Distribution Integrity Management Plan					
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Liberty Utilities

Distribution Integrity Management Plan

Liberty Utilities Co.

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Introduction

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1.1 General (§192.1005)

Liberty Utilities developed this Integrity Management Program (IMP) to comply with the requirements of PHMSA's Distribution Integrity Management Rule, 49 CFR Part 192, Subpart P, Gas Distribution Pipeline Integrity Management (IM) (2010) (see Appendix A**)**.

This IMP is applicable to all **Liberty Utilities** Divisions that operate distribution pipelines and related facilities, with the exception of the Mid-Tex Division. These operators will collectively be referred to as "**Liberty Utilities**" or "Enterprise" throughout the remainder of the document. This IMP will be implemented in accordance with §192.1005 by August 2, 2011.

1.2 Liberty Utilities' Integrity Management (IM) Plan (§192.1005)

The **Liberty Utilities** Integrity Management Plan (IM Plan), the entirety of which is contained in this document, complies with the requirements of 49 CFR Part 192, Subpart P, §192.1005, What must a gas distribution operator (other than a master meter or small LPG operator) do to implement this subpart? **Liberty Utilities** considers this IM Plan as its written procedures for the identification, assessment, and mitigation of threats that would increase risk to the integrity of its distribution systems.

In developing this written plan, **Liberty Utilities** relied, either wholly or in part, upon the requirements contained in 49 CFR Part 192, Subpart P, Gas Distribution Pipeline Integrity Management (IM) and was specifically modeled after the seven required written IMP elements contained in §192.1007.

These seven required elements are:

1. Knowledge
2. Identify Threats
3. Evaluate and Rank Risks
4. Identify and Implement Measures to Address Risks
5. Measure Performance, Monitor Results, and Evaluate Effectiveness

6. Periodic Evaluation and Improvement
7. Report Results

1.3 Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 (PIPES Act)ope of Integrity Management Program (IMP) (§192.1007(a))

The Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 (PIPES Act) was enacted in December 2006. Section 9 of the PIPES Act mandated that the Secretary of the Department of Transportation establish minimum standards for integrity management programs for distribution pipelines. Additional authority was granted such that the Secretary may require each operator of distribution pipelines to continually identify and assess risks on its distribution systems, to remediate conditions that present potential threats to the system, and to monitor program effectiveness. A copy of the PIPES Act can be found in Appendix A.

As a result of the PIPES Act, PHMSA amended 49 CFR Part 192 by adding Subpart P – Gas Distribution Pipeline Integrity Management (IM) effective February 2, 2010. A copy of this rule can be found in Appendix A.

1.4 Scope of Integrity Management Program (IMP) (§192.1007(a))

The distribution integrity requirements of 49 CFR Part 192 Subpart P prescribe the minimum requirements for an IMP on gas distribution systems and include:

> Mains - Mains are distribution lines (pipelines other than gathering or transmission lines) that are located downstream from a source of system gas supply and that serve as a common source of supply for more than one service line. In the case of steel mains, distribution lines operate at a hoop

stress of less than 20 percent of the Specified Minimum Yield Strength (SMYS).

Service Lines - A Service Line is a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.

Related Facilities - Related Facilities are appurtenances to mains and services through which natural gas is transported, including district regulator stations, farm taps, emergency valves, service regulators, and company owned meters.

IM Regions – Liberty Energy will subdivide its distribution systems in Integrity Management Regions (IM Regions) in order to meet the requirements of its IM Plan. The IM Regions will include mains, service lines, and other related distribution facilities.

1.5 Master Meter and Liquefied Petroleum Gas (LPG) Systems (§192.1015)

Master Meter System means a pipeline system for distributing gas within, but not limited to, a definable area, such as a mobile home park, housing project, or apartment complex, where the operator purchases metered gas from an outside source for resale through a gas distribution pipeline system. The gas distribution pipeline system supplies the ultimate consumer who either purchases the gas directly through a meter or by other means, such as by rents.

LPG systems can contain propane, propylene, butane, and butylene, or mixtures composed predominantly of these gases, having a vapor pressure not exceeding 208 p.s.i. at 100º Fahrenheit.

Liberty Utilities will include in its IMP only those Master Meter and LPG systems that it owns and/or operates.

1.6 Newly Defined Terms (§192.1001)

The following are newly defined terms defined by PHMSA and referenced within 49 CFR Part 192, Subpart P, Gas Distribution Pipeline Integrity Management (IM).

Excavation Damage – Any impact that results in the need to repair or replace an underground facility due to a weakening, or the partial or complete destruction, of the facility, including, but not limited to, the protective coating, lateral support, cathodic protection, or the housing for the line device or facility.

Hazardous Leak – A leak that represents an existing or probable hazard to persons or property and requires the immediate repair or continuous action until the conditions are no longer hazardous. A **Liberty Utilities** Grade 1 leak is a Hazardous Leak.

Integrity Management Plan or IM Plan – A written explanation of the mechanisms or procedures that **Liberty Utilities** will use to implement its integrity management program and to assure compliance with 49 CFR Part 192, Subpart P, Gas Distribution Pipeline Integrity Management (IM).

Integrity Management Program or IMP – The overall approach by **Liberty Utilities** to ensure the integrity of its gas distribution systems.

Mechanical Fitting – A mechanical device used to connect sections of pipe. The term "Mechanical fitting" applies only to Stab Type fittings, Nut Follower Type fittings, Bolted Type fittings, or Other Compression Type fittings.

Small LPG Operator – An operator of a liquefied petroleum gas (LPG) distribution pipeline that serves fewer than 100 customers from a single source.

For the purposes of this IM Plan, **Liberty Utilities** has chosen to define the following terms:

> Enterprise – **Liberty Utilities** Divisions that operate distribution pipelines and related facilities, with the exception of those located within the State of Texas.
>
> Most Recent - For the purposes of this IM Plan, when **Liberty Utilities** uses the phrase "most recent" in the context of data, it is referring to the calendar year(s) in which data is readily available and has been reported to PHMSA.

1.7 Key Compliance Dates (§192.1005)

June 1, 2008	Excess Flow Valves for Single Residential Service Lines
December 4, 2009	DIMP Final Rule Issued by PHMSA
February 2, 2010	DIMP Rule Effective Date
August 2, 2011	Develop and Implement **Liberty Utilities'** IMP

1.8 Acronyms

A&A Actions – Additional and Accelerated Actions

CFR – Code of Federal Regulations

COF – Consequence of Failure

DIMPlate – Distribution Integrity Management Template

DIRT – Damage Information Reporting Tool

eAM – Enterprise Asset Management system

EFV – Excess Flow Valve

GIS – Geographical Information System

IM – Integrity Management

IMP – Integrity Management Program.

IM Plan – Integrity Management Plan (Distribution)

IM Region – Integrity Management Region

LOF – Likelihood of Failure

MAOP – Maximum Allowable Operating Pressure

O&M – Operations and Maintenance

PHMSA – Pipeline and Hazardous Materials Safety Administration

PIPES Act of 2006–Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006

PIR – Potential Impact Radius

SME – Subject Matter Expert

SMYS – Specified Minimum Yield Strength

UOC – Utility Operating Council

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Liberty Utilities DIM Plan Overview

2.1 IMP Overview
2.2 Subject Matter Expert (SME)
2.3 Roles
2.4 Historical Data
2.5 IM Region Establishment
2.6 **Liberty Utilities'** IM Plan Template (DIMPlate)

2.1 IMP Overview (§192.1005, §192.1007)

The objective of the **Liberty Utilities** Integrity Management Program (IMP) is to manage the integrity of its natural gas distribution systems. As stated by PHMSA in the preamble to the DIM Rule, a strong leak management program is essential to any IMP. **Liberty Utilities** has expanded on that concept in developing a statistical risk evaluation methodology for its distribution systems that is built on leakage history. Another key component of the risk evaluation involves the grouping of distribution facilities by common physical and operating traits, or problems for the purpose of performing risk assessments. Attention can then be focused on developing measures that address the greatest risks.

