DOT	US Department of Transportation
PHMSA	Pipeline and Hazardous Materials Safety Administration
OPS	Office of Pipeline Safety
	Central Region

Principal Investigator	Judy Johnson
Region Director	David Barrett
Date of Report	12/15/2011
Subject	Failure Investigation Report – KMIGT 16" Franklin to Hastings Line

Operator, Location, & Consequences

Date of Failure	3/9/2010
Commodity Released	Natural Gas
City/County & State	Roseland/Adams, NE
OpID & Operator Name	1007 Kinder Morgan (KM) Interstate Gas Transmission Co.
Unit # & Unit Name	573 Hastings (KN Energy)
SMART Activity #	129404
Milepost / Location	MP 64 + 1055
Type of Failure	Rupture due to weld defects in longitudinal seam at location of wrinkle bend
Fatalities	0
Injuries	0
Description of area impacted	Non-HCA, Class 1, rural agricultural area
Total Costs	$55,297

Executive Summary

At approximately 15:38 CST on March 9, 2010, a pipeline rupture resulted in an unintentional release of natural gas from a Kinder Morgan (KM) Interstate Gas Transmission Company ("KMIGT") 16" pipeline located in Adams County, Roseland, Nebraska (the "Incident"). An estimated 3,352 thousand cubic feet (MCF) of natural gas was released from the pipeline, 2,535 MCF was unintentional. The Incident occurred in a Class 1 Location. The total cost of the Incident is estimated at $55,297. Gas service was interrupted to approximately 200 private residences for about 24 hours. The Incident was caused by weld defects in the pipeline longitudinal weld seam at the location of a wrinkle bend.

System Details

KMIGT's Franklin to Hastings line is a 16-inch diameter natural gas pipeline that runs from Franklin, Nebraska, to Hastings, Nebraska. The KMIGT pipeline interconnects with KM Rockies Express West (REX West) Pipeline south of the Incident location and KM Trailblazer Pipeline north of the Incident location.

At the Incident location, the pipeline is constructed of material having the characteristics of API 5L Grade B line pipe. The specified minimum yield strength (SMYS), 35,000 psig, has been established by metallurgical laboratory testing. The line pipe, installed in 1946, consists of reclaimed pipe that was originally part of the Kansas City Power and Light system. The pipe manufacture date is circa 1929. There are no records that identify the pipe manufacturer or the type of longitudinal seam. Metallurgical analysis indicates the longitudinal seam consists of "two OD weld passes with filler metal added and an autogenous (no filler metal added) ID weld." The pipeline is 16-inch diameter by 0.250-inch wall thickness, coated with a coal tar enamel type system.

The pipeline maximum allowable operating pressure (MAOP) was established by hydrostatic test in conformance with 49CFR 192.619(a)(2) on October 8, 1976. The test pressure was 902 psig establishing an MAOP of 720 psig.

Events Leading up to the Failure

At the Incident location, the pipeline lies in the flood plain of nearby Scott Creek. On March 9, 2010 heavy rainfall combined with snow melt caused flooding along Scott Creek. The pipeline ROW was submerged at the time of the incident.

At the time of the incident, pipeline operating pressure was approximately 644 psig.

Emergency Response

At 15:38 CST, KMIGT gas control received a low pressure alarm on the Franklin to Hastings system. At 15:40 CST, a third party reported a pipeline leak to the KMIGT field office located in Hastings, Nebraska. The Hastings field office immediately dispatched a technician to the Incident site to confirm the leak. At 15:55 CST, gas control determined that an abnormal operating condition (AOC) existed on the pipeline

system. The determination was based on review and analysis of SCADA information. Gas control notified the Hastings field office of the AOC.

Hastings field office personnel were dispatched to confirm the AOC and initiate isolation of the system. There were no remotely operated emergency valves on the Franklin to Hastings system. The KMIGT technician arrived at the Incident site at 16:02 CST, confirmed a leak and notified gas control. The affected section of pipeline was isolated by manually closing the upstream mainline valve (Roseland) at 16:20 CST and the downstream mainline valve (Hastings West) at 16:55 CST. The approximate 11 mile long pipeline segment was blown down to 0 psig by 18:40 CST.

KMIGT notified Adams County emergency responders of the pipeline leak at 16:41 CST and conducted an Incident coordination call at 16:45 CST. KMIGT notified the National Response Center (NRC) and the incident was assigned NRC Number 933460 and the notification was logged at 18:18 EST.

Following the Incident, KMIGT voluntarily limited the Franklin to Hastings segment operating pressure to 550 psig. The reduced operating pressure represented 85% of the operating pressure at the time of failure. KMIGT indicated 550 psig was the minimum pressure required to maintain gas supply to customers.

Summary of Return-to-Service

After the field investigation was complete, replacement pipe was installed in the area where the Incident occurred.

The pipeline was returned to service at reduced pressure. As of the date of writing, the pressure reduction remains in place.

After the pipeline was returned to service, KMIGT ran an in line inspection (ILI) high resolution geometry tool in the 16-inch diameter Franklin to Hastings North Check segment, approximately 45 pipeline miles. The purpose of the ILI was to identify the number and location of wrinkle bends in the segment. Approximately 1200 locations containing wrinkle bends were identified by the ILI. On average, each location contained two to three wrinkle bends. Based on the ILI results, KMIGT decided to replace approximately 11.4 miles of 16-inch diameter piping with new 20-inch diameter piping. The replacement piping is located in Class 2 and Class 3 areas. Pipeline replacement was completed and the 20-inch diameter pipeline was placed into service in April 2011

Approximately 33 miles of 16-inch diameter wrinkle bend construction type pipe remains in service. KMIGT will perform metallurgical laboratory testing on approximately 20 wrinkle bends taken from the 11.4 miles of pipeline that has been replaced. KMIGT will evaluate the results of the laboratory testing to determine if the remaining 33 miles of 16-inch diameter pipeline will require replacement.

