KINDER MORGAN INC.



May 30, 2007

**VIA CERTIFIED MAIL –**
**RETURN RECEIPT REQUESTED**

Mr. Chris Hoidal
Director, Western Region
Pipeline and Hazardous Materials
Safety Administration
12300 W. Dakota Avenue
Suite 110
Lakewood, Colorado 80228

Re: CPF 5-2007-1002M

Mr. Hoidal:

On August 14 through 18, 2006 and August 28 through September 1, 2006, representatives of the Pipeline and Hazardous Materials Safety Administration (PHMSA) conducted a review of Kinder Morgan Inc.'s (KMI) Integrity Management Program in our Lakewood, Colorado offices. As a result of that review PHMSA offered constructive criticism and suggestions for improvement that KMI is incorporating in our program.

On March 5, 2007, PHMSA sent a Notice of Amendment to KMI requiring changes to three (3) specific areas of our Program. In order to maintain clarity in our response to PHMSA's requirements for amendment KMI will repeat the required amendment and immediately following provide our response in bold font. Our Response includes the section of text within our revised program where the specific addition to language that addresses the required change occurs.

At the suggestion of the PHMSA inspection team KMI is in the process of restructuring our entire Integrity Management program to correspond with PHMSA inspection protocols. The filing of our revised plan will be done in conformance with Federal Requirements (192.909(b)) and will be completed by September 30, 2007.

Item 1A: 192.911(h) and 192.937(b):

The KMI procedure for establishing when continual evaluations are needed do not explicitly require that a re-evaluation be conducted in response to significant leaks, failures, or incidents.

**KMI Response:**

**Kinder Morgan has revised the IMP plan to clearly detail this requirement. Section 9.1 below describes the KM requirement for Continual Evaluations. Section 6.2.1.3 details how the information is obtained by the risk engineer to trigger this event.**

**9.1 Periodic Evaluations [192.937(b); Protocol F.01]**

**Subsequent to the baseline integrity assessment, KMI continues to assess the covered segment at intervals and periodically evaluates each covered pipeline segment's integrity.**

**Periodic evaluations are based on data integration and risk assessment (IMP Section 6, *Threat Identification, Data Integration, and Risk Assessment*) of the pipeline system. For transmission pipelines other than plastic pipelines, the evaluation will consider past and present integrity assessment results, data integration and risk assessment information, remediation decisions, and additional preventative and mitigative actions.**

**Periodic evaluation triggers include, but are not limited to, the completion of integrity assessments and data evaluation, substantial leaks, failures or incidents, and the availability of new integrity information. As with baseline assessments, reassessment method determinations are made in accordance with the particular threats for each segment.**

***Risk Engineering* documents periodic evaluations and reassessment planning on ICAM. Documentation consists of decision making and rationale for reassessment planning.**

**Reassessment plans for KMI business units are reviewed by *Risk Engineering* annually to determine if new information of threats and pipeline conditions warrants changes to the reassessment plans. Pipeline segments are risk ranked annually in *PIRAMID*™ by total combined impact as described in IMP Section 6.3, *Risk Assessment*. The risk ranked list is employed to re-evaluate the baseline assessment/reassessment plan for each KMI business unit. The annual risk evaluation and prioritization process is conducted in a similar manner as the initial risk ranking and prioritization process as described in IMP Section 5, *Baseline Assessment Plan*.**

**6.2.1.3 Incident Reporting Tools**

***STARS*™ is an on-line tool that stores various information related to a pipeline incident or damage. Information collected includes a brief description of the incident, pipeline system data, type of incident, and the incident cause. Data stored in the *STARS*™ program is employed for determining reporting criteria and performing additional analysis on the affected segment when necessary. During the annual risk ranking process, *Risk Engineers* review *STARS*™ incident data on covered segments.**

**Incident notifications are also received by the *Director of Risk Engineering* and the *Risk Engineer* responsible for the applicable pipeline system through the company Emergency Response Line (ERL) notification system immediately after the incident is reported.**

Item 1B: 192.911(h) and 192.935(a):

IMP I 0070 provides a framework describing requirements for the P&M Measures program. However, KMI has not defined the detailed process steps used for identifying additional measures based on identified threats to each pipeline segment and the risk analysis.