Liberty Utilities recognizes that the development of its IMP will be an iterative process. Each time a cycle (e.g., gather knowledge, identify threats, rank risks, take action to reduce risk, measure performance) is completed, areas needing additional data, analyses, or actions may become apparent. For example, the initial general knowledge of the system may be used to group facilities, identify the applicable threats, and begin the risk analysis. Facility groupings may subsequently need to be redefined, such as by subdividing groups or combining groups, in order to improve the risk analysis.

Figure 2.1.1 on the following page depicts the process that **Liberty Utilities** will use to evaluate, monitor and report on the threats that exist in our distribution systems. **Liberty Utilities** will use various data sources to determine the risks associated with our gas distribution systems. These sources will include, but are not limited to, DOT annual reports, installation and maintenance records, Damage Information Reporting Tool (DIRT) reports, and Subject Matter Expert (SME) input.

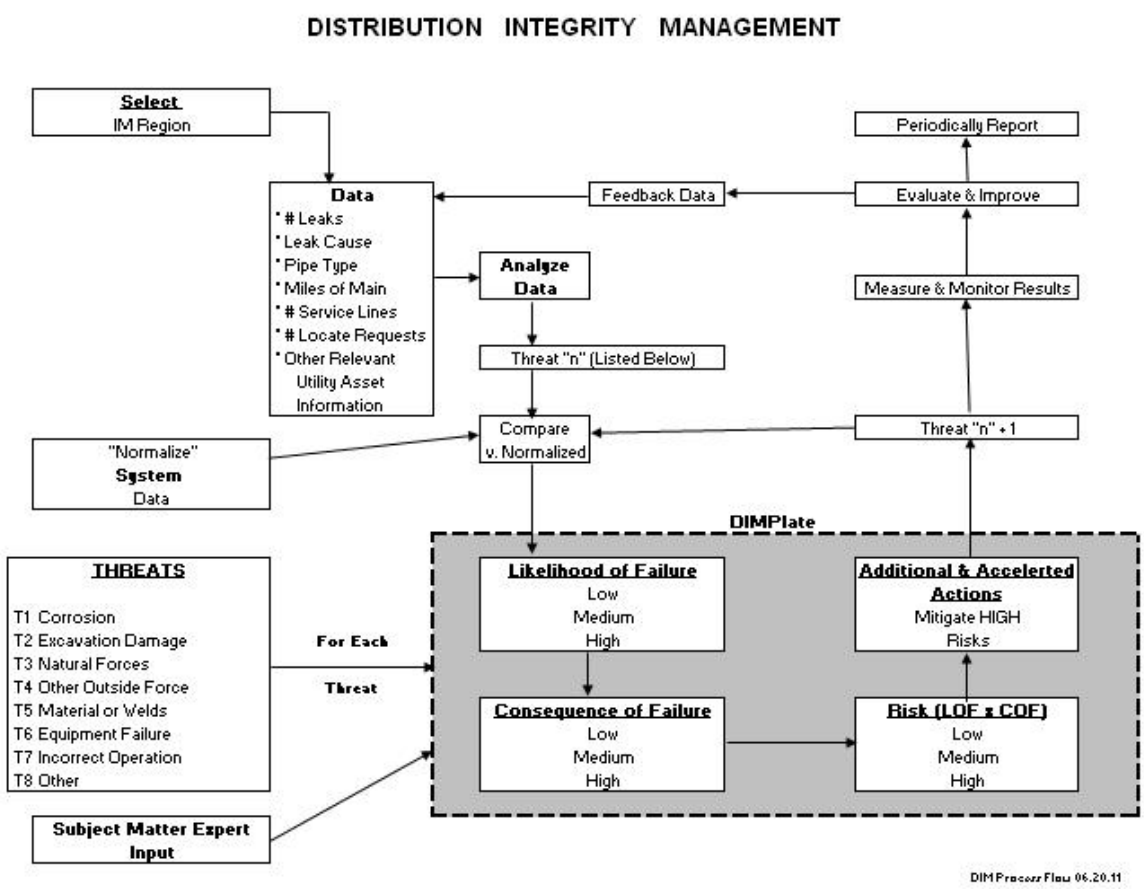

Figure 2.1.1 – Liberty Utilities' IMP Flow Diagram

2.2 Subject Matter Expert (SME) (§192.1007(a))

Liberty Utilities will use the Subject Matter Expert (SME) approach in preparing integrity management plans for individual IM Regions. A SME is any person knowledgeable about the design, construction, operations, maintenance activities, or the system characteristics of **Liberty Utilities'** distribution systems. Persons designated as SME(s) **do not** require specialized education or advanced qualifications.

2.3 Roles (§192.1007(e), (f))

The IM Team, under the direction of the Utility Operations Council's Compliance Committee, will be responsible for the oversight of **Liberty Utilities'** IMP including the periodic evaluation, review, and modification of the **Liberty Utilities** IM Plan.

Each **Liberty Utilities** Division that operates distribution systems, excluding the Mid-Tex Division, will be responsible for preparing, updating, and maintaining individual IM Region plans. Division Compliance Managers and Operations Managers will have responsibility for ensuring that the individual IM Region plans are created, updated, reviewed, modified if needed, and implemented. For regulatory audit purposes, each Division's Compliance Manager will be considered the Division's IM Administrator. Each Division's Compliance Manager and/or Operations Managers will be responsible for the implementation and review of any additional and accelerated (A&A) actions that are identified by the risk analysis.

2.4 Historical Data (§192.1007(a))

Only data that is readily available at the time individual IM Region plans are prepared or revised will be uploaded into **Liberty Utilities'** computerized risk model (DIMPlate). As a general practice, no attempt will be made to specifically search for unknown design, construction, or O&M records to augment missing data. Data gaps may vary from IM Region to IM Region due to the differences in historical O&M and construction practices and procedures as well as the differences in the data management processes of the companies that **Liberty Utilities** has acquired over the years.

Going forward and recognizing the data gaps that exist, **Liberty Utilities** will continue to build its system knowledge through an iterative process during which data becomes available and is captured through routine construction and O&M activities in the respective IM regions. When gaps are identified through the evaluation of IM Region plans, **Liberty Utilities** will utilize O&M activities, field surveys, construction activities, and other excavation opportunities to capture needed data.

2.5 IM Region Establishment (§192.1007(a), (b))

Liberty Utilities operates distribution systems over a wide geographic area from sparsely populated rural areas to high-density urban locations. Distribution systems vary in complexity from small diameter, low-pressure systems to distribution systems that have multiple operating pressures with various pipe attributes.

The diversity of distribution systems operated by **Liberty Utilities** does not allow for a single approach to establish IM regions for risk analysis purposes. In many cases, it will be appropriate for SME(s), with input from others as needed, to consider distribution systems, either singularly or grouped, as a single IM Region for risk analysis purposes. In other cases, it may be necessary to subdivide a single distribution system into multiple IM regions based on construction, materials, location, operating pressure, vintage, etc. In addition, SME(s) will consider if similar threats exist across other distribution systems.

Considerations should be applied to all eight threat categories. This also applies to the physical attributes of the distribution systems under consideration for grouping into IM regions.

2.6 Liberty Utilities' IM Plan Template (DIMPlate) (§192.1007(c))

Liberty Utilities will utilize a computer application to assess the risks associated with the eight threat categories that are discussed in greater detail in Chapter 5. This application is referred to internally as **Liberty Utilities'** IM Plan Template (DIMPlate). **Liberty Utilities'** DIMPlate is auto-populated with facilities and leak data from internal databases within **Liberty Utilities** and excavation damage data from external databases. The DIMPlate calculates and prioritizes risk scores. Data and score validation are performed by SME(s) within the framework of the DIMPlate. A&A actions chosen to mitigate risk by the SME(s) are also documented within the DIMPlate. Appendix B contains a detailed overview of the DIMPlate that provides screenshots and commentary of the assessment process.

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System Knowledge

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3.3 IM Region Data
3.4 Environmental Factors
3.5 O&M Data
3.6 Corrosion Data
3.7 Excavation Data
3.8 Data Collected on Piping Systems Installed after August 1, 2011

3.1 General (§192.1007(a))

Liberty Utilities will gather information about the company's infrastructure from existing records of design, construction, and O&M activities along with SME(s) input. **Liberty Utilities** will not expose buried facilities for the sole purpose of obtaining additional data, but will rather continue to collect data in the future in conjunction with normal construction and O&M activities. Descriptions of data that could be used to gain system knowledge are contained in the remaining portions of this chapter.