Investigation Details

On March 11, 2010, a PHMSA Central Region inspector conducted an on-site investigation of the Incident. In situ visual inspection of the damaged pipe joint revealed a circumferential fracture located near the centerline of a wrinkle bend. The fracture extended circumferentially from the approximate

9:00 o'clock position, around the top of the pipe, to the approximate 3:00 o'clock position. The fracture was approximately 24 inches in length and approximately ¼ inch wide. The pipeline longitudinal seam was located between the 11:00 and 12:00 o'clock circumferential position. The wrinkle bend was part of an under bend in the pipeline.

KMIGT removed a five foot section of pipe near survey station number 3389+75. The pipeline segment contained the fractured wrinkle bend and an additional wrinkle bend located approximately two feet downstream of the failure. This section of pipe was transported to a metallurgical laboratory for further analysis. The analysis concluded the fracture was caused by weld defects, primarily slag inclusion and non-fusion, in the pipeline longitudinal weld seam at the location of the wrinkle bend. The wrinkle bend located two feet downstream of the failure also contained circumferential cracks in the wrinkle bend initiating at the longitudinal weld seam. Wrinkle bend construction is currently prohibited in new pipelines by 192.315. However, it was common practice at the time the Franklin to Hastings pipeline was constructed and 192 Subpart G is not retroactive.

A review of KMIGT leak records identified a 1997 pipeline rupture associated with wrinkle bend construction. The wrinkle bend was cut out and replaced, however there are no records of a metallurgical analysis of the failure.

Findings and Contributing Factors

The KMIGT 16-inch diameter Franklin to Hastings Incident was caused by weld defects in the pipeline longitudinal weld seam at the location of a wrinkle bend. The weld defects consist of slag inclusions and non-fusion. A wrinkle bend located two feet downstream of the failure also contained circumferential cracks in the wrinkle bend initiating at the longitudinal weld seam.

Appendices

A Map and Photographs

B NRC Report

C Kinder Morgan Incident Report to PHMSA

D Kinder Morgan Loss Causation Report, 3/10/2010

E Kinder Morgan Metallurgical Investigation Report, 4/22/2010

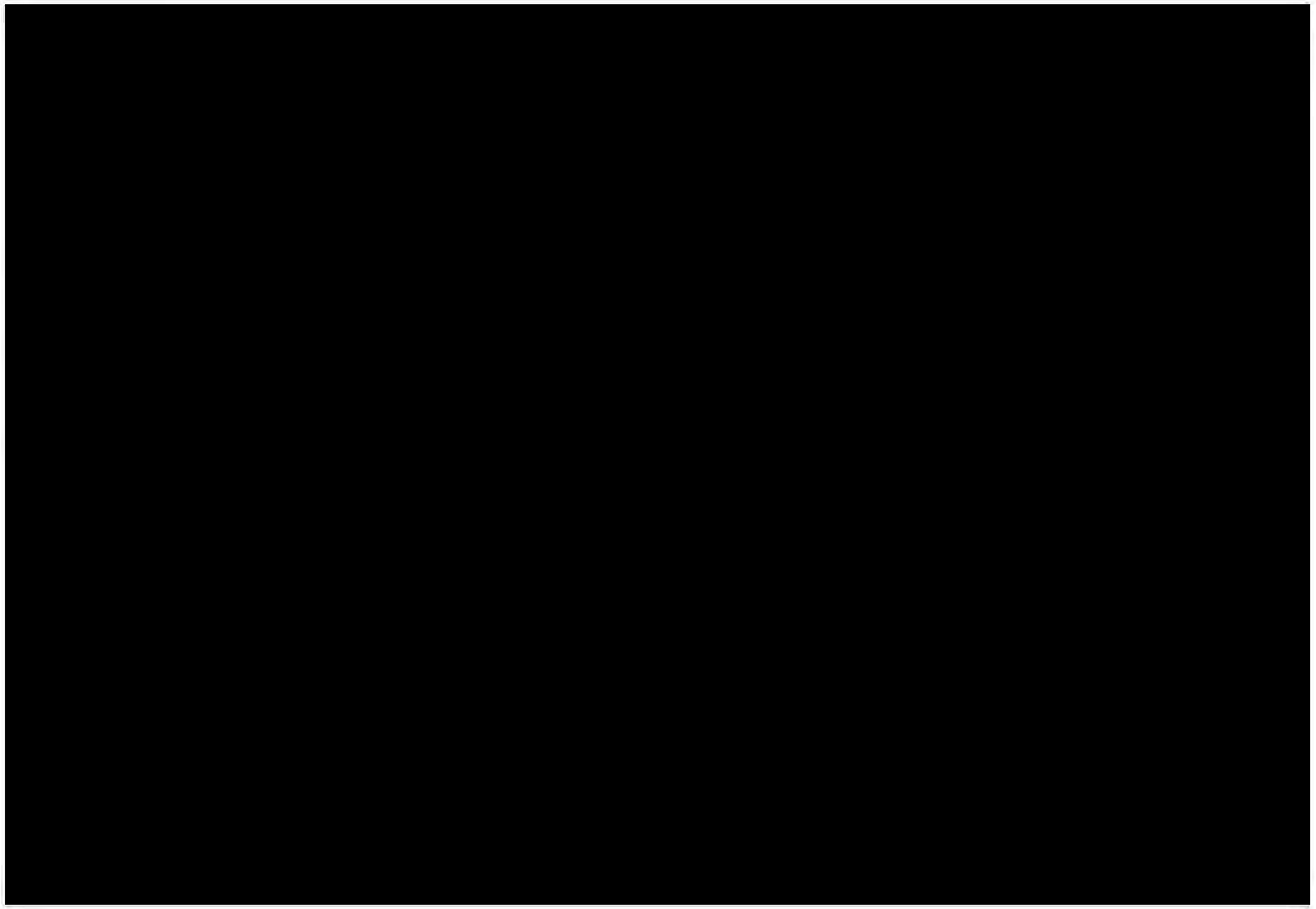
Failure Investigation Report – KMIGT 16" Franklin to Hastings Line, Failure Date 03/09/2010, Appendix A – Maps and Photographs