**KMI Response:**

**Kinder Morgan has revised the IMP plan to detail the process used for evaluating Preventive and Mitigative Measures. Section 11 describes the base process used and section 7 of the Risk Process Document details the steps taken.**
**Due to the length of these sections KMI has included their entire text in the attached Appendix A.**

Item 2A:

KMICD Lander Hudson Lateral was listed as an HCA in the 2004 BAP. This HCA was removed from the BAP in the 12/17/2005 BAP. KMI did not document the reason for change, authority for approving change, analysis of implications, or the communication of the change to affected parties.

**KMI Response:**

**Kinder Morgan has revised the IMP plan to describe the process used to evaluate changes in HCAs. This process includes steps to validate the changes and generate an MOC related to the change. Section 4.6 describes this process. Also included is O&M 155 and form OM100-15-IMP that describe the Kinder Morgan MOC process. Due to the length of these sections KMI has included their entire text in the attached Appendix B.**

**4.6 Identification and Evaluation of Newly Identified HCAs, Program Requirements [192.905(c); Protocol A.06]**

**Continuing surveillance activities are provided in O&M Procedure 220, *Structure Survey for Class Location and HCA Determination.* New or changed HCA boundaries caused by changing pipeline conditions are identified and updated annually. Those changes include:**

- **Change in MAOP**
- **Pipeline modification including pipe diameter alteration**
- **Change in pipeline product**
- **Installation of new pipe**
- **Change in class location / location boundary**
- **Pipeline reroute, new pipeline**
- **Correction to pipeline centerline**
- **Field design changes**
- **Identification of new construction activity**
- **Change in the use of existing buildings**

**In addition to tasks performed in O&M Procedure 220, *Structure Survey for Class Location and HCA Determination,* and IPODS Engineering Standards, once each calendar year, *Engineering and Technical Services* will run the Petris software HCA Comparison Tool. This software uses the criteria in the bullet points above and**

**compares new or changed HCA boundaries to previously identified HCAs. This data is used by *Risk Engineering* to update the baseline assessment/reassessment plans in accordance with IMP Section 5.4, *New HCAs/Newly Installed Pipe, Newly Acquired Pipe*. This data is also used to validate the HCA changes and to develop an MOC for any changes to the BAP.**

If you should have further questions regarding this response please do not hesitate to contact me.

Sincerely,

M. Dwayne Burton
Vice President, Gas Pipeline
Operations and Engineering
Kinder Morgan, Inc.
One Allen Center
500 Dallas Street
Suite 1000
Houston, TX 77002
(713) 369-9356

# Appendix A

# 11. Preventive and Mitigative Measures



## 11.0. Introduction [192.935; Protocol Area H]

In accordance with 49 CFR 192.935, KMI evaluates and employs preventive and mitigative measures (P&MMs) to prevent and mitigate the consequences of a pipeline failure. The P&MM process consists of the following key components:

- Identification of P&MMs
- Evaluation of P&MMs
- Documentation
- Management of Change

As established in IMP Section 6, *Threat Identification, Data Integration, Risk Assessment*, KMI conducts threat identification and risk ranking. Upon having identified threats along a particular pipeline segment or facility, KMI evaluates the necessity of additional potential P&MMs.

### 11.0.1. Scope

This section describes the process for evaluating and selecting P&MMs for covered segments.

### 11.0.2. Responsibilities

The ***Director of Risk Engineering*** is responsible for the development, implementation, and oversight of the processes and procedures contained in this section. Additionally, the ***Director of Risk Engineering*** is responsible for the following specific components of this section:

- Oversight of P&MM evaluations
- Oversight of addition or modification of P&MMs

***Risk Engineers*** are responsible for supporting the ***Director of Risk Engineering*** with the implementation of the policies and procedures contained in this section.

***Engineering Records Department*** will maintain all completed P&MM projects and associated documentation for the life of the pipeline.

### 11.0.3. Associated KMI Procedures

The following KMI O&M Procedures are referenced in this section, and have been incorporated into this program:

- O&M Procedure 159, *Incident Reporting and Investigation*
- O&M Procedure 199, *Operator Qualification*
- O&M Procedure 215, *Patrolling and Leak Detection*
- O&M Procedure 232, *Damage Prevention and Public Education*
- Risk Process Document

## 11.1. General Requirements [192.935(a); Protocol H.01]

Identification and evaluation of additional P&MMs are based on identified threats to each pipeline segment and the risk analysis required by 49 CFR 192.917.

Initial P&MM evaluations for covered segments are scheduled based on the baseline assessment/reassessment plans published in March 2007. Evaluations for the top 50% (highest risk) covered segments will be completed by June 30, 2008. The remaining covered segments (lowest risk) will be evaluated by June 30, 2009.