The available data will be used to evaluate threats and risks and to determine any mitigating actions to minimize risk.

3.2 PHMSA 7100.1-1 Annual Report Information (§192.1007(a))

Basic knowledge and understanding of **Liberty Utilities'** distribution systems can be found by reviewing data filed annually on the PHMSA Form 7100.1-1, Annual Report for Gas Distribution Systems. **Liberty Utilities** files a separate Form 7100.1-1 for each state in which distribution systems are operated. A copy of Form 7100.1-1 is included in Appendix A.

3.3 IM Region Data (§192.1007(a))

The following IM Region data, as available, shall be gathered, documented, and updated on the **Liberty Utilities** DIMPlate. The SME(s) completing the IM Plan will review the gathered data listed on the DIMPlate. A more detailed listing of the data being collected and reviewed, including descriptions, DIMPlate cross-references, data sources, and potential responses, is included in Appendix D

- Miles of Main by Material
- Miles of Main by Diameter
- Number of Service Lines
- MAOP
- Pressure Reducing Stations
- Critical Valves
- Distribution Patrol Zones
- Odorant Test Points
- CP Zones
- CP Test Points
- Corrosion Control System
- Isolated Steel Sections (< 100’)
- Atmospheric Corrosion Survey Results
- Business District Surveys

A key component in establishing system knowledge for an IM Region is to understand if the system components, such as regulators, relief valves, and valves in district regulator stations, town border stations, city gate stations, purchase stations, and critical valve assemblies are commonly used in the natural gas industry for those applications. If it is determined a system contains non-standard industry components, further explanation will be required from the SME(s).

3.4 Environmental Factors (§192.1007(a))

The following Environmental Factors shall be considered and documented on the Liberty Utilities DIMPlate. The SME(s) completing the IM Plan should respond "YES" or "NO" to the likelihood of each environmental factor affecting the integrity of the IM Region under consideration. A more detailed listing of the data being collected, including a description, DIMPlate cross-reference, data source, and potential responses, is included in Appendix D.

- Wash Out
- Earthquake Fault Zone
- Landslide / Subsidence
- Freeze / Thaw Cycles
- Snow Loading
- Overbuilds

3.5 O&M Data (§192.1007(a))

The following O&M data for an IM Region spanning a period of five years shall be compiled and documented on the DIMPlate. A more detailed listing of the data being collected, including a description, DIMPlate cross-reference, data source, and potential responses, is included in Appendix D.

- Leak History – Number of Repaired Leaks on Mains
- Leak History – Number of Repaired Leaks on Service Lines
- Leak History – Number of Open Leaks on Mains and Services

3.6 Corrosion Data (§192.1007(a))

In order to gain IM Region knowledge regarding corrosion, the nature and the extent of the following corrosion types will be determined based on SME knowledge. A more detailed listing of the data being collected, including a description, DIMPlate cross-reference, source, and potential responses, is included in Appendix D.

- External Corrosion – Bare Steel
- External Corrosion – Coated Steel
- Graphitization – Cast Iron
- Internal Corrosion
- Atmospheric Corrosion

3.7 Excavation Data (§192.1007(a))

In order to gain IM Region knowledge regarding excavation activity levels for the following need to be determined based on SME knowledge of each activity. A more detailed listing of the data being collected, including a description, DIMPlate cross-reference, source, and potential responses, is included in Appendix D. The historical data of line locate requests and excavation damages will be for a period of three years.

- Number of Line Locate Requests
- Number of Excavation Damages
- Imminent Construction Activity

3.8 Data Collected on Piping Systems Installed after August 1, 2011 (§192.1007(a))

The location and materials of construction for facilities installed beginning August 2, 2011 will be captured and recorded as follows:

Mains – Location, material, and other pertinent attributes will be recorded in each Division's GIS system, with additional information maintained in various project files and retained for the life of the facility.

Service Lines - Location, material, and other pertinent attributes will be recorded in each Division's current service line system of record, either electronically in GIS, on paper service line installation documentation or in both, and retained for the life of the facility.

Appurtenances – The location of town border stations, district regulator stations, and flow control valves will be recorded in each Division's GIS system. Details of the material of construction with additional information will be maintained in various project files and retained for the life of the facility.

All relevant information on excavation damages to **Liberty Utilities'** distribution facilities will be captured and stored within internal databases.

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Risk

4.1 General
4.2 Risk Methodology
4.3 Risk Determination
4.4 Likelihood of Failure (LOF)
4.5 Consequence of Failure (COF)
4.6 COF Calculation
4.7 Risk Score Validation

4.1 General (§192.1007(c))

Risk analysis, as it applies to IM, is the process of understanding the potential threats to natural gas distribution facilities within an IM Region and the associated consequences. The primary objectives of the evaluation and ranking of IM Region risks are:

- Consideration of both current and potential threats.
- Consideration of the likelihood of failure associated with each threat for each IM Region.
- Consideration of the consequence of a failure for each IM Region.
- Ranking of the risks relative to the IM Region.

4.2 Risk Methodology (§192.1007(c))

Liberty Utilities will characterize the risk that each of the eight threats pose to an IM Region as LOW, MEDIUM, or HIGH. The resulting risk determination will assist in establishing the need for the implementation of Additional and Accelerated Actions (A&A Actions) that would mitigate the level of risk. A detailed list of potential A&A Actions are documented in Appendix E.

The numerical expression of risk is the product of the likelihood of a threat occurring and the consequence from a threat occurring, or

Risk Score = Likelihood of Failure (LOF) x Consequence of Failure (COF)

- The likelihood of a failure (LOF) occurring is classified as LOW, MEDIUM, or HIGH and is threat specific. LOF Values are 1, 2, or 3 and correspond to the LOF Classification as shown below in Table 4.2.1.

LOF Classification	LOF Value
Low	**1**
Medium	**2**
High	**3**

Table 4.2.1 – LOF Classifications and Values

- The consequence of a failure (COF) occurring is a summation of the factors that would potentially impact the area should a failure occur. COF is IM Region specific and the scores range from 4-20. A detailed explanation of the factors, methodology, and calculations used in determining a COF score are found in Sections 4.5 and 4.6.

4.3 Risk Determination (§192.1007(c))

Liberty Utilities operates its natural gas distribution systems in accordance with applicable Federal and State regulations. Details of existing **Liberty Utilities** programs which meet or exceed the minimum requirements of Federal and State pipeline regulations and also provide the foundation for minimizing risk across its natural gas distribution systems are documented in Chapter 6. The **Liberty Utilities** DIMPlate for each individual IM Region will auto-populate with the calculated numerical score associated with the risk from each threat. Scores will range from 4.00 to 60.00. In accordance with this IM Plan, the risk calculations relative to each of the eight threats will be analyzed and validated by the SME(s) for the applicable IM regions.

Classification of the risk scores as LOW, MEDIUM, or HIGH will be made by performing a statistical analysis on all of the risk scores in each of the eight threat categories from every IM region within **Liberty Utilities**. As shown in Table 4.3.1 below, the risk ranking classifications are made by comparing the IM region risk score by threat category to the Enterprise statistical mean of the risk scores associated with that particular threat category. Based on the results of this analysis, **Liberty Utilities** will implement additional mitigating actions in those IM regions possessing HIGH risk(s).

Risk Classification	Statistical Measure
Low	**If the risk score for a threat in an IM Region is below the mean of the enterprise statistical analysis for the risks scores of that threat category, then the risk will be considered "Low"**

Medium	**If the risk score for a threat in an IM Region is between the mean of the enterprise statistical analysis and two standard deviations above the mean for that threat, the risk will be considered "Medium"**
High	**If the risk score for a threat in an IM Region is greater than the mean plus two standard deviations of the enterprise statistical analysis for that threat, the risk will be considered "High"**

Table 4.3.1 – Risk Ranking Classification

4.4 Likelihood of Failure (LOF) (§192.1007(c))

Likelihood of Failure (LOF) is an indicator of the potential of a particular threat occurring (see Section 5.2) in an IM Region. LOF classifications, as used by **Liberty Utilities**, are LOW, MEDIUM, or HIGH. In a general sense, the LOF classification is a comparative measure of the individual IM Region's normalized leak rate by cause to the applicable enterprise baseline leak rate for that particular threat category. Depending on the variation between the two figures, as gauged by standard deviation, an initial determination of LOF is made. The SME(s) validates the initial LOF classification using their knowledge of the system. The SME(s) will examine leak data from internal databases to determine leakage patterns, if any, in an IM Region.

