Risk Management at the Asset Level

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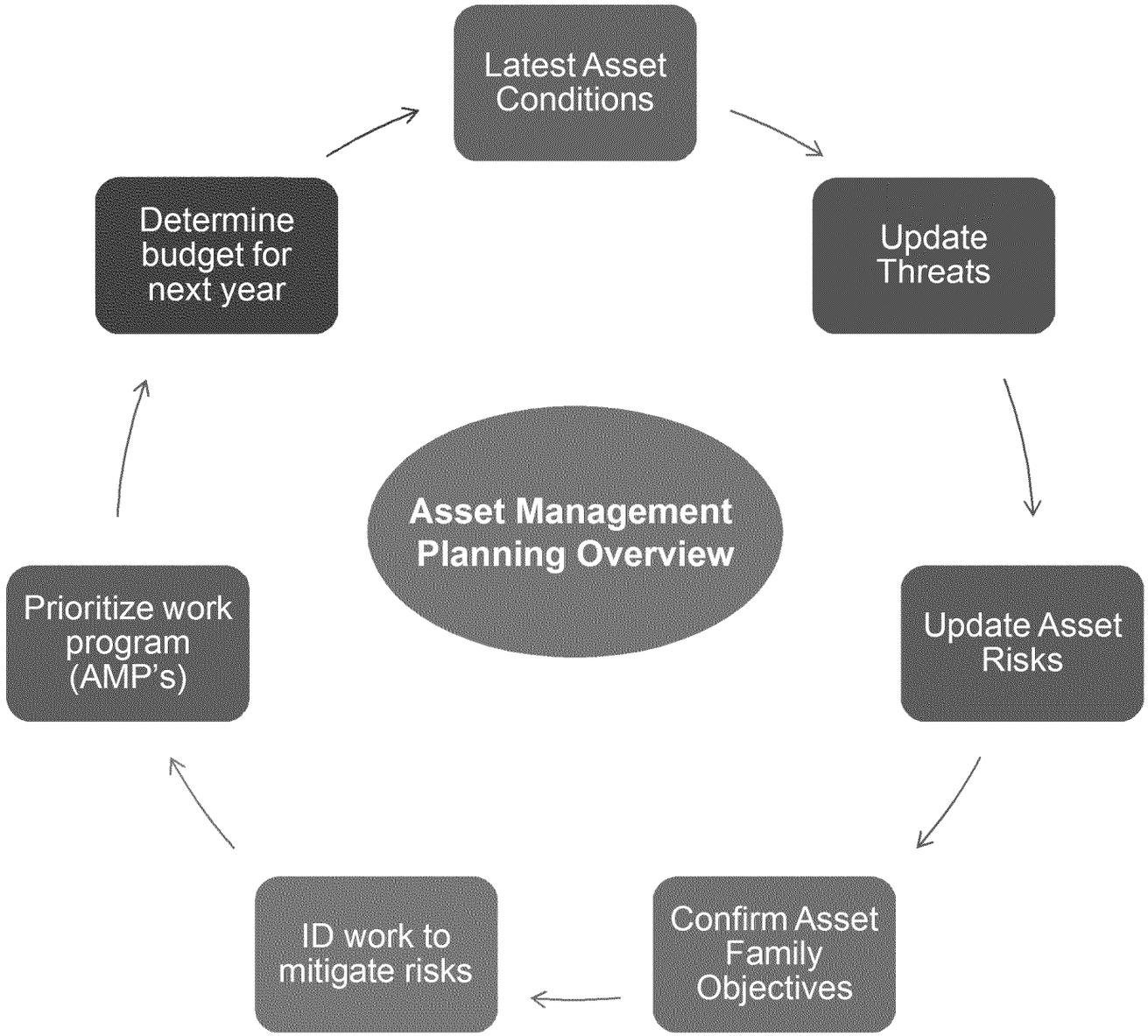

Asset Management Planning for the Distribution Mains and Services Asset Family

Asset management planning process and the Asset Family Owner (AFO) role

How current asset management practices have enhanced understanding

Threat matrix discussion

Asset Management Plans

Asset Management Planning Process

Threats and Risks →

What does "good" look like? →

How do we get there? →

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← Data Quality

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Threat Matrix - Distribution Mains &Services