Continual P&MM evaluations are completed for covered sections in response to the following events:

- Integrity assessment and subsequent remediation
- Significant leaks, failures, or incidents
- New information providing substantial changes to identified threats or relative risk ranking

In order to identify potential additional or new P&MMs, ***Risk Engineering*** conducts a P&MM evaluation process consisting of four critical steps:

- Threat based P&MM identification
- *PIRAMID*™ - Scenario Comparisons
- Preliminary Evaluation and Decision Making
- Formal P&MM Reviews

The following sections establish the requirements and methodology for each of these steps.

### 11.1.1. Threat Based P&MM Identification [192.917; 192.935(a)]

Decisions regarding P&MMs are based on the threats identified during Risk Analysis Process (IMP Section 6, *Threat Identification, Data Integration, and Risk Assessment*). Specific pipeline threats are identified and P&MMs are evaluated by ***Risk Engineering***.

In order to consistently and systematically identify P&MMs, ***Risk Engineering*** consults Table IMP 11-1, *Preventive and Mitigative Measures Selection Criteria*, for an initial identification of appropriate P&MMs for each unique threat. P&MM considerations include, but are not limited to:

- Enhancements to leak detection systems (e.g. Control Center monitoring)
- Addition of Automatic Shut-off Valves or Remote Control Valves
- Additional training for personnel on response procedures
- Enhancements to corrosion control efforts
- Enhancements to third party damage prevention programs
- Enhancements to inspections and maintenance programs

- Conduct drills with local emergency responders
- Replace pipe segments with segments of heavier wall thickness

Upon having identified threat based P&MMs, ***Risk Engineering*** employs *PIRAMID*™ to further evaluate potential P&MM activities.

### 11.1.2. Creating and Comparing Scenarios [192.911(c); 192.935(a)]

***Risk Engineering*** employs *PIRAMID*™ to determine whether initially identified P&MM activities are appropriate (based on pipeline characteristics, operational parameters, integrity threat, initial risk, risk reduction, and benefit/cost). The *PIRAMID*™ scenario creation function allows for creating "what-if" scenarios to determine the risk reduction due to an integrity activity. ***Risk Engineering*** employs *PIRAMID*™ as a tool to evaluate the various risk control and mitigation methods by:

- Identifying risk control options that could lower the likelihood of a pipeline system incident, reduce the consequences, or both
- Systematically evaluating and comparing those options
- Selecting and implementing the optimum strategy for risk control

The existing attributes for the pipeline segment being modeled are stored as baseline data. *PIRAMID*™ creates scenarios by modifying the attributes specific to the scenario while maintaining the remaining attributes in the baseline data as constant. Probability, consequence, and costs are calculated for the pipeline segment before and after scenario is implementation. The results can be compared to determine the impact of risk reduction and/or benefit cost due to the scenario.

Risk comparisons may be made based on cost/benefit ratio, total cost, utility, or impact index as a means to identify the most cost-effective approach to implementing P&MMs. For example, the P&MM scenario comparison can be employed to compare increased signage, increased patrols, and enhanced protection (against equipment damage) as an aid in selecting the most effective P&MM(s) to implement.

### 11.1.3. Preliminary Evaluation and Decision Making

***Risk Engineers*** employ the *PIRAMID*™ scenario comparison and risk evaluation functions for preliminary P&MM evaluations.

A spreadsheet consisting of output from the *PIRAMID*™ model for initial system attributes (baseline) and potential P&MM scenarios is employed for preliminary screening. The spreadsheet contains the total combined impact, and the risk before and after the PMM scenario.

***Risk Engineers*** perform a preliminary evaluation of the P&MM scenario results and eliminate any P&MM scenario that does not result in any risk reduction or provides no benefit/cost. The resulting P&MM scenario comparison list is employed in the formal review process, and documented on ICAM software.

### 11.1.4. Formal P&MM Reviews

Upon having completed threat based P&MM identification, scenario modeling, and preliminary evaluation of P&MMs, ***Risk Engineering*** presents the proposed P&MMs to other KMI personnel. Formal P&MM reviews may combine several covered segments with similar characteristics in a single discussion. Representatives from ***Engineering***, ***Operations*** (district managers, maintenance, and corrosion staff, etc.), and ***Business*** departments are present for the formal P&MM reviews to finalize the selection of P&MMs. As with each component of the P&MM process, review results are documented on ICAM.

Approved final P&MMs are budgeted for and tracked until completion by the ***Director of Risk Engineering***.