Based on the SME(s)'s assessment, the initial LOF classification of the IM Region can increase, decrease, or remain as originally calculated. Documentation will be maintained in the IM Region's IM Plan for any changes in the initial LOF classification.

Liberty Utilities will utilize leak, facilities, and excavation information from databases such as eAM, GIS, DIRT, etc., to calculate the enterprise-wide baseline figures for the normalized leak rates by threat category for both mains and services. Chapter 5 of this Plan provides more detailed guidance on the LOF classification for each of the eight threats.

4.5 Consequence of Failure (COF) (§192.1007(c))

The calculation of the Consequence of Failure (COF) value will consider the following four variables from any applicable IM Region that is evaluated – maximum allowable operating pressure (MAOP), pipe diameter, population density, and a gas migration coefficient based on the ratio of the commercial business district footage within a system to the overall system pipe footage.

Underlying Assumptions:

1. Population density data is taken from the U. S. Census Bureau – Report GCT-PH1 – Population, Housing Units, Area, and Density: 2000. Except for a few large urban areas such as Jackson, Mississippi, **Liberty Utilities'** service area can generally be classified as rural communities. The population density figures from the U.S. Census Bureau's data are indicative of county-wide measures. A copy of the U.S. Census data is located in Appendix F.

2. The potential impact radius (PIR) formula found in Section 3.2 of ASME B31.8S (2004) is utilized to establish the greatest extent of damage from a rupture. Under **Liberty Utilities'** methodology, SME(s) will enter data (MAOP and pipe diameter) into the DIMPlate that will be used to calculate the IM region's actual worst-case PIR. A chart showing sample PIR calculations is located in Appendix G.

3. As **Liberty Utilities** annually reports by state on the PHMSA 7100.1-1 annual report, the range of average lengths of a service line by state is 60 – 80 feet. Appendix G contains the calculated PIR for distribution mains ranging in diameter from 2" to 20" and operating at pressures ranging from 20 to 500 psig. The calculated potential impact distances resulting from a failure on most of **Liberty Utilities** distribution mains are substantially less than the length of the average service line.

4. The gas migration factor is calculated by taking the percentage of the footage of distribution piping within its commercial business district(s) to the overall footage of piping in the IM Region. By utilizing this approach, the impact of the gas migration threat is recognized for those IM Regions possessing significant amounts of concrete and asphalt in addition to other subsurface utility infrastructures, such as storm drains, sewers, and electrical conduits that allow migration to more readily occur.

5. The COF value will not be reduced based on a favorable leak history for any IM Region. In doing so, the results of the risk analysis for all IM Regions will be conservative.

4.6 COF Calculation (§192.1007(c))

The following steps are required to calculate the COF value for any IM Region. Appendix H contains a step by step example of the COF calculation for an IM Region.

$$\text{COF Score} = \text{PIR}_{factor} + \text{Population Density}_{factor} + \text{Gas Migration}_{factor} + \text{SME Review}_{factor}$$

1. Calculate the PIR(s) for each pipe diameter and corresponding MAOP by using the physical data collected on the DIMPlate for the IM Region. Utilize the largest PIR to interpolate the PIR_{factor} from the appropriate table below. Table 4.6.1.a contains PIR values for Mains and Table 4.6.1.b contains PIR values for Service Lines. The PIR ranges are different due to service lines closer proximity to structures.

PIR (ft.)	PIR_{factor}
PIR ≤ 20	1
20 < PIR ≤ 40	2
40 < PIR ≤ 60	3
60 < PIR ≤ 80	4
80 < PIR	5

Table 4.6.1.a – Main PIR_{factor}

PIR (ft.)	PIR_{factor}
PIR ≤ 10	1
10 < PIR ≤ 20	2
20 < PIR ≤ 30	3
30 < PIR ≤ 40	4
40 < PIR	5

Table 4.6.1.b – Service Line PIR_{factor}

2. From the U.S. Census Bureau data found in Appendix F, determine the population density of the County/Parish in which the IM Region is located. The actual Population $Density_{factor}$ would be a value interpolated from this scale.

Population Density (PD) (Number of People / square miles of land)	Population $Density_{factor}$
PD ≤ 50	1
50 < PD ≤ 100	2
100 < PD ≤ 150	3
150 < PD ≤ 200	4
200 < PD	5

Table 4.6.2 - Population $Density_{factor}$

3. Calculate the Gas $Migration_{factor}$ from Table 4.6.3 below for the IM Region under review. The Gas $Migration_{factor}$ is discussed in more detail in Section 4.5.

Business District Percentage (BD) (% System Mains in Business Districts)	Gas $Migration_{factor}$

BD ≤ 4%	1
4% < BD ≤ 8%	2
8% < BD ≤ 12%	3
12% < BD ≤ 16%	4
16% < BD	5

Table 4.6.3 - Gas Migration$_{factor}$

4. The SME(s) will determine if other factors in the IM Region would influence the COF. The SME Review$_{factor}$ has a scale of 1 to 5. The default SME Review$_{factor}$ is 3. The SME(s) will need to document any factors that would result in changing the default SME Review$_{factor}$.

The calculated COF score can range from 4 to 20 and is used along with the LOF score to determine the IM Region's risk score as discussed earlier in Section 4.2 – "Risk Methodology".

4.7 Risk Score Validation (§192.1007)

The calculated risk score for each IM Region will be reviewed and validated by the appropriate SME(s). This step is necessary to ensure the calculated scores correspond to the actual operating conditions of the facilities being evaluated. If the SME(s) does not believe the calculated risk score accurately reflects the actual conditions within the IM Region, then further studies will be performed to reconcile the differences and ensure the integrity of the IM Region. If during the validation process a calculated risk score is changed based on SME review, documentation shall be maintained describing the rationale for arriving at the revised risk score.

Distribution Integrity Management Plan					
Section:	Chapter 5				
Subject:	Threats				
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Threats

5.1 General
5.2 Threats to be Addressed
5.3 Corrosion
5.4 Excavation Damage
5.5 Natural Forces
5.6 Other Outside Forces
5.7 Material or Welds
5.8 Equipment Failure
5.9 Incorrect Operations
5.10 Other

5.1 General (§192.1007)

The identification of existing and potential threats is the foundation of risk assessment within **Liberty Utilities'** IM Plan. The eight categories of threats to IM regions are described in Section 5.2, "Threats to be Addressed". For the purpose of assessing the risk posed by a particular threat category, **Liberty Utilities'** selection of its risk methodology is based on the pipe types, mileage of mains, and leak history found in the IM Region. The threat assessment of services will mirror that of the method selected for the mains of the IM region. Open leaks for all IM Regions will be incorporated into the statistical/SME analyses in the manner as discussed in Appendix C.3. A general discussion of the methodologies follows in the paragraphs below.

IM regions within **Liberty Utilities'** piping infrastructure possessing more than 100 miles of main and having leakage rates that are greater than two standard deviations above the Enterprise statistical mean for either mains or services, will undergo further review for the applicable threat(s) by SME(s). This additional review will be completed to validate the threat level for those IM regions.

Liberty Utilities will not use the above methodology for those IM regions that have distribution mains totaling 100 miles or less due to the potential of overstating the severity of the threat. The process of normalizing the number of leaks could distort the validity of the leak data when the total main mileage is less than the standard (100 miles) used to establish the normalization rate. Instead a baseline figure for these IM regions will be established by calculating the most recent five-year average of leaks for both mains and services. The number and types of leaks for both mains and services for the most recent year will then be evaluated by SME(s) familiar with the IM Region to determine if the LOF for this threat occurring within the IM Region is increasing in comparison to the norm established by the five-year average. Based on their evaluation, the SME(s) will assign a LOF value for use in the risk calculation.