Failure site, looking west toward Roseland Avenue. Tree line in background marks the location of Scott Creek.

Failure site, looking east. Grasses laid over in foreground due to flooding of Scott Creek.

Failure site, looking northeast (downstream). Pipeline markers in background indicate Scott Creek crossing.

Pipeline rupture at wrinkle bend (underbend), looking southeast.



Appendix B - NRC Report No. 933460

Pipeline & Hazardous Materials Safety Administration

HMIS->INCIDENTS->TELEPHONICS

(Version 3.4.05 PROD) Rules of Behavior Home Logout Menu

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Rescinded **Comments** (max 250 characters)

NRC Number: **933460**
Call Date: **03/09/2010** **Call Time:** **18:18:55**

Caller Information

First Name:	LARRY	Last Name:	KEPPLER
Company Name:	KINDER MORGAN- KMIGT		
Address:	500 DALLAS ST.		
City:	HOUSTON	State:	TX
Country:	USA	Zip:	77082
Phone 1:	8325964128	Phone 2:	
Organization Type:	PRIVAT	Is caller the spiller?	(•) Yes ( ) No ( ) No Response
Confidential:	( ) Yes (•) No ( ) No Response		

Discharger Information

First Name:	LARRY	Last Name:	KEPPLER
Company Name:	KINDER MORGAN- KMIGT		
Address:	500 DALLAS ST.		
City:	HOUSTON	State:	TX
Country:	USA	Zip:	77082
Phone 1:	8325964128	Phone 2:	
Organization Type:	PRIVAT		

Spill Information

State:	NE	County:	ADAMS
Nearest City:	HASTINGS	Zip Code:	

Location

Spill Date:	03/09/2010 (mm/dd/yyyy)	Spill Time:	16:02:00 (24hh:mm:ss)
DTG Type:	DISCOVERED		
Incident Type	PIPELINE	Reported Incident Type	PIPELINE

Description

Appendix B - NRC Report No. 933460

CALLER STATED THAT THERE WAS A GAS LEAK REPORTED BY A PRIVATE CITIZEN. PERSONNEL INVESTIGATED AND CONFIRMED A RUPTURE IN THE PIPELINE DUE TO UNKNOWN CAUSES.

Materials Involved

Material / Chris Name	Chris Code	Total Qty.	Water Qty.
NATURAL GAS	ONG	0 UNKNOWN AMOUNT	

Medium Type: AIR

Additional Medium Information:

ATMOSPHERE

Injuries: Fatalites:

Evacuations: Yes No Unknown No. of Evacuations:

Damages: Yes No Unknown Damage Amount:

Federal Agency Notified: Yes No Unknown State Agency Notified: Yes No Unknown

Other Agency Notified: Yes No Unknown

Remedial Actions

PERSONNEL BLOCKED IN THE PIPELINE SEGMENT. THE PIPELINE WILL LEAK DOWN. THE PIPELINE IS UNDERWATER DUE TO SNOW MELT, PERSONNEL MAY NEED TO DAM A CREEK IN ORDER TO FIX THE PIPELINE.

Additional Info

CALLER WILL NOTIFY LOCAL AUTHORITIES.

Latitude

Degrees: 40 Minutes: 29 Seconds: 0 Quadrant: N

Longitude

Degrees: 98 Minutes: 30 Seconds: 0 Quadrant: W

Distance from City: Direction:

Section: Township:

Range: Milepost:

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed 100,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $1,000,000 as provided in 49 USC 60122.	OMB NO: 2137-0522 EXPIRATION DATE: 01/31/2013
U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration	**Report Date:** 04/07/2010 **No.** 20100012 - 15129 (DOT Use Only)

INCIDENT REPORT - GAS TRANSMISSION AND GATHERING PIPELINE SYSTEMS

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2137-0522. Public reporting for this collection of information is estimated to be approximately 10 hours per response, including the time for reviewing instructions, gathering the data needed, and completing and reviewing the collection of information. All responses to this collection of information are mandatory. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, PHMSA, Office of Pipeline Safety (PHP-30) 1200 New Jersey Avenue, SE, Washington, D.C. 20590.

