

**2016 Risk Assessment Mitigation Phase  
Investigation 16-10-015  
Workpapers to  
Catastrophic Damage Involving a  
Medium-Pressure Pipeline Failure  
(Chapter SDG&E-16-WP)**

January 2017



2016 Risk Assessment Mitigation Phase  
SDG&E-16-WP  
Risk: Catastrophic Damage Involving a Medium-Pressure Pipeline Failure (O&M)

Line No.	Mitigation	Project/Program	Project/Program Description	Recorded (Directs, 2015 \$000)						Forecast Range (Directs, 2015 \$000)						Forecast Methodology
				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	
1	Maintenance	Leak Mitigation, Unstable Earth, Bridge and Span, Pipeline Patrol	Leak surveys are performed to find any leaks in the system using state of the art technology and SAP leak reporting for tracking purposes. Inspections of natural gas pipeline over bridges and land crossings occur at least once every 2 calendar years, but with intervals not exceeding 27 months. Pipeline patrol is performed to look for any broken terraces, exposed pipe, erosion, sunken back fill, etc. Self audits are also performed each month. Any remedial action discovered must be issued within 30 days and completed in 90 days. These programs are mandated by the Federal Code of Regulation (CFR) 49 Part 192 Subpart M.	B	1,341	1,415	1,343	1,358	1,501	1,497	1,655	1,497	1,655	1,497	1,655	Base Year
2		Leak Repair	Leak repair s the result of leak mitigation and pipeline patrol. The activity involves replacing pipe or components that are poorly performing by leaking.	B	886	970	1,092	1,097	1,195	1,140	1,260	1,235	1,365	1,330	1,470	5-Year Trend
3		Regulator Station Inspections, Meter Set Assembly (MSA), Valve Inspection, Meter and Regulators	Inspect meters, regulators, and gauges to evaluate and confirm overpressure protection is in place and maintained. Each pressure limiting station, relief device, signaling device, and pressure regulating station and its equipment must be inspected and tested at intervals not exceeding 15 months, but at least once each calendar year. Valves are checked and serviced at intervals not exceeding 15 months, but at least once each calendar year. (CFR 192.747). Region operations may perform tests and inspections at other times other than the compliance period but cannot be substituted for federally mandated valve inspection in CFR 192.747. These programs are mandated by CFR 49 Part 192 Subpart M.	B	1,727	2,021	2,248	2,286	2,279	2,273	2,513	2,273	2,513	2,273	2,513	Base Year
4		Utility Conflict Review (Right of Way)	Inspection of the property area where pipelines are located and addresses encroachment, which is tangible property belonging to either the owner or a third party, which has unlawfully been or will be placed within the Company's right of way. This is mandated by CFR 49 Part 192 Subpart M.	B	52	70	63	70	807	767	847	767	847	767	847	Base Year
5	Maintenance Subtotal				4,006	4,476	4,746	4,811	5,782	5,677	6,275	5,772	6,380	5,867	6,485	

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				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	
6	Qualifications of Pipeline Personnel	Distribution Reg Tech Operator Qualification (Op Qual) Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	37	37	37	37	37	51	63	57	69	59	72	Zero-Based
7		Distribution System Protection Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	20	20	20	20	20	34	42	40	48	40	48	Zero-Based
8		Distribution Instrument Tech Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	2	2	2	2	2	4	4	4	4	4	4	Zero-Based
9		Distribution Pipeline Patrolers Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	16	16	16	16	16	22	26	24	30	24	30	Zero-Based
10		Distribution Valve Tech Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	2	2	2	2	2	4	4	4	4	4	4	Zero-Based
11		Distribution Welder Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	186	186	186	186	186	207	253	229	279	229	279	Zero-Based
12		Distribution Construction Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	119	119	119	119	119	195	239	195	239	195	239	Zero-Based
13		Distribution Op Qual Instructor	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	118	118	118	118	118	163	199	200	244	233	285	Zero-Based
14		Training Props	For safety and distribution staff training, props are purchased to be used in situation city to simulate real world scenarios while qualifying personnel.	B	-	-	-	-	-	-	-	-	-	-	-	
15	Qualifications of Pipeline Personnel Subtotal				500	500	500	500	500	680	831	752	919	787	961	
16	Requirements for Corrosion Control	Cathodic Protection	System protection requirements mandated by CFR 49 Part 192 Subpart I. This program maintains cathodically protected assets by repairing, replacing, or retrofitting components.	B	999	1,039	1,078	1,195	1,399	1,462	1,616	1,462	1,616	1,462	1,616	Base Year
17	Requirements for Corrosion Control Subtotal				999	1,039	1,078	1,195	1,399	1,462	1,616	1,462	1,616	1,462	1,616	