Liberty Utilities will use the Common Ground Alliance's standard of excavation damages per 1,000 locate requests along with SME(s) input to assess the LOF of this threat in its various IM regions. The assessment of this threat is discussed in greater detail in Section 5.4 of this chapter.

For the numerical calculation of Risk as discussed in Chapter 4, LOF Classifications are assigned LOF Values of 1, 2, or 3 as shown below in Table 5.1.1.

LOF Classification	LOF Value
Low	1
Medium	2
High	3

Table 5.1.1 – Risk Ranking Classifications and Values

5.2 Threats to be Addressed (§192.1007(b))

In **Liberty Utilities'** IM Plan, leakage rates from eight threat categories are evaluated to determine the risk level within its various IM regions. These leak causes are defined below in Table 5.2.1. **Liberty Utilities** has utilized these leak causes as the foundation for its IM Plan.

Threat	Description
Corrosion	An indication that a leak or incident might occur in metallic pipe or other metallic components caused by galvanic, bacterial, chemical, stray current, or other corrosive actions resulting in external, internal or atmospheric corrosion.
Excavation Damage	An indication that a leak or incident might occur from damage caused by earth moving or other equipment and tools, including damage caused by company personnel, company contractors, or others (third parties) not affiliated with the company.
Natural Force Damage	An indication that a leak or incident might occur from earth movements, earthquakes, landslides, subsidence, lightning, heavy rain, floods, washouts, flotation, mudslides, scouring, temperature, frost heave, frozen components, high winds, or similar natural causes.
Other Outside Force Damage	An indication that a leak or incident might occur from vehicle damage, fire or explosion, vandalism, sabotage, or terrorism.
Material or Welds	An indication that a leak or incident might occur from failure of original sound material from force applied during construction that caused a

	dent, gouge, excessive strain, or other material defect caused by faulty manufacture.
Equipment Failure	An indication that a leak or incident might occur from the malfunction of control/relief equipment including valves, regulators, or other instrumentation; stripped threads or broken pipe couplings on nipples, valves or mechanical couplings; or seal failures on gaskets or O-rings.
Incorrect Operation	An indication that a leak or incident might occur from inadequate procedures or safety practices, failure to follow correct procedures, inadequate training / qualification, or other operator error.
Other	An indication that a leak or incident might occur from causes not attributable to one of the above threats.

Table 5.2.1 – Threats to be Addressed

5.3 Corrosion (§192.1007(b))

A "Corrosion" threat is an indication that a leak might occur in metallic pipe or other metallic components caused by galvanic, bacterial, chemical, stray current, or other corrosive actions resulting in external, internal or atmospheric corrosion. **Liberty Utilities** views "Corrosion" as a primary threat to the integrity of its metallic facilities.

In order to assess this threat for IM regions that have 100 miles or more of metallic main, **Liberty Utilities** will determine the LOF of a specified IM Region by comparing its average annual corrosion leakage rate for metallic mains and services within that IM Region for the most recent five-year cycle to the Enterprise-wide baseline figures for corrosion leakage. As shown in Appendix B, **Liberty Utilities** will utilize leakage data to calculate the following: 1) the normalized rate of corrosion leaks per 100 miles of metallic main for the previous five years, and 2) the normalized rate of corrosion leaks per 1,000 metallic services for the previous five years. These leakage rates are then statistically analyzed by calculating the statistical mean along with the corresponding standard deviation. The statistical mean represents the Enterprise baseline value that will be utilized in the future evaluation of corrosion prevention efforts at the IM Region level. Guidelines to classify the LOF for the threat of "Corrosion" are provided below in Table 5.3.1.

$LOF_{Corrosion}$	Statistical Measure
Low	Rate of "Corrosion" leaks per 100 miles of metallic main or per 1,000 metallic services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Corrosion" leak metrics.
Medium	Rate of "Corrosion" leaks per 100 miles of metallic main or per 1,000 metallic services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Corrosion" leak metrics.
High	Rate of "Corrosion" leaks per 100 miles of metallic main or per 1,000 metallic services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Corrosion" leak metrics.

Table 5.3.1 – LOF Classification for "Corrosion" Threat

Liberty Utilities will not use the above methodology for those IM regions that have metallic distribution mains totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of the threat from "Corrosion". The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Corrosion" will distort the validity of the leak data when total metallic pipe mileage or number of metallic services is less than the standard (100 miles/1,000 services) used to establish the normalization rate. A baseline figure for these IM regions will be established by calculating the annual average of corrosion leaks for both mains and services for the most recent five years. The number of annual corrosion leaks for both mains and services for the latest year will then be evaluated by SME(s) familiar with the IM Region to determine if the threat of "Corrosion" is increasing within the IM Region in comparison to the norm established by the five-year average.

5.4 Excavation Damage (§192.1007(b))

An "Excavation Damage" threat is an indication that a failure might occur from damage caused by earth moving or other equipment and tools including damage caused by third parties, company contractors, or company personnel. **Liberty Utilities** views "Excavation Damage" as one of its primary threats. In the analysis to determine the LOF associated

with this threat at the IM Region level, **Liberty Utilities** will consider mains and services together as a cumulative grouping.

Liberty Utilities will use damage incidents per 1,000 locate tickets to evaluate the LOF associated with the "Excavation Damage" threat. This normalized rate of damage incidents is widely used across the United States as an indicator of the effectiveness of existing damage prevention programs. Depending on the physical size of the IM Region being evaluated, two methodologies are available for the LOF assessment from the threat of "Excavation Damage".

Data from the applicable One-Call and Damage Prevention databases will supply the required historical data to calculate the normalized rate of damage incidents per 1,000 locate tickets for the previous three years for each state. These state rates are then statistically analyzed by calculating the statistical mean along with its corresponding standard deviation. The statistical mean represents the Enterprise baseline value that will be utilized as a benchmark for the evaluation of the "Excavation Damage" threat. The threat evaluation at the IM Region level consists of comparing the average annual number of damage incidents per 1,000 locate tickets for the IM Region from the most recent three year period to the Enterprise baseline value.

In order to properly assess the LOF of this threat at the IM Region level, SME(s) must evaluate the "raw" historical IM Region value relative to the potential for eminent future excavation damages. The criteria considered by SME(s) include, but is not limited to, the following factors: anticipated economic activity, future infrastructure projects, strength of local/state One-Call laws, and the ability to effectively locate natural gas facilities. This adjustment of the "raw" score is performed on the **Liberty Utilities** DIMPlate. Guidelines to classify the LOF for the threat of "Excavation Damage" are provided below in Table 5.4.1.

The value for the LOF for excavation damage at the IM Region level is expressed by the following formula:

Excavation Score (ES) = Damage Rate (per 1,000 Locate Tickets)

$LOF_{Excavation}$	Excavation Score (ES)
Low	0 < ES < 3
Medium	3 < ES < 6
High	> 6

Table 5.4.1 – LOF Classification for "Excavation Damage" Threat

The LOF for excavation threats will be classified in accordance with Table 5.4.1. The numerical Excavation Score (ES) will be classified either as LOW, MEDIUM, or HIGH.

Liberty Utilities will not use the above methodology for those IM regions that have excavation activity of less than 1,000 locates per year due to the potential of overstating the severity of the threat from "Excavation Damage". The process of normalizing the number of "Excavation Damage" leaks per 1,000 locate tickets will distort the validity of the leak data where excavation activity is less than the standard (1,000 tickets per year) used to establish the normalization rate. A baseline figure for these IM regions will be established by calculating the annual average of excavation damage leaks for both mains and services for the most recent three years. The number of annual excavation damage leaks for both mains and services for the latest year will then be evaluated by SME(s) familiar with the IM Region to determine if the LOF from the threat of "Excavation Damage" is increasing in comparison to the norm established by the three-year average. SME(s) will evaluate the historical IM Region excavation damage leakage rate relative to the potential for future excavation damages. The criteria considered by SME(s) include, but is not limited to, the following factors: anticipated economic activity, future infrastructure projects, strength of local/state One-Call laws, and the ability to effectively locate natural gas facilities.