## 11.2. Third Party Damage [192.935(b)(1); Protocol H.02]

In supplement to the Damage Prevention Program and in accordance with 49 CFR 192.935 (b), KMI has developed enhanced measures to prevent third party damage. These enhanced measures include the following:

- Using qualified personnel for IMP work tasks such as marking, locating, and direct supervision of direct excavation work
- Collection, in a central data base, location specific information on excavation damage (covered and non-covered segments) and root cause analysis
- Participation in one-call systems
- Monitoring of excavations on covered segments by KMI personnel

In the event that third party damage is identified as a threat, KMI, at a minimum, enhances its damage prevention program with the listed actions below to prevent and minimize the consequences of a release due to third party damage:

- Using qualified personnel for work conducted by KMI (O&M Procedure 199, *Operator Qualification*)
- Collecting and recording information in *STARS*™ central database on excavation damage that occurs on covered and non-covered segments in the transmission system. It will include root cause analysis to support identifying targeted additional preventive and mitigative measures in HCA's. The report will include recognized damage that is not required to be reported to DOT as an incident (O&M Procedure 159, *Incident Reporting and Investigation*).
- Participating in one-call systems in locations with covered segments (O&M Procedure 232, *Damage Prevention and Public Education*)
- Providing pipeline personnel to monitor excavations conducted on covered pipeline segments (O&M Procedure 215, *Patrolling and Leak Detection*)

## 11.3. Pipelines Operating Below 30% SMYS [192.935(d); Protocol H.03]

For pipelines operating below 30% SMYS and located in an HCA, KMI implements the following actions:

- Use qualified personnel for work conducted by KMI (O&M Procedure 199, *Operator Qualification*)
- Participate in one-call systems in locations with covered segments (O&M Procedure 232, *Damage Prevention and Public Education*)
- Monitor excavations near the pipeline or conduct bi-monthly pipeline patrols. If an indication of an unreported construction activity is discovered, a follow-up investigation will be required to determine if mechanical damage has occurred. (O&M Procedure 215, *Patrolling and Leak Detection*) For pipelines operating below 30% SMYS and located in a Class 3 or 4 area but not in an HCA, KMI will implement the following actions:
- Use qualified personnel for work conducted by KMI (O&M Procedure 199, *Operator Qualification*)
- Participate in one-call systems in locations with covered segments (O&M Procedure 232, *Damage Prevention and Public Education*)
- Monitor excavations near the pipeline or conduct bi-monthly pipeline patrols. In the event that an indication of an unreported construction activity is discovered, a follow-up investigation will be required to determine if mechanical damage has occurred. Perform semi-annual leak surveys or quarterly leak surveys for unprotected pipe or cathodically

protected pipe where electrical surveys are impractical (O&M Procedure 215, *Patrolling and Leak Detection*).

Guidance for selecting P&MMs related to these two conditions listed above is attached as Table IMP 11-2, *Preventive and Mitigative Measures for Pipelines Operating at less than 30% SMYS in an HCA*, and Table IMP 11-3, *Preventive and Mitigative Measures for Pipelines operating Below 30% SMYS in a Class 3 or 4 but not in an HCA*.

## 11.4. Plastic Transmission Lines [192.935(e); Protocol H.04]

In the event that KMI operates a plastic transmission pipeline in a covered segment, KMI will consider the following P&MMs:

- Use qualified personnel for work conducted by KMI (O&M Procedure 199, *Operator Qualification*)
- Participate in one-call systems in locations with covered segments (O&M Procedure 232, *Damage Prevention and Public Education*)
- Provide pipeline personnel to monitor excavations conducted on covered pipeline segments (O&M Procedure 215, *Patrolling and Leak Detection*)

## 11.5. Outside Force Damage [192.935(b)(2); Protocol H.05]

In the event that KMI determines damage by outside forces (earth movements, floods, unstable suspension bridge) is a threat, KMI may implement measures to minimize the consequences from the outside force threat (O&M Procedure 215, *Patrolling and Leak Detection*). Additional measures to minimize the consequences of damage from outside forces include, but are not limited to:

- Increasing patrol frequency
- Increased signage
- Adding external protection
- Reducing external stress
- Relocating the line

## 11.6. Corrosion [192.917(e)(5); Protocol H.06]

As with other threats, KMI takes measures to determine if corrosion is a threat to covered pipeline segments. In the event that a corrosion threat is identified, KMI completes:

- Evaluation and remediation of covered and non-covered segments with similar material coating
- Development of a schedule for evaluating and remediation, as necessary, the similar segments consistent with the operator's established operating and maintenance procedures under 49 CFR 192 for test and repair.