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the PHMSA Pipeline Safety Community Web Page at http://www.phmsa.dot.gov/pipeline.*

PART A - KEY REPORT INFORMATION

Report Type: *(select all that apply)*	**Original:**	**Supplemental:**	**Final:**
		Yes	**Yes**
Report Status:	Submitted		
Create Date:	12/02/2010		
1. Operator's OPS-issued Operator Identification Number (OPID):	1007		
2. Name of Operator	KM INTERSTATE GAS TRANSMISSION CO		
3. Address of Operator:			
3a. Street Address	500 DALLAS ST. (ONE ALLEN CENTER)		
3b. City	HOUSTON		
3c. State	Texas		
3d. Zip Code:	77002		
4. Local time *(24-hr clock)* and date of the Incident:	03/09/2010 16:02		
5. Location of Incident:			
Latitude:	40.48771		
Longitude:	-98.55188		
6. National Response Center Report Number (if applicable):	933460		
7. Local time *(24-hr clock)* and date of initial telephonic report to the National Response Center (if applicable):	03/09/2010 17:26		
8. Incident resulted from:	Unintentional release of gas		
9. Gas released: (select only one, based on predominant volume released)	Natural Gas		
- Other Gas Released Name:			
10. Estimated volume of commodity released unintentionally - Thousand Cubic Feet (MCF):	2,535.00		
11. Estimated volume of intentional and controlled release/blowdown - Thousand Cubic Feet (MCF)	3,352.00		
12. Estimated volume of accompanying liquid release (Barrels):			
13. Were there fatalities?	No		
- If Yes, specify the number in each category:			
13a. Operator employees			
13b. Contractor employees working for the Operator			
13c. Non-Operator emergency responders			
13d. Workers working on the right-of-way, but NOT associated with this Operator			
13e. General public			
13f. Total fatalities (sum of above)			
14. Were there injuries requiring inpatient hospitalization?	No		
- If Yes, specify the number in each category:			
14a. Operator employees			
14b. Contractor employees working for the Operator			
14c. Non-Operator emergency responders			
14d. Workers working on the right-of-way, but NOT associated with this Operator			
14e. General public			
14f. Total injuries (sum of above)			
15. Was the pipeline/facility shut down due to the incident?	Yes		

- If No, Explain:	
- If Yes, complete Questions 15a and 15b: *(use local time, 24-hr clock)*	
15a. Local time and date of shutdown	03/09/2010 16:20
15b. Local time pipeline/facility restarted	03/23/2010 18:30
- Still shut down? (* Supplemental Report Required)	
16. Did the gas ignite?	No
17. Did the gas explode?	No
18. Number of general public evacuated:	0
19. Time sequence *(use local time, 24-hour clock)*:	
19a. Local time operator identified Incident	03/09/2010 16:02
19b. Local time operator resources arrived on site	03/09/2010 16:02
PART B - ADDITIONAL LOCATION INFORMATION	
1. Was the origin of the Incident onshore?	Yes
- Yes (Complete Questions 2-12)	
- No (Complete Questions 13-15)	
If Onshore:	
2. State:	Nebraska
3. Zip Code:	68973
4. City	Roseland
5. County or Parish	Adams
6. Operator designated location	Survey Station No.
Specify:	3389+75
7. Pipeline/Facility name:	16" Franklin to Hastings
8. Segment name/ID:	710-005-00-00
9. Was Incident on Federal land, other than the Outer Continental Shelf (OCS)?	No
10. Location of Incident :	Pipeline Right-of-way
11. Area of Incident (as found) :	Underground
Specify:	Under soil
Other – Describe:	
Depth-of-Cover (in):	41
12. Did Incident occur in a crossing?	No
- If Yes, specify type below:	
- If Bridge crossing –	
Cased/ Uncased:	
- If Railroad crossing –	
Cased/ Uncased/ Bored/drilled	
- If Road crossing –	
Cased/ Uncased/ Bored/drilled	
- If Water crossing –	
Cased/ Uncased	
Name of body of water (If commonly known):	
Approx. water depth (ft) at the point of the Incident:	
Select:	
If Offshore:	
13. Approx. water depth (ft) at the point of the Incident:	
14. Origin of Incident:	
- If "In State waters":	
- State:	
- Area:	
- Block/Tract #:	
- Nearest County/Parish:	
- If "On the Outer Continental Shelf (OCS)":	
- Area:	
- Block #:	
15. Area of Incident:	
PART C - ADDITIONAL FACILITY INFORMATION	
1. Is the pipeline or facility: - Interstate - Intrastate	Interstate
2. Part of system involved in Incident:	Onshore Pipeline, Including Valve Sites
3. Item involved in Incident:	Pipe
- If Pipe – Specify:	Pipe Body
3a. Nominal diameter of pipe (in):	16
3b. Wall thickness (in):	.25
3c. SMYS (Specified Minimum Yield Strength) of pipe (psi):	35,000
3d. Pipe specification:	API 5L - Grade B

3e. Pipe Seam – Specify:	Other
- If Other, Describe:	Electric Welded
3f. Pipe manufacturer:	Unknown
3g. Year of manufacture:	1929
3h. Pipeline coating type at point of Incident – Specify:	Coal Tar
- If Other, Describe:	
- If Weld, including heat-affected zone – Specify:	
- If Other, Describe:	
- If Valve – Specify:	
- If Mainline – Specify:	
- If Other, Describe:	
3i. Mainline valve manufacturer:	
3j. Year of manufacture:	
- If Other, Describe:	
4. Year item involved in Incident was installed:	1946
5. Material involved in Incident:	Carbon Steel
- If Material other than Steel or Plastic – Specify:	
6. Type of Incident involved:	Rupture
- If Mechanical Puncture – Specify Approx. size:	
Approx. size: in. (in axial) by	
in. (circumferential)	
- If Leak - Select Type:	
- If Other – Describe:	
- If Rupture - Select Orientation:	Circumferential
- If Other – Describe:	
Approx. size: in. (widest opening):	.2
by in. (length circumferentially or axially):	21.5
- If Other – Describe:	