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				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	
18	Operations	Operator Qualification Program Administration and Development	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	90	90	270	270	270	257	284	257	284	257	284	Base Year
19		Gas Standards Review	All procedures in Gas Standards are reviewed yearly for updated regulator information & updating standard procedures	B	45	45	68	68	68	65	71	65	71	65	71	Base Year
20		Pipeline Safety and Compliance	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	45	45	90	90	90	86	95	86	95	86	95	Base Year
21		Quality Assurance/Quality Control (QA/QC) mostly new construction	Inspections of installed assets, welding/bonding procedures, material verification, gas standard compliance, personnel training/qualification verification.	B	68	68	68	68	68	64	71	64	71	64	71	Base Year
22		Odorization new pipelines	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	-	-	-	-	-	-	-	-	-	-	-	
23	Operations Subtotal				248	248	496	496	496	471	520	471	520	471	520	
24	Gas Distribution Pipeline Integrity Management	DIMP Distribution Risk Evaluation and Monitoring System (DREAMS) & Distribution Integrity Management Program (DIMP) DREAMS	DREAMS identifies and remediates non-state-of-the-art (Steel pipe, bare or coated, without cathodic protection (CP), and all DuPont Aldyl-A (PE) pipe installed before 1987) medium-pressure pipe segments based on historical performance (leakage) as well as pipe attributes, construction practices, and relative location to populated areas. An accelerated version of the DREAMS program began in 2013, which replaces an addition 55 miles a year of non-state-of-the-art pipe. DREAMS is part of DIMP, which is mandated by CFR 49 Part 192 Subpart P.	B/P	385	432	345	126	17	222	300	222	300	222	300	Zero-Based
25		EPOCH	Generally, Epoch projects start with a single coded leak repair. The section of pipe to be replaced is added to the Epoch list and risk-ranked. The scores are reevaluated when another leak occurs in the same area of an identified Epoch project; which could result in the project moving up the list.	B	-	-	-	-	-	-	-	-	-	-	-	
26	Gas Distribution Pipeline Integrity Management Subtotal				385	432	345	126	17	222	300	222	300	222	300	

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					2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	
27	Improvements	Dresser Mechanical Couplings	This program consists of evaluating the coupling field location, excavating, and assessing the weld housing to encapsulate the dresser mechanical couplings main in and near downtown San Diego.	P						53	72	-	-	-	-	Zero-Based
28		Oil Drip Piping	This project is designed to verify the location of above ground and buried oil drip lines and containers. As part of the process, SDG&E consults with Pipeline Operations and Region Engineering to determine and remove facilities that are not necessary.	P						12	16	-	-	-	-	Zero-Based
29		Buried Piping in Vaults	SDG&E has pipeline buried in vaults that may be corroded by above ground facilities and pitting of below ground piping. This activity will determine the locations vaults containing medium and high pressure facilities. SDG&E will assess the coating and the condition of the above-ground and below-ground facilities within the vaults.	P						369	499	-	-	-	-	Zero-Based
30		Cathodic Protection (CP) Reliability Program	This is a region specific program which will perform a detailed cathodic protection evaluation that will include the development of a relative risk algorithm to assess the "health" of the CP system. The information will feed into a relative risk ranking tool for DIMP segments that are under CP protection. The CP system analysis will include enhanced documentation and expanded analysis of the system's routine maintenance records collected per CFR 49 Part 192 Subpart I – Requirements for Corrosion Control.	P						-	-	-	-	-	6,698	Zero-Based
31		Closed Valves Between High and Medium Pressure Piping	This proposed activity involves verifying the valve location, excavating, and removing the closed and locked valves which connect high pressure piping to medium pressure piping.	P						-	-	-	-	-	-	
32		Early Vintage Steel Replacement	This program is intended to remove pre-1947, non-piggable high pressure pipeline as well as pre-1955 medium pressure steel mains. In the years prior to 1955, cold tar asphaltic wrap was used as the primary protection against corrosion with cathodic protection supplementing as secondary protection.	P						-	-	-	-	-	-	
33		Threaded Piping Removal	Prior to 1933, piping in the gas distribution system was joined by treaded couplings. This project aims to proactively remove a total of 152 miles of threaded pipe over a 10-year period. This would be a 10-year program to remove 15 miles of pipe per year.	P						-	-	-	-	-	-	
34	Improvements Subtotal				-	-	-	-	-	434	587	-	-	-	6,698	
35	TOTAL				\$ 6,138	\$ 6,694	\$ 7,165	\$ 7,128	\$ 8,193	\$ 8,945	\$ 10,129	\$ 8,678	\$ 9,735	\$ 8,808	\$ 16,581	

Notes:

- Baseline (B) and Proposed (P).
- Numbers in risk chapter tables may differ due to rounding.
- The purpose of Risk Assessment Mitigation Phase (RAMP) is not to request funding. Any funding requests will be made in the General Rate Case (GRC). The forecasts for mitigations are not for funding purposes, but are rather to provide a range for the future GRC filing. This range will be refined with supporting testimony in the GRC.