## 11.7. Automatic Shutoff Valves or Remote Control Valves [192.935(c); Protocol H.07]

***Risk Engineering*** conducts a risk and cost benefit analysis to determine whether an automatic shutoff valve (ASV) or remote control valve (RCV) would be an efficient means of adding protection to an HCA in the event of a gas release. The review includes, at a minimum: leak detection speed, pipe shutdown capabilities, the type of gas transported, operating pressure, rate of potential release, pipeline profile, potential for ignition, and nearest response personnel location. ***Risk Engineering***, with the assistance of ***System Design***, evaluates the installation feasibility.

**Table IMP 11-1 – Preventive and Mitigative Measures Selection Criteria**

**See attached table.**

**Table IMP 11-2 - Preventive and Mitigative Measures**
**Pipelines Operating at less than 30% SMYS in an HCA**
**[Part 192, Table E.II.3]**

| Threat | Existing 192 Requirements | | Additional Preventive & Mitigative Measures to 192 requirements |
|---|---|---|---|
| | Primary | Secondary | |
| **External Corrosion** | 455-(Gen. Post 1971)<br>457-(Gen. Pre-1971)<br>459-(Examination)<br>461-(Ext. coating)<br>463-(CP)<br>465-(Monitoring)<br>467-(Elect Isolation)<br>469-(Test Stations)<br>471-(Test Leads)<br>473-(Interference)<br>479-(Atmospheric)<br>481-(Atmospheric)<br>485-(Remedial)<br>705-(Patrol)<br>706-(Leak survey)<br>711-(Repair – gen.)<br>717-(Repair – perm.) | 603-(Gen Oper)<br>613-(Surveillance) | For Cathodically Protected Trans. Pipelines<br>• Perform an electrical survey (i.e. indirect examination tool/method) at least every 7 years. Results are to be utilized as part of an overall evaluation of the CP system and corrosion threat for the covered segment. Evaluation shall include consideration of leak repair and inspection records, corrosion monitoring records, exposed pipe inspection records, and the pipeline environment.<br><br>For Unprotected Trans. Pipelines or for Cathodically Protected Pipe where Electrical Surveys are Impracticable<br>• Conduct quarterly leak surveys AND<br>• Every 1-1/2 years, determine areas of active corrosion by evaluation of leak repair and inspection records, corrosion monitoring records, exposed pipe inspection records, and the pipeline environment |
| **Internal Corrosion** | 475-(Gen IC)<br>477-(IC Monitoring)<br>485-(Remedial)<br>705-(Patrol)<br>706-(Leak Survey)<br>711 (Repair – gen.)<br>717-(Repair – perm.) | 53(a)-(Materials)<br>603-(Gen Oper)<br>613-(Surveillance) | • Obtain and review gas analysis data each calendar year for corrosive agents from transmission pipelines in HCA's,<br>• Periodic testing of fluid removed from pipelines. Specifically, once each calendar year from each storage field that may affect transmission pipelines in HCA's, AND<br>• At least every 7 years, integrate data obtained with applicable internal corrosion leak records, incident reports, safety related condition reports, repair records, patrol records, exposed pipe reports, and test records. |
| **3rd Party Damage** | 103-(Gen. Design)<br>111-(Design Factor)<br>317-(Hazard Protection)<br>327-(Cover)<br>614-(Dam. Prevent)<br>616-(Public Education)<br>705-(Patrol)<br>707-(Line Markers)<br>711 (Repair – gen.)<br>717-(Repair – perm.) | 615 –(Emergency Plan) | • Participation in state one-call system,<br>• Use of qualified operator employees and contractors to perform marking and locating of buried structures and in direct supervision of excavation work, AND<br>• Either monitoring of excavations near operator's transmission pipelines, or bi-monthly patrol of transmission pipelines in HCA's or Class 3 and 4 locations. Any indications of unreported construction activity require a follow-up investigation to determine if mechanical damage occurred. |