availability and the quality of the asset data

complete | partial | weak

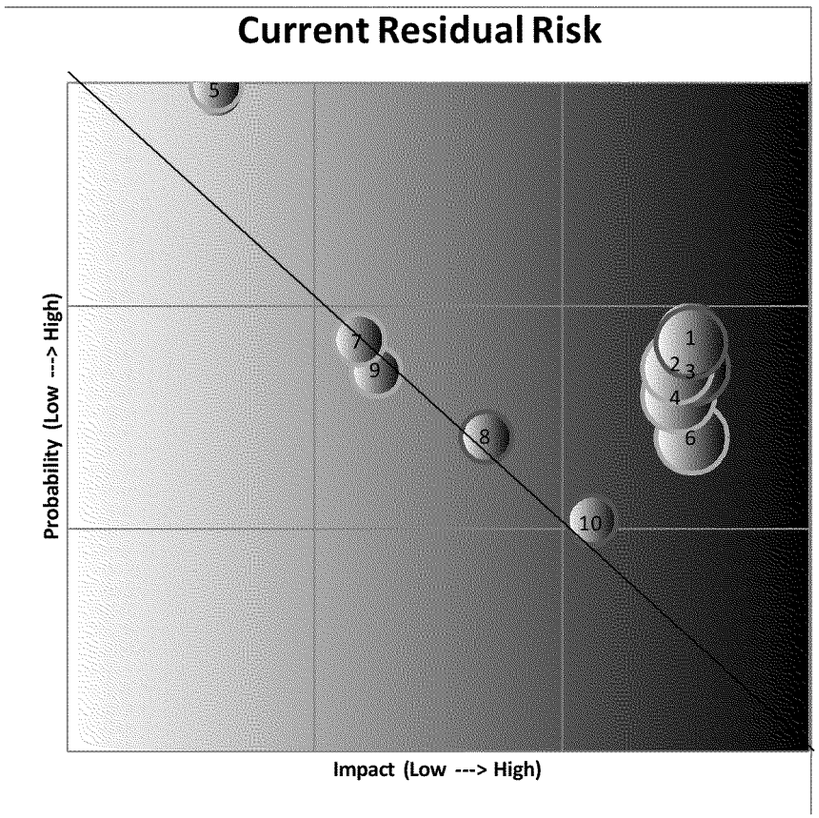
GREEN = Meet or exceed industry best practices

AMBER = Partially meet industry best practices

WHITE = Are not doing now, or do not meet best practices

	Primary Causes of Failures		Primary Mitigation Measures						
Time Dependent Threats	External Corrosion	• Inadequate coating • Inadequate Cathodic protection • Atmospheric conditions	Cathodic Protection	Asset Replacement	Compl Leak Survey	Accel Leak Survey	AC Inspections	Modified ECDA	
	Internal Corrosion	• Sulfur • Water intrusion	Asset Replacement	Compliance Leak Survey	Accelerated Leak Survey				
	Material or Weld - Plastic	• Poor resin quality • Rock impingement/ stress on pipe	Asset Replacement	Compl Leak Survey	Accel Leak Survey	Material Specs	Inspection during Manufacturing	Pressure Testing	
Stable Threats	Material or Weld – Metallic Pipe	• Poor quality manufacture • Inadequate specifications	Asset Replacement	Compl Leak Survey	Accel Leak Survey	Material Specs	Inspection during Manufacturing	Pressure Testing	
	Equipment Related	• Age, Obsolescence • Incorrect sizing/design	Preventive Maint	Asset Replacement	Training	Equipment Specs	Design Stds	Process Safety	
Time Independent Threats	Excavation Damage	• 1st, 2nd, 3rd Party Excavation Damage • Utility Pole Conflicts • Cross Bores	Locating and Marking	One Call System	Public Awareness	Quality Control	Excavation Monitoring		
	Incorrect Operations	• Inadequate Procedures • Human Error • Applicant/Contractor Installation	Training	Quality Control	Operator Qualifications	Quality Assurance Audits	Process Safety		
	Natural Forces	• Weather-Related • Seismic events • Wildfire	Emergency Preparedness Procedures	Design Standards	Slope Monitoring and Stabilization	Emergency Zones			
	Other Outside Forces	• Vandalism • Vehicular Damage • Terrorism • Overbuilds • Burnouts	Design	Asset Relocation/ Replacement	Physical Barrier to Asset	Cybersecurity			

Distribution Mains & Services Heat Map



Risk #	Risk - In order of highest score
Risk 1	Corrosion of copper, resulting in loss of containment, leading to gas migration and ignition
Risk 2	Damage to gas distribution facilities due to a third party, leading to public or employee safety issues or significant property damage
Risk 3	Damage to distribution facility due to the asset running through a sewer, leading to public or employee safety issues or significant property damage
Risk 4	Aldyl-A pipe material failure, leading to loss of containment with potential for ignition
Risk 5	Excavation damage due to third party digging in to PG&E pipelines, leading to pipe damage but no significant safety issues or property damage
Risk 6	Overpressure on low pressure system from Measurement & Control asset family, leading to excessive pilot light
Risk 7	Overpressure from Measurement & Control asset family (regulator stations), leading to overpressure on the semi-high or high system
Risk 8	Cast iron material failure due to seismic activity, leading to significant downtime following earthquake and/or loss of containment, leading to ignition
Risk 9	Plastic T-caps material failure, leading to loss of containment, but no gas ignition
Risk 10	Corrosion (mostly external) on older steel system, leading to loss of containment, but no ignition