PART D - ADDITIONAL CONSEQUENCE INFORMATION

1. Class Location of Incident:	Class 1 Location
2. Did this Incident occur in a High Consequence Area (HCA)?	No
- If Yes:	
2a. Specify the Method used to identify the HCA:	
3. What is the PIR (Potential Impact Radius) for the location of this Incident? Feet:	296
4. Were any structures outside the PIR impacted or otherwise damaged due to heat/fire resulting from the Incident?	No
5. Were any structures outside the PIR impacted or otherwise damaged NOT by heat/fire resulting from the Incident?	No
6. Were any of the fatalities or injuries reported for persons located outside the PIR?	No
7. Estimated cost to Operator :	
7a. Estimated cost of public and non-Operator private property damage paid/reimbursed by the Operator	$ 0
7b. Estimated cost of gas released unintentionally	$ 14,450
7c. Estimated cost of gas released during intentional and controlled blowdown	$ 19,107
7d. Estimated cost of Operator's property damage & repairs	$ 21,200
7e. Estimated cost of Operator's emergency response	$ 540
7f. Estimated other costs	$ 0
Describe:	
7g. Estimated total costs (sum of above)	$ 55,297

PART E - ADDITIONAL OPERATING INFORMATION

1. Estimated pressure at the point and time of the Incident (psig):_	644.00
2. Maximum Allowable Operating Pressure (MAOP) at the point and time of the Incident (psig):	720.00
3. Describe the pressure on the system or facility relating to the Incident:	Pressure did not exceed MAOP
4. Not including pressure reductions required by PHMSA regulations (such as for repairs and pipe movement), was the system or facility relating to the Incident operating under an established pressure restriction with pressure limits below those normally allowed by the MAOP?	No
- If Yes - (*Complete 4a and 4b below)*	

4a. Did the pressure exceed this established pressure restriction?	
4b. Was this pressure restriction mandated by PHMSA or the State?	
5. Was "Onshore Pipeline, Including Valve Sites" OR "Offshore Pipeline, Including Riser and Riser Bend" selected in PART C, Question 2?	Yes
- If Yes - (*Complete 5a. - 5f. below):*	
5a. Type of upstream valve used to initially isolate release source:	Manual
5b. Type of downstream valve used to initially isolate release source:	Manual
5c. Length of segment isolated between valves (ft):	56,726
5d. Is the pipeline configured to accommodate internal inspection tools?	Yes
- If No – Which physical features limit tool accommodation? *(select all that apply)*	
- Changes in line pipe diameter	
- Presence of unsuitable mainline valves	
- Tight or mitered pipe bends	
- Other passage restrictions (i.e. unbarred tee's, projecting instrumentation, etc.)	
- Extra thick pipe wall (applicable only for magnetic flux leakage internal inspection tools)	
- Other	
- If Other, Describe:	
5e. For this pipeline, are there operational factors which significantly complicate the execution of an internal inspection tool run?	No
- If Yes, which operational factors complicate execution? *(select all that apply)*	
- Excessive debris or scale, wax, or other wall build-up	
- Low operating pressure(s)	
- Low flow or absence of flow	
- Incompatible commodity	
- Other	
- If Other, Describe:	
5f. Function of pipeline system:	Transmission System
6. Was a Supervisory Control and Data Acquisition (SCADA)-based system in place on the pipeline or facility involved in the Incident?	Yes
- If Yes:	
6a. Was it operating at the time of the Incident?	Yes
6b. Was it fully functional at the time of the Incident?	Yes
6c. Did SCADA-based information (such as alarm(s), alert(s), event(s), and/or volume or pack calculations) assist with the detection of the Incident?	Yes
6d. Did SCADA-based information (such as alarm(s), alert(s), event(s), and/or volume calculations) assist with the confirmation of the Incident?	Yes
7. How was the Incident initially identified for the Operator?	Notification From Public
- If Other – Describe:	
7a. If "Controller", "Local Operating Personnel, including contractors", "Air Patrol", or "Ground Patrol by Operator or its contractor" is selected in Question 7, specify the following:	
8. Was an investigation initiated into whether or not the controller(s) or control room issues were the cause of or a contributing factor to the Incident?	No, the Operator did not find that an investigation of the controller(s) actions or control room issues was necessary due to: (provide an explanation for why the Operator did not investigate)
- If No, the operator did not find that an investigation of the controller(s) actions or control room issues was necessary due to: *(provide an explanation for why the operator did not investigate)*	SCADA system was functioning normally at the time of the incident. Line pressure was within normal operating range at the time of the incident. Gas controller responded appropriately.
- If Yes, Describe investigation result(s) *(select all that apply)*:	
- Investigation reviewed work schedule rotations, continuous hours of service (while working for the operator), and other factors associated with fatigue	
- Investigation did NOT review work schedule rotations, continuous hours of service (while working for the Operator) and other factors associated with fatigue	
- Provide an explanation for why not:	
- Investigation identified no control room issues	
- Investigation identified no controller issues	
- Investigation identified incorrect controller action or controller error	

- Investigation identified that fatigue may have affected the controller(s) involved or impacted the involved controller(s) response	
- Investigation identified incorrect procedures	
- Investigation identified incorrect control room equipment operation	
- Investigation identified maintenance activities that affected control room operations, procedures, and/or controller response	
- Investigation identified areas other than those above –	
Describe:	