**Table IMP 11-3 - Preventive and Mitigative Measures**
**Pipelines operating Below 30% SMYS in a Class 3 or 4 but not in an HCA**
**[Part 192, Table E.II.1]**

| Threat | Existing 192 Requirements | | Additional Preventive & Mitigative Measures to 192 requirements |
|---|---|---|---|
| | Primary | Secondary | |
| **External Corrosion** | 455- (Gen. Post 1971)<br>457-(Gen. Pre-1971)<br>459-(Examination)<br>461-(Ext. Coating)<br>463-(CP)<br>465-(Monitoring)<br>467-(Elect Isolation)<br>469-(Test Stations)<br>471-(Test Leads)<br>473-(Interference)<br>479-(Atmospheric)<br>481-(Atmospheric)<br>485-(Remedial)<br>705-(Patrol)<br>706-(Leak Survey)<br>711-(Repair-gen.)<br>717-(Repair-perm.) | 603-(Gen Oper)<br>613-(Surveillance) | For Cathodically Protected Transmission Pipeline:<br>• Perform semi-annual leak surveys.<br>- - - - - - - - - - - - - - - - - - - - - - - -<br>For Unprotected Transmission Pipelines or for Cathodically Protected Pipe where Electrical Surveys are Impractical:<br>• Perform quarterly leak surveys |
| **Internal Corrosion** | 475-(Gen IC)<br>477-(IC Monitoring)<br>485-(Remedial)<br>705-(Patrol)<br>706-(Leak Survey)<br>711 (Repair-gen.)<br>717-(Repair-perm.) | 53(a)-(Materials)<br>603-(Gen Oper'n)<br>613-(Surveillance) | • Perform semi-annual leak surveys. |
| **3rd Party Damage** | 103-(Gen. Design)<br>111-(Design Factor)<br>317-(Hazard Protection)<br>327-(Cover)<br>614-(Dam. Prevent)<br>616-(Public Education)<br>705-(Patrol),<br>707-(Line Markers)<br>711 (Repair – gen.)<br>717-(Repair – perm.) | 615–(Emergency Plan) | • Participation in state one-call system,<br>• Use of qualified operator employees and contractors to perform marking and locating of buried structures and in direct supervision of excavation work, AND<br>• Either monitoring of excavations near operator's transmission pipelines, or bi-monthly patrol of transmission pipelines in Class 3 and 4 locations. Any indications of unreported construction activity require a follow-up investigation to determine if mechanical damage occurred. |

## Table IMP 11-1 – Preventive and Mitigative Measures Selection Criteria

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Increased Patrols | X | | | | X | | X | | X |
| Enhance Public Awareness Program | | | | | | | X | | |
| Operator Training (Procedures and Response) | | | | | | | X | X | |
| Conduct Emergency Repsonse drills | | | | | | | X | | |
| Increase Signage on ROW | | | | | | | X | | |
| Install Mechanical barrier or External Protection | | | | | | | X | | X |
| Install Warning Tape Mesh | | | | | | | X | | |
| Increased CP Monitor | X | | | | | | | | |
| CIS | X | | | | | | | | |
| Install ACVs, RCVs | X | X | X | X | X | X | X | X | X |
| Install leak detection and monitoring system | X | X | | | X | X | X | | |
| Strain Measurement | | | | | | | | | X |
| Reduce External Stress | | | | | X | X | | | X |
| Line Relocation | | | | | | | X | | X |
| Recoat | X | | X | X | X | | X | | X |
| Increase depth of cover | | | | | | | X | | X |
| Pipe Replacement/increase wall thickness | X | X | X | X | X | X | X | | X |
| Install Moisture Reduction equipment | | X | | | | | | | |
| Internal corrosion Monitoring | | X | | | | | | | |
| Biocide/Inhibiting Injection | | X | | | | | | | |
| Monitor Gas quality | | X | | | | | | | |
| Internal Cleaning Pig Program | | X | | | | | | | |
| Pressure Reduction | X | X | X | X | X | | X | | |

# 7. Preventive and Mitigative Measures

Preventive and Mitigative Measures (P&MM's) are activities to be considered that are intended to provide additional protection to the High Consequence Areas. The P&MM's are required to be evaluated by the user after the threats have been identified. A P&MM Selection Criteria checklist provides a list of activities to be considered and identifies which threat the activity applies. P&MM activities will be evaluated using scenarios created in PIRAMID™. The results of the scenarios will be evaluated against implementation criteria and subject to further SME review. This section will describe the evaluation process.

7.1. Identify threats through PIRAMID™

The final BAP (See Section 4) will identify the threats associated with each HCA segment. These threats will be used as a starting point for determining which activity to consider for evaluation.

7.2. P&MM selection criteria checklist

7.2.1. Locate the P&MM tab on the PIPER output sheet from the BAP. Each HCA will be listed along the left side axis and the P&MM activities to consider for evaluation will be across the top. For each row of each HCA, there will be series of "X's". These "X's" correspond to the associated P&MM activity along the top of the sheet. A scenario will be evaluated in PIRAMID for each "X" associated with the HCA segment.