Outer Circle Color = Mitigation status

- Evaluation in progress. Risk status unknown
- Current controls are not sufficient
- Current controls are not sufficient, new controls being implemented and in progress
- Controls in place are sufficient

Inner Circle Color = Asset Family

- Distribution Mains & Services

Size of Bubble = Safety Impact

- Low: a) instantly correctable. b) Operations and practices could result in minor injury to employees or public.
- Medium: a) Correctable health and safety impact. b) Operations and practices which are reasonably possible to result in recordable injuries to employees or public.
- High: a) Non-reversible health and safety impact, imminent threat to life. b) Operations and practices that are probable to result in serious injuries to employees or public.

Objectives – Distribution Mains & Services

Category	Objective Description
Asset Condition	**Leak Performance:** Improve leak performance of system to first quartile by 2022
	Leak Backlog: Maintain open leak backlog at less than 1,000 Grade 2 leaks
	Cathodic Protection: Evaluate cathodic protection on metallic distribution mains and services by 2018.
Safety	**Emergency Shutdown Zones:** Reduce size of ESZ's to less than 10,000 customers by 2018
	Dig-Ins: Reduce 3rd party dig-ins to first quartile by 2016
	Over-pressurization: Reduce major over-pressurization events to 0 by 2018
Compliance	**DIMP Compliance**: PHMSA recognition that the PG&E Gas DIMP program is effective at addressing risks during next audit
Asset / System Performance	**Outages:** Schedule outages 6-months in advance
Other	**Data & Documentation**: Improve completeness and accuracy of digital data to support data driven risk identification and scoring by 2020.

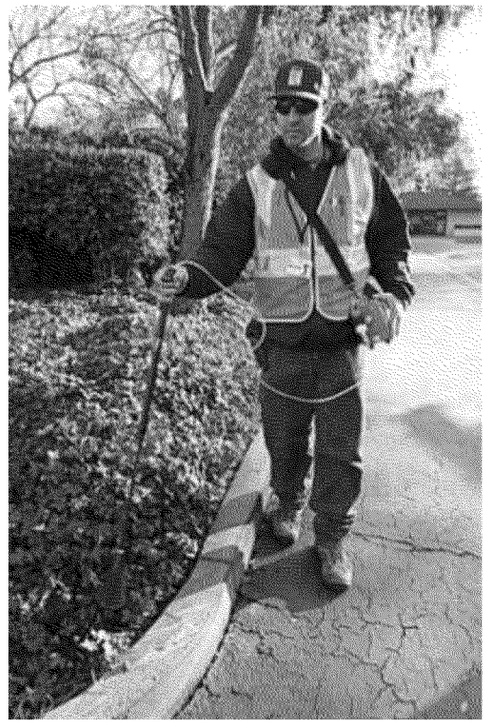
Distribution – Major Programs of Work

Capital Work

- Plastic Pipeline Replacement Program (MWC 14D)
- Gas Pipeline Replacement Program (MWC 14A)
- Leak Survey and Repair (MWCs DE and FI)
- Leaking Service Replacements (50G)
- Low Pressure to High Pressure Replacement (50A)

Expense Work

- Leak Survey (DE)
- Cross-bore Sewer Program (JSK)
- Preventative Maintenance – Cathodic Protection (DG)
- Damage Prevention (DF and JSC)



Investment Prioritization Process

*Goal: Investment portfolio that is **risk-based**, accounts for other key project attributes, **incorporates constraints**, and has been vetted by key stakeholders using a **consistent, repeatable process***

	High level process steps	Key Criteria
1 **Classify Projects**	▪ Classify all projects based on explicit definitions of the following categories:	▪ Compliance ▪ Commitments ▪ Strategic ▪ Financial/NPV ▪ WRO ▪ Preventative Maintenance
2 **Risk-score projects**	▪ Risk score all projects based on likelihood and consequence across the following categories	▪ Safety ▪ Reliability ▪ Environmental
3 **Review constraints**	▪ Analyze key constraints including:	▪ System Constraints ▪ Resources ▪ Equipment ▪ Location / Permits / Government
3 **Portfolio Build , Challenge, and Make Decisions**	▪ Build portfolio based on classification, risk scores, and constraints. Hold a series of sessions to calibrate scores and shape the final portfolio via tradeoffs among Asset Family Owners:	▪ Intra-Asset Calibration Sessions ▪ Inter-Asset Calibration Sessions ▪ Initial Portfolio Build ▪ Challenge Sessions with AFOs ▪ Present to Governance and Sanctioning