PART F - DRUG & ALCOHOL TESTING INFORMATION

1. As a result of this Incident, were any Operator employees tested under the post-accident drug and alcohol testing requirements of DOT's Drug & Alcohol Testing regulations?	No
- If Yes:	
1a. Describe how many were tested:	
1b. Describe how many failed:	
2. As a result of this Incident, were any Operator contractor employees tested under the post-accident drug and alcohol testing requirements of DOT's Drug & Alcohol Testing regulations?	No
- If Yes:	
2a. Describe how many were tested:	
2b. Describe how many failed:	

PART G - APPARENT CAUSE

Select only one box from PART G in the shaded column on the left representing the APPARENT Cause of the Incident, and answer the questions on the right. Describe secondary, contributing, or root causes of the Incident in the narrative (PART H).

Apparent Cause:	G5 - Material Failure of Pipe or Weld

G1 - Corrosion Failure - *only one **sub-cause** can be picked from shaded left-hand column*

Corrosion Failure – Sub-cause:	
- If External Corrosion:	
1. Results of visual examination:	
- If Other, Describe:	
2. Type of corrosion: *(select all that apply)*	
- Galvanic	
- Atmospheric	
- Stray Current	
- Microbiological	
- Selective Seam	
- Other	
- If Other – Describe:	
3. The type(s) of corrosion selected in Question 2 is based on the following: *(select all that apply)*	
- Field examination	
- Determined by metallurgical analysis	
- Other	
- If Other – Describe:	
4. Was the failed item buried under the ground?	
- If Yes:	
4a. Was failed item considered to be under cathodic protection at the time of the incident?	
- If Yes, Year protection started:	
4b. Was shielding, tenting, or disbonding of coating evident at the point of the incident?	
4c. Has one or more Cathodic Protection Survey been conducted at the point of the incident?	
If "Yes, CP Annual Survey" – Most recent year conducted:	
If "Yes, Close Interval Survey" – Most recent year conducted:	
If "Yes, Other CP Survey" – Most recent year conducted:	
- If No:	
4d. Was the failed item externally coated or painted?	
5. Was there observable damage to the coating or paint in the vicinity of the corrosion?	

- If Internal Corrosion:	
6. Results of visual examination:	
- If Other, Describe:	
7. Cause of corrosion *(select all that apply)*:	
- Corrosive Commodity	
- Water drop-out/Acid	
- Microbiological	
- Erosion	
- Other	
- If Other, Describe:	
8. The cause(s) of corrosion selected in Question 7 is based on the following *(select all that apply)*:	
- Field examination	
- Determined by metallurgical analysis	
- Other	
- If Other, Describe:	
9. Location of corrosion *(select all that apply)*:	
- Low point in pipe	
- Elbow	
- Drop-out	
- Other	
- If Other, Describe:	
10. Was the gas/fluid treated with corrosion inhibitors or biocides?	
11. Was the interior coated or lined with protective coating?	
12. Were cleaning/dewatering pigs (or other operations) routinely utilized?	
13. Were corrosion coupons routinely utilized?	
Complete the following if any Corrosion Failure sub-cause is selected AND the "Item Involved in Incident" (from PART C, Question 3) is Pipe or Weld.	
14. Has one or more internal inspection tool collected data at the point of the Incident?	
14a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage Tool	
Most recent year run:	
- Ultrasonic	
Most recent year run:	
- Geometry	
Most recent year run:	
- Caliper	
Most recent year run:	
- Crack	
Most recent year run:	
- Hard Spot	
Most recent year run:	
- Combination Tool	
Most recent year run:	
- Transverse Field/Triaxial	
Most recent year run:	
- Other	
Most recent year run:	
If Other, Describe:	
15. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Incident?	
- If Yes,	
Most recent year tested:	
Test pressure (psig):	
16. Has one or more Direct Assessment been conducted on this segment?	
- If Yes, and an investigative dig was conducted at the point of the Incident:	
Most recent year conducted:	
- If Yes, but the point of the Incident was not identified as a dig site:	
Most recent year conducted:	
17. Has one or more non-destructive examination been conducted at the point of the Incident since January 1, 2002?	
17a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year examined:	
- Guided Wave Ultrasonic	
Most recent year examined:	

- Handheld Ultrasonic Tool	
Most recent year examined:	
- Wet Magnetic Particle Test	
Most recent year examined:	
- Dry Magnetic Particle Test	
Most recent year examined:	
- Other	
Most recent year examined:	
If Other, Describe:	
G2 - Natural Force Damage - *only one **sub-cause** can be picked from shaded left-handed column*	
Natural Force Damage – Sub-Cause:	
- If Earth Movement, NOT due to Heavy Rains/Floods:	
1. Specify:	
- If Other, Describe:	
- If Heavy Rains/Floods:	
2. Specify:	
- If Other, Describe:	
- If Lightning:	
3. Specify:	
- If Temperature:	
4. Specify:	
- If Other, Describe:	
- If Other Natural Force Damage:	
5. Describe:	
Complete the following if any Natural Force Damage sub-cause is selected.	
6. Were the natural forces causing the Incident generated in conjunction with an extreme weather event?	
6a. If yes, specify: *(select all that apply)*:	
- Hurricane	
- Tropical Storm	
- Tornado	
- Other	
- If Other, Describe:	
G3 - Excavation Damage *only one **sub-cause** can be picked from shaded left-hand column*	
Excavation Damage – Sub-Cause:	
- If Previous Damage Due to Excavation Activity:	
Complete Questions 1-5 ONLY IF the "Item Involved in Incident" (From Part C, Question 3) is Pipe or Weld.	
1. Has one or more internal inspection tool collected data at the point of the Incident?	
1a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage	
Year:	
- Ultrasonic	
Year:	
- Geometry	
Year:	
- Caliper	
Year:	
- Crack	
Year:	
- Hard Spot	
Year:	
- Combination Tool	
Year:	
- Transverse Field/Triaxial	
Year:	
- Other:	
Year:	
Describe:	
2. Do you have reason to believe that the internal inspection was completed BEFORE the damage was sustained?	
3. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Incident?	
- If Yes:	