7.3. Evaluate P&MM's through PIRAMID™

The P&MM activities will be evaluated through scenarios created in PIRAMID™.

7.3.1. Scenario Creation in PIRAMID™[1]

7.3.1.1. Scenarios allow the user to update attributes associated with a mitigative activity to determine the impact of the change. A filter in the scenario is used to show the user which attributes may be updated with new data. As an example – If the user chooses the scenario "increase signage", the attributes the user can change associated with that scenario will be displayed. The filter can be turned off which will display all the attributes.

7.3.1.2. Scenarios have been created in PIRAMID™ as a template to address the P&MM activities on the Checklist.

7.3.2. Merge or Import "pir" file

The data is downloaded into PIRAMID™ by using either the Merge or Import command.

7.3.2.1. Merge data

7.3.2.1.1. Open PIRAMID™ and load the template. The template is located in folder :All_Engr\Risk Engineering\Risk Ranking\Templates\P&MM_scenarios_template.pir

7.3.2.1.2. Click on the "Merge" command under 'File" in the toolbar to open a new window. (See figure 7.1). Before "Merging", the user is cautioned that the Probability Modules in the template ".pir" file and the ".pir" file that will be merged must be the same. If different, the user should remove the probability modules in the template that do not match the modules in the ".pir" to be merged. After merging, the user can add the probability modules back to the template.[2]

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[1] See PIRAMID™ Users Guide 5.8.4 for more information on creating scenarios. The user is expected to understand the basic operation of PIRAMID™.

[2] See PIRAMID users guide Section 5.7.1 and 5.7.2 for more information on "Adding" modules.

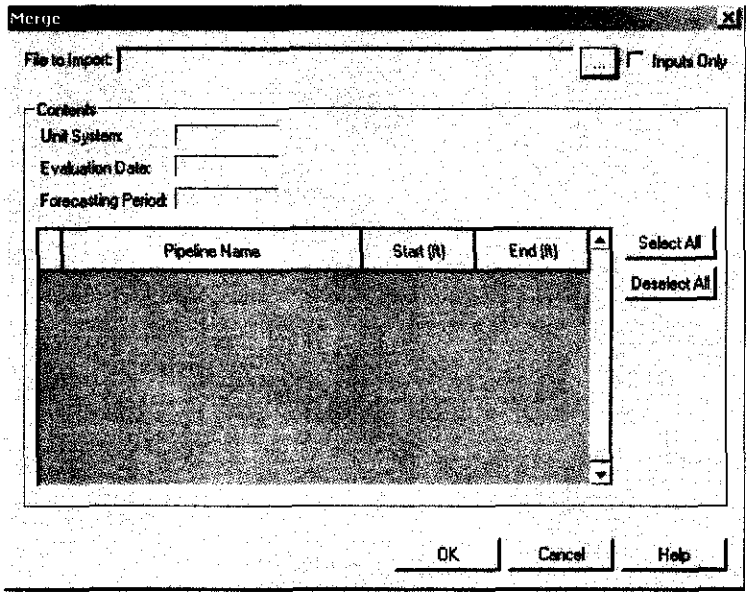


Figure 7.1. Merge window

7.3.2.1.3. Click on the three dot icon,  , to the right of the "File to Import" line to open a new window labeled "Import database". The user will need to locate the ".pir" file that contains the completed PIRAMID™ analysis for the HCA segment to be evaluated. When located, highlight the file name and click "Import". The .pir file name will now be listed in the 'File to Import" line, the Contents windows will display data and the segments in the ".pir "file will be displayed.

7.3.2.1.4. Check the box next to the "Inputs Only" entry. Check the box(es) next to the pipeline segments the user would like to merge. The user can click on "Select All" to choose every HCA segment to merge.

7.3.2.1.5. When segments have been chosen, click on "OK" to merge the data into the template. The data should merge and each segment should be listed under the System folder and under each scenario.

7.3.2.1.6. When the data has been merged, the user can delete the segment named "Test" under the "System" folder. It is not needed after the data has been merged.

7.3.2.1.7. Save the changes by Clicking on "File" in the main toolbar and click "Save As". Change the name of the .pir file to the appropriate name and save it in an appropriate folder on the Risk Engineering drive.

7.3.2.1.8. The user can repeat steps 7.3.2.1.2 to 7.3.2.1.6 to merge data from another ".pir" file into the template. Save the file after merging the data.

7.3.2.2. Import .pir file data

As an alternative, the user can import the data from a .pir file that has already been calculated.