5.5 Natural Forces (§192.1007(b))

A "Natural Forces" threat is an indication that a leak might occur from earth movements, earthquakes, landslides, subsidence, lightning, heavy rain, floods, washouts, floatation, mudslides, scouring, temperature, frost heave, frozen components, high winds, or similar natural causes. **Liberty Utilities** considers "Natural Forces" to be a minor threat when evaluated globally across its distribution network. When evaluating "Natural Forces" threat, Environmental Factors listed in Appendix D should be considered.

In order to evaluate this threat, the number of leaks attributable to "Natural Forces" for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix C. Likewise, the average annual number of leaks attributable to "Natural Forces" at the IM Region level for the previous five years will be calculated, normalized, and then compared to the Enterprise's statistical mean figures for both mains and services. The applicable SME(s) will validate the threat level for those IM regions that have a five-year average greater than two standard deviations above the Enterprise statistical means for both mains and services to determine whether a higher than normal level of natural forces activity exists within the IM Region. Guidelines to classify the LOF for this threat are provided below in Table 5.5.1.

$LOF_{\text{Natural Forces}}$	Statistical Measure
Low	Rate of "Natural Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Natural Forces" leak metrics.
Medium	Rate of "Natural Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Natural Forces" leak metrics.
High	Rate of "Natural Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Natural Forces" leak metrics.

Table 5.5.1 – LOF Classification for "Natural Forces" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due

to the potential of overstating the severity of the threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Natural Forces" will distort the validity of the leak data when total pipe mileage or number of services is less than the standard (100 miles/1,000 services) used to establish the normalization rate. Instead a baseline figure for these IM regions will be established by calculating the five-year average of "Natural Forces" leaks for both mains and services. The number of "Natural Forces" leaks for both mains and services for the most recent calendar year will then be evaluated by SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

5.6 Other Outside Forces (§192.1007(b))

An "Other Outside Forces" threat is an indication that a leak might occur from vehicle damage, fire or explosion, vandalism, or sabotage and/or terrorism. **Liberty Utilities** considers "Other Outside Forces" to be a minor threat when evaluated globally across its distribution network. The threats posed by terrorism and sabotage are addressed through the **Liberty Utilities** Corporation Security Plan.

Depending on the physical size of the IM Region being evaluated, two methodologies discussed in the following paragraphs below are available for the evaluation of the LOF from the threat of "Other Outside Forces".

In order to evaluate this threat, the number of leaks attributable to "Other Outside Forces" for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix B. Likewise, the average annual number of leaks attributable to "Other Outside Forces" at the IM Region level for the previous five years will be calculated, normalized, and then compared to the Enterprise's statistical mean for both mains and services. The applicable SME(s) will validate the threat level for those IM regions that are greater than two standard deviations above the Enterprise statistical mean to determine whether a higher than normal level of "Other Outside Forces" activity exists. Guidelines to classify the LOF for this threat are provided below in Table 5.6.1.

$LOF_{Other\ Outside\ Forces}$	Statistical Measure
Low	Rate of "Other Outside Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Other Outside Forces" leak metrics.
Medium	Rate of "Other Outside Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Other Outside Forces" leak metrics.
High	Rate of "Other Outside Forces" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Other Outside Forces" leak metrics.

Table 5.6.1 – LOF Classification for "Other Outside Forces" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of the threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services attributable to "Other Outside Forces" will distort the validity of the leak data when total pipe mileage or number of services is less than the standard (100 miles/1,000 services) used to establish the normalized rate. Instead a baseline figure for these IM regions will be established by calculating the five-year average of "Other Outside Forces" leaks for both mains and services. The number and type of "Other Outside Forces" leaks for both mains and services for the most recent calendar year will then be evaluated by SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

5.7 Material or Welds (§192.1007(b))

A "Material or Welds" threat is an indication that a leak might occur from failure of original sound material from force applied during construction that caused a dent, gouge, excessive strain, or other material defect caused by faulty manufacture or a faulty weld. Depending on the physical size of the IM Region being evaluated two methodologies

discussed in the following paragraphs below are available for the evaluation of the LOF from the threat of "Material or Welds".

In order to evaluate the threat of "Material or Welds", the number of leaks attributable to this threat for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix B. Likewise, the annual number of leaks attributable to "Material or Welds" at the IM Region level for mains and services for the previous five years will be calculated, normalized, and then compared to the Enterprise's statistical mean figures. The applicable SME(s) will validate the threat level for those IM regions that are greater than two standard deviations above the Enterprise statistical mean figures for both mains and services to determine whether a higher than normal level of material or weld failure activity exists. Guidelines to classify the LOF for this threat are provided below in Table 5.7.1.

$LOF_{Material\ or\ Welds}$	Statistical Measure
Low	Rate of "Material or Welds" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Material or Welds" leak metrics.
Medium	Rate of "Material or Welds" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Material or Welds" leak metrics.
High	Rate of "Material or Welds" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Material or Welds" leak metrics.

Table 5.7.1 – LOF Classification for "Material or Welds" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of the threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Material or Welds" will distort the validity of the leakage data when total pipe mileage or number of services is less than the standard (100 miles/1,000 services) used to establish the normalized rate. Instead a baseline figure for these IM regions will be

established by calculating their five-year average of "Material or Welds" leaks for both mains and services. The number and type of "Material or Welds" leaks for both mains and services for the most recent calendar year will then be evaluated by SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

5.8 Equipment Failure (§192.1007(b))

An "Equipment Failure" threat is an indication that a leak might occur from the malfunction of control/relief equipment including valves, regulators or other instrumentation; stripped threads or broken pipe couplings on nipples, valves, or mechanical couplings; or seal failures on gaskets or O-rings.

Depending on the physical size of the IM Region being evaluated, two methodologies are discussed in the following paragraphs below to evaluate the LOF from the threat of "Equipment Failure".

In order to assess the threat of "Equipment Failure" in IM regions possessing more than 100 miles of distribution mains, the number of leaks attributable to this threat for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix B. Likewise, the average annual number of leaks attributable to "Equipment Failure" at the IM Region level for mains and services will be calculated and normalized for the previous five years and then compared to the Enterprise's statistical mean. The applicable SME(s) will validate the threat level for those IM regions that are greater than two standard deviations above the Enterprise's statistical mean for both mains and services to determine whether a higher than normal level of "Equipment Failure" activity exists. Guidelines to classify the LOF for this threat are provided below in the Table 5.8.1.

$LOF_{Equipment\ Failure}$	Statistical Measure
Low	Rate of "Equipment Failure" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Equipment Failure" leak metrics.
Medium	Rate of "Equipment Failure" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Equipment Failure" leak metrics.
High	Rate of "Equipment Failure" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Equipment Failure" leak metrics.

Table 5.8.1 – LOF Classification for "Equipment Failure" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of this threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Equipment Failure" will distort the validity of the leak data when total pipe mileage or number of services is less than the standard (100 miles/1,000 services) used to establish the normalization rate. Instead a baseline figure for these IM regions will be established by calculating their five-year average of "Equipment Failure" leaks for both mains and services. The number and type of "Equipment Failure" leaks for both mains and services for the most recent calendar year will then be evaluated by an SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

5.9 Incorrect Operations (§192.1007(b))

An "Incorrect Operations" threat is an indication that a failure might occur from incorrect procedures or safety practices, failure to follow correct procedures, inadequate training/qualification, or other operator error.

Depending on the physical size of the IM Region being evaluated, two methodologies discussed in the following paragraphs below are available for evaluating the LOF from the threat of "Incorrect Operations".

In order to assess the threat of "Incorrect Operations" in IM regions possessing more than 100 miles of distribution mains, the number of leaks attributable to this threat for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix C. Likewise, the annual number of leaks attributable to "Incorrect Operations" at the IM Region level for mains and services for the previous five years will be calculated and then compared to the Enterprise's statistical mean. The applicable SME(s) will validate the threat level for those IM regions that are greater than two standard deviations above the Enterprise statistical mean for both mains and services to determine whether a higher than normal level of "Incorrect Operations" activity exists. Guidelines to classify the LOF for this threat are provided below in Table 5.9.1.