2016 Risk Assessment Mitigation Phase  
SDG&E-16-WP  
Risk: Catastrophic Damage Involving a Medium-Pressure Pipeline Failure (Capital)

Line No.	Mitigation	Project/Program	Project/Program Description	Recorded (Directs, 2015 \$000)						Forecast Range (Directs, 2015 \$000)						2017-2019 Low (Sum)	2017-2019 High (Sum)	Forecast Methodology
				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High			
1	Maintenance	Leak Mitigation, Unstable Earth, Bridge and Span, Pipeline Patrol	Leak surveys are performed to find any leaks in the system using state of the art technology and SAP leak reporting for tracking purposes. Inspections of natural gas pipeline over bridges and land crossings occur at least once every 2 calendar years, but with intervals not exceeding 27 months. Pipeline patrol is performed to look for any broken terraces, exposed pipe, erosion, sunken back fill, etc. Self audits are also performed each month. Any remedial action discovered must be issued within 30 days and completed in 90 days. These programs are mandated by the Federal Code of Regulation (CFR) 49 Part 192 Subpart M.	B	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
2		Leak Repair	Leak repair s the result of leak mitigation and pipeline patrol. The activity involves replacing pipe or components that are poorly performing by leaking.	B	531	350	297	949	1,215	994	1,098	994	1,098	994	1,098	2,981	3,295	Trend
3		Regulator Station Inspections, Meter Set Assembly (MSA), Valve Inspection, Meter and Regulators	Inspect meters, regulators, and gauges to evaluate and confirm overpressure protection is in place and maintained. Each pressure limiting station, relief device, signaling device, and pressure regulating station and its equipment must be inspected and tested at intervals not exceeding 15 months, but at least once each calendar year. Valves are checked and serviced at intervals not exceeding 15 months, but at least once each calendar year. (CFR 192.747). Region operations may perform tests and inspections at other times other than the compliance period but cannot be substituted for federally mandated valve inspection in CFR 192.747. These programs are mandated by CFR 49 Part 192 Subpart M.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
4		Utility Conflict Review (Right of Way)	Inspection of the property area where pipelines are located and addresses encroachment, which is tangible property belonging to either the owner or a third party, which has unlawfully been or will be placed within the Company's right of way. This is mandated by CFR 49 Part 192 Subpart M.	B														
5	Maintenance Subtotal				531	350	297	949	1,215	994	1,098	994	1,098	994	1,098	2,981	3,295	

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6	Qualifications of Pipeline Personnel	Distribution Reg Tech Operator Qualification (Op Qual) Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
7		Distribution System Protection Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
8		Distribution Instrument Tech Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
9		Distribution Pipeline Patrolers Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
10		Distribution Valve Tech Op Qual Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
11		Distribution Welder Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
12		Distribution Construction Training	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
13		Distribution Op Qual Instructor	Certification and training that is required for all distribution employees to work on company assets. This is mandated by CFR 49 Part 192 Subpart N.	B	81	-	-	-	-	-	-	-	-	-	-	-	-	
14		Training Props	For safety and distribution staff training, props are purchased to be used in situation city to simulate real world scenarios while qualifying personnel.	B	-	-	-	-	200	662	809	463	565	293	358	1,417	1,731	Zero-Based
15	Qualifications of Pipeline Personnel Subtotal				81	-	-	-	200	662	809	463	565	293	358	1,417	1,731	
16	Requirements for Corrosion Control	Cathodic Protection	System protection requirements mandated by CFR 49 Part 192 Subpart I. This program maintains cathodically protected assets by repairing, replacing, or retrofitting components.	B	451	628	669	1,103	531	1,864	2,060	2,051	2,267	2,154	2,380	6,069	6,707	Zero-Based
17	Requirements for Corrosion Control Subtotal				451	628	669	1,103	531	1,864	2,060	2,051	2,267	2,154	2,380	6,069	6,707	

