pressure or external load"*	Time Independent Threats *"The threat exists outside of the continuum of time"*		Capacity and / or Reliability Threats *"Inability to meet our obligation to serve"*		Emergency Response *"Preparedness to respond to incidents in a timely manner."*
Capital $971 Expense $648	External Corrosion, Internal Corrosion and Stress Corrosion Cracking*	Manufacturing Related Defects , Welding / Fabrication Related and Equipment Related*	3rd Party / Mechanical Damage, Incorrect Operations and Weather-Related & Outside Forces*		Physical System Constraints, Equipment Limitations		System Control Limitations, Improper Training and Coordination
Targeted Mitigations	Corrosion Control *Chapter 8* 79.1 35.3	Direct Assessment *Chapter 5* - 35.1	Vintage Pipe Replacement *Chapter 5* 40.6 -	Station Systems and Components Replacement *Chapter 7* 76.1 19.1	Exposed & Shallow Pipe (including Water and Levee Crossings) *Chapter 5* 21.7 0.9	Locate & Mark *Chapter 9* - 13.2	Capacity *Chapter 10* 70.0 6.2	Work Requested by Others *Chapter 5* 27.9 0.7	Gas System Operations *Chapter 10* - 22.2
	Gas Quality Assessments *Chapter 7* - 1.0	Hydrostatic Testing *Chapter 5* 46.0 151.0		Station Rebuilds *Chapter 7* 44.7 -	Geo-Hazard Monitoring & Mitigation *Chapter 5* 4.5 2.8	Earthquake Fault Crossing *Chapter 5* 12.2 1.4	New Business *Chapter 10* 4.7 -	Class Location Program *Chapter 5* 5.5 3.3	Valve Automation *Chapter 5* 29.5 -
	Leak Management *Chapter 9* - 6.1	Storage Assessments *Chapter 6* - 10.8	Station Assessments & Strength Tests *Chapter 7* 0.3 7.3	FIMP Implementation and Documentation *Chapter 7* - 5.7		Physical Security *Chapter 7* 9.4 -	LNG/CNG *Chapter 5* 3.7 2.8		Public Awareness *Chapter 5* - 4.4
	Storage Well Reworks *Chapter 6* 160.3 -	Storage Repair & Replace *Chapter 6* 3.2 -	Storage Controls & Monitoring *Chapter 6* 14.5 -	Compressor Replacements *Chapter 7* 21.5 -					Valve Program *Chapter 5* 25.9 0.9
	In-Line-Inspection *Chapter 5* 213.5 124.5								SCADA *Chapter 10* 2.7 -
	Programs to Enhance Integrity Management *Chapter 5* - 14.2								
	Operations & Maintenance *Chapter 9* - 46.6								
	Research & Development *Chapter 12* - 2.9								
Capital 924.9 Expense 522.6	Other Pipeline Safety and Reliability Pipe Replacements *Chapter 5* 7.4 4.1								
Support Work	Information Technology *Chapter 12* 30.4 20.4								
	Other GT&S Work *Chapters 10 and 13* 6.1 91.8								
	StanPac *Chapters 5, 7, 8, 9* 6.0 4.5								
	Gas Gathering *Chapter 5* 4.0 -								
Capital 46.6 Expense 125.4	Pipe Investigations and Field Engineering *Chapter 5* - 8.7								

Corrosion Control Program

- PG&E uses an active cathodic protection (CP) system on its gas transmission and steel distribution pipelines to protect them against external corrosion.

- CP systems inspected annually to ensure they are operating correctly.

- Inspections of the cathodic protection systems on the lines in Lafayette took place in September 2018 and February 2019 and were found to be operating correctly.

Public Awareness Program (Damage Prevention)

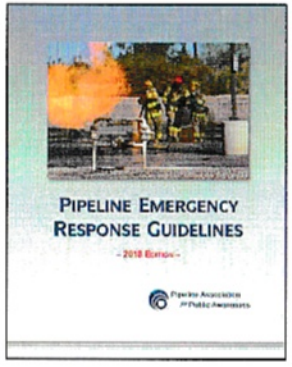
- Along with Patrolling/Continuing Surveillance, Locate and Mark, Pipeline signs, shallow pipe program, and the ILI program, the Damage Prevention portion of the Public Awareness program is a key mitigation program for prevention of 3rd party excavation damage.