$LOF_{\text{Incorrect Operations}}$	Statistical Measure
Low	Rate of "Incorrect Operations" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Incorrect Operations" leak metrics.
Medium	Rate of "Incorrect Operations" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Incorrect Operations" leak metrics.
High	Rate of "Incorrect Operations" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Incorrect Operations" leak metrics.

Table 5.9.1 – LOF Classification for "Incorrect Operations" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of this threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Incorrect Operations" will distort the validity of the leak data when total pipe mileage or number of services is less than the standard (100 miles/1,000) used to establish the normalization rate. Instead a baseline figure for these IM regions will be established by calculating the five-year average of "Incorrect Operations" leaks for both mains and services. The number of "Incorrect Operations" leaks for both mains and services for the most recent calendar year will then be evaluated by an SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

5.10 Other (§192.1007(b))

An "Other" threat is an indication that a leak, failure, or incident might occur from causes not attributable to one of the above threats. Depending on the physical size of the IM Region being evaluated, two methodologies discussed in the following paragraphs below are available for performing the LOF evaluation from the threat of "Other".

In order to assess the threat of "Other" in IM regions possessing more than 100 miles of distribution mains, the number of leaks for the previous five years will be normalized per 100 miles of main and per 1,000 services for statistical analysis as shown in Appendix C. Likewise, the annual number of leaks attributable to "Other" at the IM Region level for mains and services will be calculated and normalized for the most recent five years and then compared to the Enterprise's statistical mean. The applicable SME(s) will validate the threat level for those IM regions that are greater than two standard deviations above the Enterprise statistical mean for both mains and services for the most recent five years to determine whether a higher than normal level of "Other" activity exists. Guidelines to classify the LOF for this threat are provided below in the Table 5.10.1.

LOF_{Other}	Statistical Measure
Low	Rate of "Other" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or below the statistical mean for **Liberty Utilities'** "Other" leak metrics.
Medium	Rate of "Other" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is between the statistical mean and two standard deviations above the statistical mean for **Liberty Utilities'** "Other" leak metrics.
High	Rate of "Other" leaks per 100 miles of main or per 1,000 services for the IM Region being reviewed that is equal to or greater than two standard deviations above the statistical mean for **Liberty Utilities'** "Other" leak metrics.

Table 5.10.1 – LOF Classification for "Other" Threat

Liberty Utilities will not use the above methodology for those IM regions that have distribution main totaling less than 100 miles or containing less than 1,000 services due to the potential of overstating the severity of this threat. The process of normalizing the number of leaks per 100 miles of main or per 1,000 services that are attributable to "Other" will distort the validity of the leak data when total pipe mileage or number of services is less than the standard (100 miles/1,000 services) used to establish the normalization rate. Instead a baseline figure for these IM regions will be established by calculating the five-year average of "Other" leaks for both mains and services. The number and type of "Other" leaks for both mains and services for the most recent calendar year will then be evaluated by SME(s) familiar with those IM regions to determine if the LOF for this threat is increasing in comparison to the norm established by the five-year average.

Distribution Integrity Management Plan					
Section:	Chapter 6				
Subject:	Identify and Implement Measures to Address Risk				
Reference:	49 CFR Part 192, Subpart P, **(2010)**				
Issue Date:	12/07/11	**Effective Date:**	12/07/11	**Revision Date:**	12/07/11

Identify and Implement Measures to Address Risk

6.1 General
6.2 Leak Management Program
6.3 Damage Prevention Program
6.4 Operator Qualification Program
6.5 Public Awareness Program
6.6 Excess Flow Valves
6.7 Drug and Alcohol Program
6.8 Continuing Surveillance Program
6.9 Pipeline Patrolling Program
6.10 Welding Program
6.11 Plastic Pipe Joining Program
6.12 Corrosion Control Program
6.13 Technical Training Programs
6.14 Potential A&A Actions to Mitigate “HIGH” Risk Threats

6.1 General (§192.1007(d))

Liberty Utilities currently operates its natural gas distribution systems in accordance with applicable federal and state pipeline safety regulations. Programs/policies currently in place to ensure compliance with the applicable federal and state regulations minimize those risks associated with the threats discussed in Chapter 5, Threats.

Programs/policies currently in-place include:

- Leak Management Program
- Damage Prevention Program
- Operator Qualification Program
- Public Awareness Program
- Excess Flow Valve Installation
- Alcohol Misuse and Drug Abuse Policy
- Continuing Surveillance Program
- Pipeline Patrolling Program
- Welding Program
- Plastic Pipe Joining Program
- Corrosion Control Program
- Technical Training Programs

6.2 Leak Management Program

Liberty Utilities' Leak Management Program complies with the minimum requirements of 49 CFR Part 192, §192.703, and §192.723. The program is described in **Liberty Utilities'** Operations & Maintenance Procedures, Section 9, and Gas Leak Surveys. Key elements of **Liberty Utilities'** Leak Management Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of the surveying of distribution systems and the subsequent locating, grading, and repair and/or monitoring of leaks found within those systems, **Liberty Utilities'** Leak Management Program contributes directly to the mitigation of the following threats or risks:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Other Outside Forces**
- **Material or Welds**
- **Incorrect Operations**
- **Equipment Failure**
- **Other**

Leak Management Program Enhancements

Certain aspects of **Liberty Utilities'** Leak Management Program exceed 49 CFR Part 192 minimum requirements. Such enhancements are incorporated in the applicable sections of **Liberty Utilities'** Operations & Maintenance Procedures, Section 9, Gas Leak Surveys.

6.3 Damage Prevention Program

Liberty Utilities' Damage Prevention Program complies with the minimum requirements of 49 CFR Part 192, §192.614 and is described in **Liberty Utilities'** Operations & Maintenance Procedures, Section 3, Damage Prevention Program. Key elements of **Liberty Utilities'** Damage Prevention Program along with the document can be found in Appendix I.

Threats / Risks Mitigated

As a result of **Liberty Utilities'** participation in One Call Systems and the Common Ground Alliance, its adherence to and support of damage prevention and locating laws, and its promotion of public education surrounding damage prevention, **Liberty Utilities'** Damage Prevention Program contributes directly to the mitigation of the following threats or risks:

- **Excavation Damage**
- **Other**

Damage Prevention Program Enhancements

Certain aspects of **Liberty Utilities'** Damage Prevention Program exceed 49 CFR Part 192 minimum requirements. Such enhancements are incorporated in applicable sections of **Liberty Utilities'** Operations & Maintenance Procedures, Section 3, Damage Prevention Program.

6.4 Operator Qualification Program

Liberty Utilities' Operator Qualification Program complies with the minimum requirements of 49 CFR Part 192 and is described in **Liberty Utilities'** OQ Written Plan for Liberty Utilities (excludes Missouri) and OQ Written Plan for Missouri. Key elements of **Liberty Utilities'** Operator Qualification Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of assessments performed under **Liberty Utilities'** Operator Qualification Program, each affected **Liberty Utilities** and contractor employee is assured to have the necessary skills and knowledge to properly perform their assigned tasks on **Liberty Utilities'** distribution systems. This program contributes directly to the mitigation of the following threats or risks:

- **Corrosion**
- **Excavation Damage**
- **Material or Welds**
- **Incorrect Operations**
- **Other**

Operator Qualification Program Enhancements

In addition to the minimum requirements pertaining to damage prevention prescribed in 49 CFR Part 192, **Liberty Utilities** requires personnel installing new pipeline facilities to adhere to the same requirements as those doing maintenance-type work. These requirements are incorporated in **Liberty Utilities'** Operator Qualification Plan, Definitions Section.