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18	Operations	Operator Qualification Program Administration and Development	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
19		Gas Standards Review	All procedures in Gas Standards are reviewed yearly for updated regulator information & updating standard procedures	B	45	45	68	68	68	65	71	65	71	65	71	194	214	Base Year
20		Pipeline Safety and Compliance	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
21		Quality Assurance/Quality Control (QA/QC) mostly new construction	Inspections of installed assets, welding/bonding procedures, material verification, gas standard compliance, personnel training/qualification verification.	B	383	383	383	383	383	363	402	363	402	363	402	1,090	1,205	Base Year
22		Odorization new pipelines	The minimum safety requirements prescribed by CFR 49 Part 192 Subpart L – Operations include locate and mark, emergency preparedness and odorization. These activities are intended to address threats as identified by PHMSA.	B	45	45	45	45	45	43	47	43	47	43	47	128	142	Base Year
23	Operations Subtotal				473	473	496	496	496	471	520	471	520	471	520	1,412	1,561	
24	Gas Distribution Pipeline Integrity Management	DIMP Distribution Risk Evaluation and Monitoring System (DREAMS) & Distribution Integrity Management Program (DIMP) DREAMS	DREAMS identifies and remediates non-state-of-the-art (Steel pipe, bare or coated, without cathodic protection (CP), and all DuPont Aldyl-A (PE) pipe installed before 1987) medium-pressure pipe segments based on historical performance (leakage) as well as pipe attributes, construction practices, and relative location to populated areas. An accelerated version of the DREAMS program began in 2013, which replaces an addition 55 miles a year of non-state-of-the-art pipe. DREAMS is part of DIMP, which is mandated by CFR 49 Part 192 Subpart P.	B/P	560	1,416	2,223	1,958	4,267	19,000	21,000	19,000	21,000	20,000	40,000	58,000	82,000	Zero-Based
25		EPOCH	Generally, Epoch projects start with a single coded leak repair. The section of pipe to be replaced is added to the Epoch list and risk-ranked. The scores are reevaluated when another leak occurs in the same area of an identified Epoch project; which could result in the project moving up the list.	B	1,945	1,231	1,599	2,560	1,941	1,866	2,062	2,146	2,372	2,467	2,727	6,479	7,161	Zero-Based
26	Gas Distribution Pipeline Integrity Management Subtotal				2,505	2,647	3,822	4,518	6,208	20,866	23,062	21,146	23,372	22,467	42,727	64,479	89,161	



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				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High				
27	Improvements	Dresser Mechanical Couplings	This program consists of evaluating the coupling field location, excavating, and assessing the weld housing to encapsulate the dresser mechanical couplings main in and near downtown San Diego.	P						-	-	7,589	8,387	7,589	8,387	15,177	16,775	Zero-Based	
28		Oil Drip Piping	This project is designed to verify the location of above ground and buried oil drip lines and containers. As part of the process, SDG&E consults with Pipeline Operations and Region Engineering to determine and remove facilities that are not necessary.	P						-	-	8,935	9,876	8,935	9,876	17,871	19,752	Zero-Based	
29		Buried Piping in Vaults	SDG&E has pipeline buried in vaults that may be corroded by above ground facilities and pitting of below ground piping. This activity will determine the locations vaults containing medium and high pressure facilities. SDG&E will assess the coating and the condition of the above-ground and below-ground facilities within the vaults.	P						-	-	7,437	8,220	-	-	7,437	8,220	Zero-Based	
30		Cathodic Protection (CP) Reliability Program	This is a region specific program which will perform a detailed cathodic protection evaluation that will include the development of a relative risk algorithm to assess the "health" of the CP system. The information will feed into a relative risk ranking tool for DIMP segments that are under CP protection. The CP system analysis will include enhanced documentation and expanded analysis of the system's routine maintenance records collected per CFR 49 Part 192 Subpart I – Requirements for Corrosion Control.	P						3,392	3,749	-	-	-	-	3,392	3,749	Zero-Based	
31		Closed Valves Between High and Medium Pressure Piping	This proposed activity involves verifying the valve location, excavating, and removing the closed and locked valves which connect high pressure piping to medium pressure piping.	P						-	-	-	-	-	-	-	-		
32		Early Vintage Steel Replacement	This program is intended to remove pre-1947, non-piggable high pressure pipeline as well as pre-1955 medium pressure steel mains. In the years prior to 1955, cold tar asphaltic wrap was used as the primary protection against corrosion with cathodic protection supplementing as secondary protection.	P						14,231	15,729	14,231	15,729	14,231	15,729	42,694	47,188	Zero-Based	
33		Threaded Piping Removal	Prior to 1933, piping in the gas distribution system was joined by treaded couplings. This project aims to proactively remove a total of 152 miles of threaded pipe over a 10-year period. This would be a 10-year program to remove 15 miles of pipe per year.	P						14,231	15,729	14,231	15,729	14,231	15,729	42,694	47,188	Zero-Based	
34	Improvements Subtotal					-	-	-	-	31,854	35,207	52,424	57,942	44,987	49,722	129,265	142,872		
35	TOTAL					\$ 4,041	\$ 4,098	\$ 5,284	\$ 7,066	\$ 8,650	\$ 56,710	\$ 62,757	\$ 77,548	\$ 85,765	\$ 71,365	\$ 96,806	\$ 205,622	\$ 245,327	

Notes:

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- This range will be refined with supporting testimony in the GRC.