- 3rd Party Excavation Damage is the leading cause of PG&E's significant incidents reported to PHMSA. systemwide
  - *Transmission: 93%*
  - *Distribution: 38%*

- More than half of 3rd party dig-ins in Lafayette caused by no USA ticket called or expired USA ticket
  - *All dig-ins on Distribution, over 95% on Distribution Services* 5% transmission
  - *Nearly 90% of the 3rd party dig-ins in residential locations.*
  - *PG&E's USA ticket counts have increased nearly 50% since 2013*

Customer and Public Safety Communications

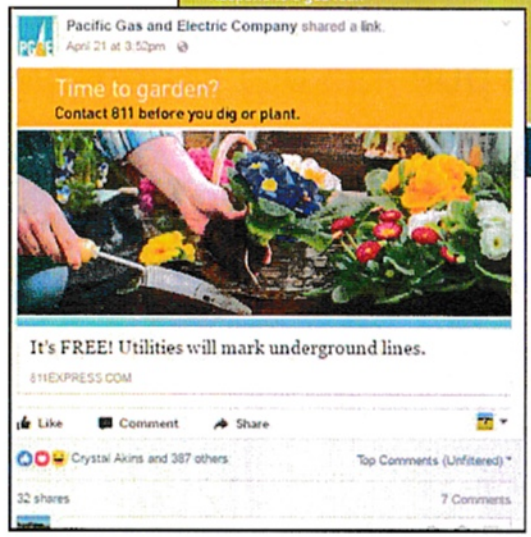
- Bill Inserts and E-Campaigns
  - Businesses and residents within PG&E service territory who receive a gas bill
- Asset Specific Mailings
  - Businesses and residents within proximity to Storage or compressor facility, transmission pipeline, un-odorized pipeline
- Customer Specific Mailings
  - Core gas customers and Master Meter account holders
- School Outreach
  - School administrators and district officials within PG&E's service territory



- Excavator Newsletter
  - Companies performing excavation work in California and companies involved in land development and planning in California
- Pipeline Emergency Response Guidelines
  - Local, state or regional officials and agencies with pubic safety jurisdiction within PG&E's service territory
- Public Officials Newsletter
  - Local, city, county and state officials located within PG&E's gas service territory

Customer and Public Safety Additional Targeted Communications

- Farmer Mailing
  - individuals and companies who own or operate a farm or ranch within PG&E's service territory
- Landscaper Mailing
  - plumbing, fencing, and landscaping companies within PG&E's service territory
- Homeowners Associations Mailing
  - HOA officers and agents within PG&E's service territory
- Social media campaigns
  - Targeted areas with high damages
- Children's safety campaign
  - Downloadable gas and electric safety activity sheets for children



Excavation Damage – How Can Lafayette Help?

- Encourage the City of Lafayette to become a Gold Shovel City.

  http://goldshovelstandard.org/

- Hire a Compliance Officer who will patrol the city and ensure anyone conducting excavation work has a valid permit and a valid USA ticket.

- Work with landscape companies, fencing companies, and homeowners and 811 to offer free safe digging classes.

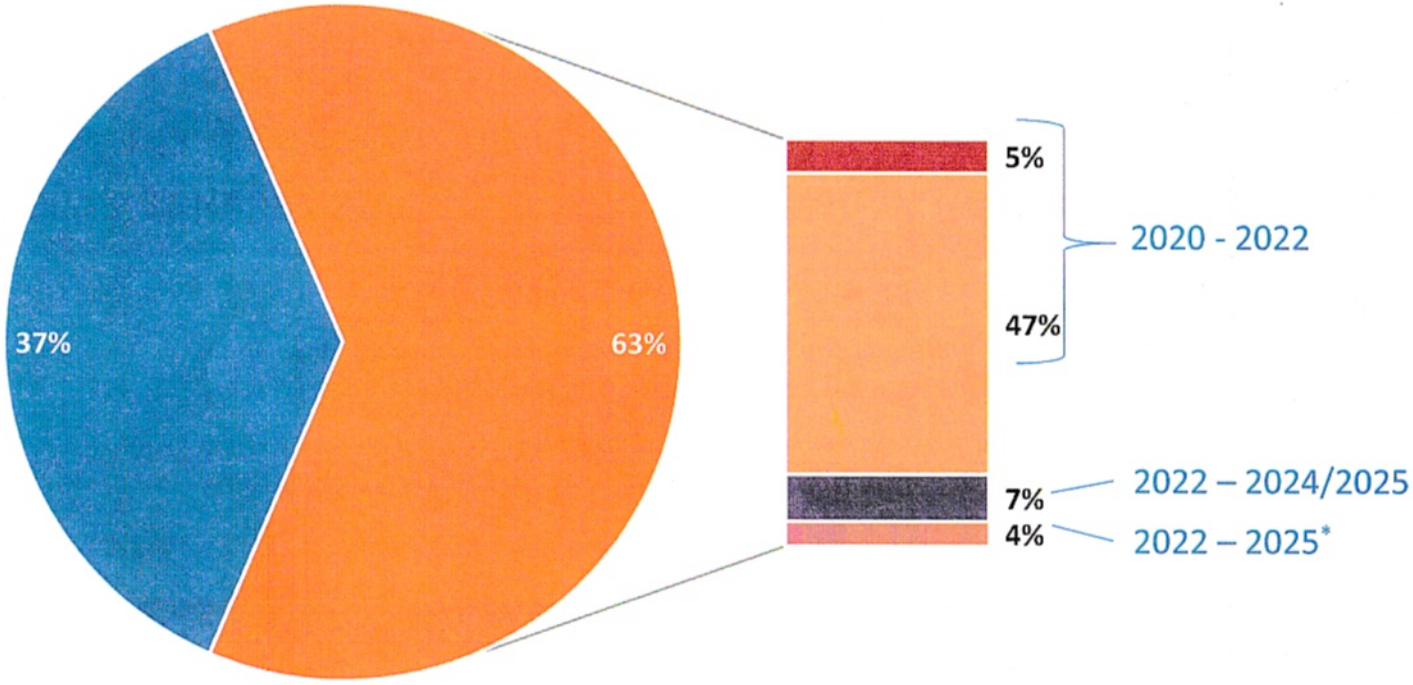
- Partner with gardening clubs, rental companies, and other stakeholders to Sponsor 8-1-1 day events every August 11th.