Most recent year tested:	
Test pressure (psig):	
4. Has one or more Direct Assessment been conducted on the pipeline segment?	
- If Yes, and an investigative dig was conducted at the point of the Incident:	
Most recent year conducted:	
- If Yes, but the point of the Incident was not identified as a dig site:	
Most recent year conducted:	
5. Has one or more non-destructive examination been conducted at the point of the Incident since January 1, 2002?	
5a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Year:	
- Guided Wave Ultrasonic	
Year:	
- Handheld Ultrasonic Tool	
Year:	
- Wet Magnetic Particle Test	
Year:	
- Dry Magnetic Particle Test	
Year:	
- Other	
Year:	
Describe:	
Complete the following if Excavation Damage by Third Party is selected as the sub-cause.	
6. Did the operator get prior notification of the excavation activity?	
6a. If Yes, Notification received from *(select all that apply)*:	
- One-Call System	
- Excavator	
- Contractor	
- Landowner	
Complete the following mandatory CGA-DIRT Program questions if any Excavation Damage sub-cause is selected.	
7. Do you want PHMSA to upload the following information to CGA-DIRT (www.cga-dirt.com)?	
8. Right-of-Way where event occurred *(select all that apply)*:	
- Public	
- If Public, Specify:	
- Private	
- If Private, Specify:	
- Pipeline Property/Easement	
- Power/Transmission Line	
- Railroad	
- Dedicated Public Utility Easement	
- Federal Land	
- Data not collected	
- Unknown/Other	
9. Type of excavator :	
10. Type of excavation equipment :	
11. Type of work performed :	
12. Was the One-Call Center notified? - Yes - No	
12a. If Yes, specify ticket number:	
12b. If this is a State where more than a single One-Call Center exists, list the name of the One-Call Center notified:	
13. Type of Locator:	
14. Were facility locate marks visible in the area of excavation?	
15. Were facilities marked correctly?	
16. Did the damage cause an interruption in service?	
16a. If Yes, specify duration of the interruption: (hours)	
17. Description of the **CGA-DIRT Root Cause** (*select only the one predominant first level CGA-DIRT Root Cause and then, where available as a choice, then one predominant second level CGA-DIRT Root Cause as well*):	
- Predominant first level CGA-DIRT Root Cause:	
- If One-Call Notification Practices Not Sufficient, Specify:	
- If Locating Practices Not Sufficient, Specify:	
- If Excavation Practices Not Sufficient, Specify:	
- If Other/None of the Above, Explain:	
G4 - Other Outside Force Damage - only one **sub-cause** can be selected from the shaded left-hand column	

Other Outside Force Damage – Sub-Cause:	
- If Damage by Car, Truck, or Other Motorized Vehicle/Equipment NOT Engaged in Excavation:	
1. Vehicle/Equipment operated by:	
- If Damage by Boats, Barges, Drilling Rigs, or Other Maritime Equipment or Vessels Set Adrift or Which Have Otherwise Lost Their Mooring:	
2. Select one or more of the following IF an extreme weather event was a factor:	
- Hurricane	
- Tropical Storm	
- Tornado	
- Heavy Rains/Flood	
- Other	
- If Other, Describe:	
- If Previous Mechanical Damage NOT Related to Excavation:	
Complete Questions 3-7 ONLY IF the "Item Involved in Incident" (from PART C, Question 3) is Pipe or Weld.	
3. Has one or more internal inspection tool collected data at the point of the Incident?	
3a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage	
Most recent year run:	
- Ultrasonic	
Most recent year run:	
- Geometry	
Most recent year run:	
- Caliper	
Most recent year run:	
- Crack	
Most recent year run:	
- Hard Spot	
Most recent year run:	
- Combination Tool	
Most recent year run:	
- Transverse Field/Triaxial	
Most recent year run:	
- Other:	
Most recent year run:	
Describe:	
4. Do you have reason to believe that the internal inspection was completed BEFORE the damage was sustained?	
5. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Incident?	
- If Yes:	
Most recent year tested:	
Test pressure (psig):	
6. Has one or more Direct Assessment been conducted on the pipeline segment?	
- If Yes, and an investigative dig was conducted at the point of the Incident :	
Most recent year conducted:	
- If Yes, but the point of the Incident was not identified as a dig site:	
Most recent year conducted:	
7. Has one or more non-destructive examination been conducted at the point of the Incident since January 1, 2002?	
7a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	
- Handheld Ultrasonic Tool	
Most recent year conducted:	
- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	

Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
If - If Intentional Damage:	
8. Specify:	
- If Other, Describe:	
- If Other Outside Force Damage:	
9. Describe:	

G5 - Pipe, Weld, or Joint Failure	**Use this section to report material failures ONLY IF the "Item Involved in Incident" (from PART C, Question 3) is "Pipe" or "Weld."**
	Only one **sub-cause** can be selected from the shaded left-hand column