6.5 Public Awareness Program

Liberty Utilities' Public Awareness Program complies with the minimum requirements of 49 CFR Part 192, §192.615(a)(2), (a)(8) and §192.616. This program is described in **Liberty Utilities'** Pipeline Safety Public Awareness Program. Key elements of **Liberty Utilities'** Public Awareness Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of **Liberty Utilities'** promotion of public education and awareness of its pipeline facilities in accordance with API RP1162 (2005), **Liberty Utilities'** Public Awareness Program contributes directly to the mitigation of the following threats or risks:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Other Outside Forces**
- **Material or Welds**
- **Equipment Failure**
- **Other**

6.6 Excess Flow Valves

The installation of excess flow valves (EFVs) is a key means to mitigating risks associated with excavation damages to residential service lines. **Liberty Utilities** began installing excess flow valves prior to June 1, 2008 per criteria outlined in PHMSA Advisory Bulletin PHMSA-RSPA-2004-19854 Pipeline Safety: Installation of Excess Flow Valves into Gas Service Lines dated June 5, 2008.

Liberty Utilities' Excess Flow Valve Installation procedures comply with the minimum requirements of 49 CFR Part 192, §192.381 and §192.383, and is further described in **Liberty Utilities'** Operations & Maintenance Procedures, Section 8.3.1, Service Lines: Excess Flow Valve Performance Standards. Key elements of **Liberty Utilities'** O&M Plan as it pertains to excess flow valves along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of **Liberty Utilities'** installation of excess flow valves, the following threats or risks are mitigated:

- **Corrosion**
- **Excavation Damage**
- **Other Outside Forces**
- **Natural Forces**
- **Material or Welds**
- **Equipment Failure**
- **Other**

Excess Flow Valve Program Enhancements

Excess flow valves are installed:

- On branch (split or companion) service lines serving no more than two residential customers or a meter manifold serving two residential customers.
- On service lines that operate at pressures of more than five psig for all of the year.

6.7 Alcohol Misuse and Drug Abuse Policy

Liberty Utilities' Alcohol Misuse and Drug Abuse Policy complies with the minimum requirements of the Transportation Workplace Drug and Alcohol Testing Regulations as applied to positions covered by the Federal Motor Carrier Safety Administration (FMCSA) and by the Pipeline & Hazardous Materials Safety Administration (PHMSA) 49 CFR Part 199, §199.101 and is described in **Liberty Utilities'** Alcohol Misuse and Drug Abuse Policy. Key elements of **Liberty Utilities'** Alcohol Misuse and Drug Abuse Policy along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of the pre-employment, random, post-accident, and "reasonable cause" testing of its employees and contractor employees for drugs and alcohol**, Liberty Utilities'** Alcohol Misuse and Drug Abuse Policy contribute directly to the mitigation of the following threats or risks:

- **Incorrect Operations**
- **Excavation Damage**
- **Other**

Alcohol Misuse and Drug Abuse Policy Enhancements

In addition to the testing of individuals performing DOT covered tasks, **Liberty Utilities** also tests individuals who do not perform covered tasks as a part of their day-to-day duties in the following instances:

- Pre-employment – Drug Only
- Reasonable Cause
- Return-to-Work
- Follow-up

6.8 Continuing Surveillance Program

Liberty Utilities' Continuing Surveillance Program complies with the minimum requirements of 49 CFR Part 192, §192.613 and is described in **Liberty Utilities'** Operations and Maintenance Procedures, Chapter 25. This program takes into account the results of both the periodic visual inspections of **Liberty Utilities'** facilities along with the periodic review and analysis of records in determining areas of concern and taking appropriate actions. Key elements of **Liberty Utilities'** Continuing Surveillance Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of **Liberty Utilities'** continuing surveillance of its pipeline facilities, the following threats or risks are mitigated:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Other Outside Forces**
- **Material or Welds**
- **Equipment Malfunction**
- **Incorrect Operations**
- **Other**

6.9 Pipeline Patrolling Program

Liberty Utilities' Pipeline Patrolling Program complies with the minimum requirements of 49 CFR Part 192, §192.721 and is described in **Liberty Utilities'** Operations and Maintenance Procedures, Chapter 10. This program provides for the performance of observational patrols of distribution lines and associated rights of way. Key elements of **Liberty Utilities'** Pipeline Patrolling Program along with their document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of **Liberty Utilities'** patrolling of its pipeline facilities that are potentially at risk for physical movement or external loading, the following threats or risks are mitigated:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Material or Welds**
- **Other Outside Forces**
- **Other**

6.10 Welding Program

Liberty Utilities' Welding Program complies with the minimum requirements of 49 CFR Part 192, Subpart E and is described in **Liberty Utilities'** Welding Manual. Key elements of **Liberty Utilities'**Welding Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated
As a result of the specifications, procedures, and testing requirements within **Liberty Utilities'** Welding Program, the following threats or risks are mitigated:

- **Material or Welds**
- **Incorrect Operations**
- **Other**

6.11 Plastic Pipe Joining Program

Liberty Utilities' Plastic Pipe Joining Program complies with the minimum requirements of 49 CFR Part 192, §192.273, §192.281, §192.283, §192.285, and §192.287. The program is described in **Liberty Utilities'** Operations and Maintenance Procedures, Chapter 22. This program provides guidelines for the joining of plastic pipe. Key elements of **Liberty Utilities'** Plastic Pipe Joining Program along with their document references can be found in Appendix I.

Threats / Risks Mitigated
As a result of the plastic pipe joining procedures and the associated certification requirements in **Liberty Utilities'** Operations and Maintenance Procedures, the following threats or risks are mitigated:

- **Material or Welds**
- **Incorrect Operations**
- **Other**

6.12 Corrosion Control Program

Liberty Utilities' Corrosion Control Program complies with the minimum requirements of 49 CFR Part 192, Subpart I and is described in **Liberty Utilities'** Operations and Maintenance Procedures, Chapter 13. Key elements of **Liberty Utilities'** Corrosion Control Program along with the document reference can be found in Appendix I.

Threats / Risks Mitigated

As a result of the design and installation of corrosion control facilities, and the subsequent performance monitoring of those facilities on **Liberty Utilities'** distribution systems, the following threats or risks are mitigated:

- **Corrosion**
- **Other**

6.13 Technical Training Programs

Many **Liberty Utilities** employees participate annually in a number of internal and external technical training programs. These programs cover a variety of topics, including but not limited to construction, service, measurement, corrosion, leak management, line locating, product selection, and governmental regulations. These programs enhance the expertise of **Liberty Utilities'** employees relative to the safe operations of the distribution systems within their IM Region(s). Key elements of **Liberty Utilities'** Technical Training Programs along with the document reference can be found in Appendix I

Threats / Risks Mitigated

As a result of specialized training in a variety of functional areas, **Liberty Utilities** ensures that its employees receive the knowledge and skills required to properly perform their assigned tasks. In doing so, the following threats or risks are mitigated:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Other Outside Forces**
- **Material or Welds**
- **Equipment Malfunction**
- **Incorrect Operations**
- **Other**

6.14 Potential A&A Actions to Mitigate "High" Risk Threats (§192.1007(d))

The A&A Actions that may be considered when implementing steps to address identified "High" risk threats within IM Systems following the risk analysis are found in Appendix E. Appropriate actions will be identified, implemented, and documented on the respective DIMPlate by the applicable SME(s) and will require final approval by the appropriate Operations and Compliance Manager(s).

In addition, Liberty Utilities will implement A&A Actions for any IM Region in which risks associated with the environmental factors described in Section 3.4 – "Environmental Factors" are identified. These A&A Actions will be independent from any other A&A Actions that are implemented for mitigating the risks associated with the threat categories listed in Chapter Five, "Threats".

Threats / Risks Mitigated

As a result of the implementation of any A&A Action on **Liberty Utilities'** pipeline facilities, the following threats or risks are mitigated:

- **Corrosion**
- **Excavation Damage**
- **Natural Forces**
- **Other Outside Forces**
- **Material or Welds**
- **Equipment Malfunction**
- **Incorrect Operations**
- **Other**

Distribution Integrity Management Plan					
Section:	Chapter 7				
Subject:	Annual Performance Measurements and Effectiveness Evaluation				
Reference:	49 CFR Part 192, Subpart P, (2010)				
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Annual Performance Measurements and Effectiveness Evaluation

7.1 General
7.2 Performance Measures Reported to PHMSA
7.3 Additional Performance Measures Maintained by **Liberty Utilities**
7.4 Mechanical Fitting Failure Report
7.5 Performance Effectiveness Review