- Sponsor and support safe digging day every Arbor Day.
  - *Provide education booths to select the right tree/plants around power lines and underground infrastructure) and include 811 training.*

Strength Testing Program

- Mitigate resident manufacturing threats and Stress Corrosion Cracking (SCC) by strength testing the pipe to confirm the pipe's integrity.
  - *Validate the integrity and assure a margin of safety for those gas transmission pipelines that lack a documented strength test record that is traceable, verifiable or complete (TVC).*

Lafayette Strength Testing



** Class 1/2 Non- HCA bundled with HCA and Class 3 tests as tests are completed*

Transmission Valve Automation Program

- Enhances emergency response in the event of a gas transmission pipeline rupture.
  - *Valve Automation priority given to pipes greater than 12 inch diameter in HCAs and Class 3 and 4, non-HCA in order to achieve a response and isolation time less than a 1 hour.*
  - *For pipes less than or equal to 12 inch diameter, incident mitigation management approach is taken, primarily using local, manual valve closure for response and isolation.*

- Valve at Reliez Station near intersection of Reliez Valley road and Olympic Blvd. planned for automation in 2020.
  - *Upstream automated valve in Walnut Creek for isolation of 16" diameter line (4.8 miles away)*

- Remaining valves 4" to 12" diameter using incident mitigation management approach, using manual valve closure for response and isolation.

Geo-Hazard and Earthquake Fault Crossing Programs

- Addresses the Weather Related and Outside Force threat
  - *Seismic fault crossing, slope instability, liquefaction, erosion, lightning, frost, heavy rain/floods, subsidence, vegetation impact (tree root), tsunami, wind, vehicular damage, vandalism, arc strike*
- Geo-Hazard Threat Identification and Mitigation Program – land movement, including subsidence, slope instability, erosion, vegetation impact (tree root), heavy rain or floods, etc.
- Earthquake Fault Crossing Program – Seismic fault crossing and liquefaction.
- Both programs are enhanced/supported by PG&E's patrolling and continuing surveillance program
  - *Routinely identifies localized land movement, especially after rainfall events, using the information for risk prioritized local mitigations*

Integrity Assessments (Direct Assessment and ILI)

- ILI tools can address multiple threats.
  - *When a pipeline cannot be made piggable, the industry best practice is to use DA to look for time dependent threats, such as external corrosion.*
- ILI - most reliable pipeline integrity assessment tool currently available to transmission pipeline operators to assess the condition of pipe.
  - *Small diameters, low flow and low pressure inhibits the use of traditional tools in natural gas pipelines*
  - *Limited use of non-traditional, robotic and tractor tools.*
- Direct Assessment - Identify and assess locations likely to have corrosion
  - *Industry and code identified integrity assessment*

	Integrity Assessment			
Route	**Prior Assessment**	**Results of Most Recent Assessment**	**Future Assessment**	**Description**
191-1	ECDA (2013)	No issues requiring corrective action	Non-Traditional ILI (2020)	Switch from ECDA to Non-Traditional ILI, approximately 0.5 miles
191-1	Hydrotest (2012)	No issues requiring corrective action	Traditional ILI (2020)	Switch from Hydrotest to Traditional ILI, prior assessment approximately 0.5 miles, estending to approximately 0.6 miles for future assessment
191B	N/A	N/A	Non-Traditional ILI (2019)	Focused integrity assessment to address a WROF threat
3001-01	N/A	N/A	ECDA (by 2026)	Baseline integrity assessment, new HCA due Transmission definition change (approximately 0.3 miles)
3001-01	N/A	N/A	ECDA (by 2027)	Baseline integrity assessment, new HCA due Transmission definition change (approximately 0.1 miles)
3001-01	N/A	N/A	ECDA (by 2028)	Baseline integrity assessment, new HCA due Transmission definition change (approximately 0.2 miles)
3002-01	ECDA (2013)	No issues requiring corrective action	ECDA (2020)	Approximately 0.02 miles for prior assessment, extended to approximately 0.3 miles for future assessment
3002-01	N/A	N/A	ECDA (by 2026)	Baseline integrity assessment, new HCA due Transmission definition change (approximately 0.4 miles)

Questions?

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