Pipe, Weld or Join Failure – Sub-Cause:	Construction-, Installation-, or Fabrication-related
1. The sub-case selected below is based on the following *(select all that apply)*:	
- Field Examination	
- Determined by Metallurgical Analysis	Yes
- Other Analysis	
- If "Other Analysis", Describe	
- Sub-cause is Tentative or Suspected; Still Under Investigation *(Supplemental Report required)*	
- If Construction-, Installation- or Fabrication- related:	
2. List contributing factors: *(select all that apply)*	
- If Fatigue or Vibration related:	
Specify:	
- If Other, Describe:	
- Mechanical Stress	
- Other	Yes
- If Other, Describe:	Long seam weld defect at wrinkle bend and soil heaving.
- If Original Manufacturing-related (NOT girth weld or other welds formed in the field):	
2. List contributing factors: *(select all that apply)*	
- If Fatigue or Vibration related:	
Specify:	
- If Other, Describe:	
- Mechanical Stress	
- Other	
- If Other, Describe:	
- If Environmental Cracking-related:	
3. Specify:	
- If Other, Describe:	
Complete the following if any Material Failure of Pipe or Weld sub-cause is selected.	
4. Additional Factors (*select all that apply*):	
- Dent	
- Gouge	
- Pipe Bend	
- Arc Burn	
- Crack	
- Lack of Fusion	
- Lamination	
- Buckle	
- Wrinkle	Yes
- Misalignment	
- Burnt Steel	
- Other	
- If Other, Describe:	
5. Has one or more internal inspection tool collected data at the point of the Incident?	Yes
5a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage	
Most recent year run:	
- Ultrasonic	
Most recent year run:	
- Geometry	
Most recent year run:	
- Caliper	Yes

Most recent year run:	2001
- Crack	
Most recent year run:	
- Hard Spot	
Most recent year run:	
- Combination Tool	
Most recent year run:	
- Transverse Field/Triaxial	
Most recent year run:	
- Other	
Most recent year run:	
Describe:	
6. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Incident?	Yes
- If Yes:	
Most recent year tested:	1976
Test pressure (psig):	902.00
7. Has one or more Direct Assessment been conducted on the pipeline segment?	No
- If Yes, and an investigative dig was conducted at the point of the Incident:	
Most recent year conducted:	
- If Yes, but the point of the Incident was not identified as a dig site:	
Most recent year conducted:	
8. Has one or more non-destructive examination(s) been conducted at the point of the Incident since January 1,2002?	No
8a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	
- Handheld Ultrasonic Tool	
Most recent year conducted:	
- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
G6 - Equipment Failure - only one **sub-cause** can be selected from the shaded left-hand column	
Equipment Failure – Sub-Cause:	
- If Malfunction of Control/Relief Equipment:	
1. Specify:	
- Control Valve	
- Instrumentation	
- SCADA	
- Communications	
- Block Valve	
- Check Valve	
- Relief Valve	
- Power Failure	
- Stopple/Control Fitting	
- Pressure Regulator	
- ESD System Failure	
- Other	
- If Other, Describe:	
- If Compressor or Compressor-related Equipment:	
2. Specify:	
- If Other, Describe:	
- If Threaded Connection/Coupling Failure:	
3. Specify:	
- If Other, Describe:	

- If Non-threaded Connection Failure:	
4. Specify:	
- If Other, Describe:	
- If Other Equipment Failure:	
5. Describe:	
Complete the following if any Equipment Failure sub-cause is selected.	
6. Additional factors that contributed to the equipment failure *(select all that apply)*	
- Excessive vibration	
- Overpressurization	
- No support or loss of support	
- Manufacturing defect	
- Loss of electricity	
- Improper installation	
- Mismatched items (different manufacturer for tubing and tubing fittings)	
- Dissimilar metals	
- Breakdown of soft goods due to compatibility issues with transported gas/fluid	
- Valve vault or valve can contributed to the release	
- Alarm/status failure	
- Misalignment	
- Thermal stress	
- Other	
- If Other, Describe:	
G7 – Incorrect Operation - only one **sub-cause** can be selected from the shaded left-hand column	
Incorrect Operation – Sub-Cause:	
- If Underground Gas Storage, Pressure Vessel, or Cavern Allowed or Caused to Overpressure:	
1. Specify:	
- If Other, Describe:	
- If Other Incorrect Operation:	
2. Describe:	
Complete the following if any Incorrect Operation sub-cause is selected.	
3. Was this Incident related to: *(select all that apply)*	
- Inadequate procedure	
- No procedure established	
- Failure to follow procedure	
- Other:	
- If Other, Describe:	
4. What category type was the activity that caused the Incident:	
5. Was the task(s) that led to the Incident identified as a covered task in your Operator Qualification Program?	
5a. If Yes, were the individuals performing the task(s) qualified for the task(s)?	
G8 - Other Incident Cause - only one **sub-cause** can be selected from the shaded left-hand column	
Other Incident Cause – Sub-Cause:	
- If Miscellaneous:	
1. Describe:	
- If Unknown:	
2. Specify:	

PART - H NARRATIVE DESCRIPTION OF THE INCIDENT

A metallurgical analysis of the failure was conducted. The conclusion of that analysis is that this report is self contained and no further information is required to complete this report.

File Full Name

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Appendix D Kinder Morgan Loss Causation Report, 3/10/2010

This document is on file at PHMSA

Appendix E Kinder Morgan Metallurgical Investigation Report, 4/22/2010

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