7.3.2.2.1. Open PIRAMID™ and load the template. The template is located in folder: All_Engr\Risk Engineering\Risk Ranking\Templates\P&MM_scenarios_template.pir

7.3.2.2.2. Click on the "Import" command under 'File" in the toolbar to open a new window. (See Figure 7.2)

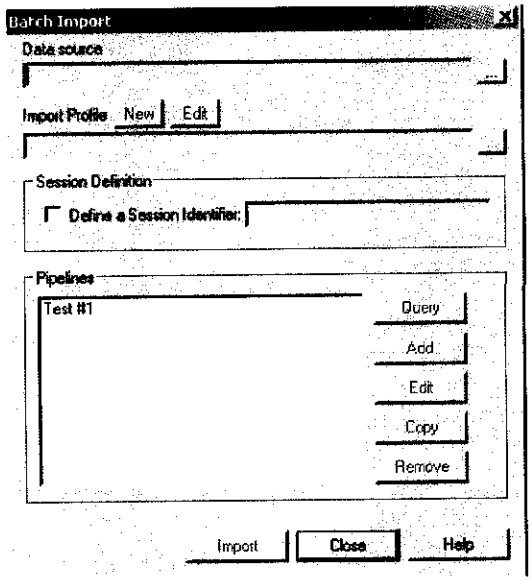


Figure 7.2 – Batch Import window

7.3.2.2.3. In the Batch Import window under "Data Source", the user will select "MS Access Database" located under the Machine Data Source tab. See Figure 7.3

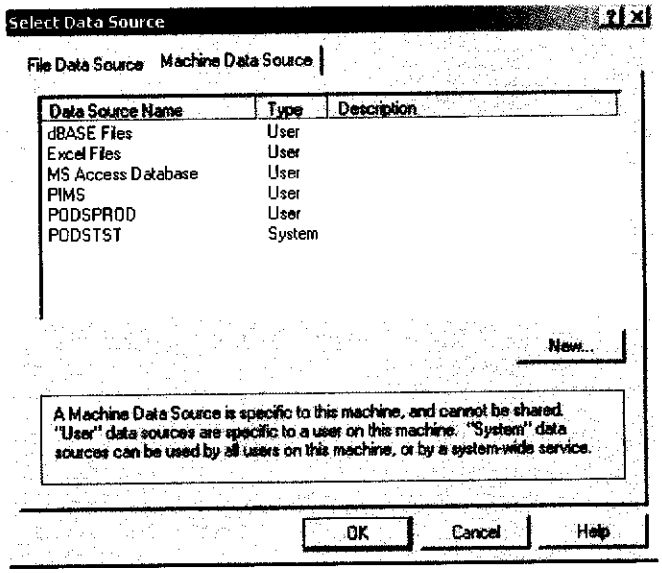


Figure 7.3 – Machine Data Source tab

7.3.2.2.4. Click on "OK" to open a window called "Select Database file". The user will click on "All files" under "List Files of Type:" and locate the .pir file containing the segments of interest.

7.3.2.2.5. Highlight the .pir file (it will be displayed in the Database Name window in the upper left corner of the active window) and click "OK".

7.3.2.2.6. Under Import profile, the user will need to load the profile that allows the .pir data to be imported. The file is named "PIRAMID.pdp" and is located in the folder All_Engr\RiskEngineering\RiskRanking\Profile\PIRAMID.pdp

7.3.2.2.7. After the profile is loaded, hit "Query" and another window opens named "Query Pipelines". Click OK and the segments from the .pir file will be loaded and be displayed into the lower left window. Highlight the segments to be imported and click the "Import" button. Answer "Yes" to merge with existing data.

7.3.2.2.8. Click on Close to import the data into the active .pir file.

7.3.2.2.9. When the data has been imported, the user can delete the segment named "Test" under the "System" folder. It is not needed after the data has been imported.

7.3.2.2.10. Save the changes by Clicking on "File" in the main toolbar and click "Save As". Change the name of the .pir file to the appropriate name and save it in an appropriate folder on the Risk Engineering drive.

7.3.2.2.11. The user can repeat steps 7.3.2.2.2 to 7.3.2.2.8 to import data from another '.pir" file into the template. Save the file after importing the data.

7.3.3. Modify Attributes in Scenario and Evaluation

7.3.3.1. Click on the "+" sign next to the System folder to expand and display the segments that were merged or imported from the previous step. Click on the "+" sign next to the Segments folder to expand it. An "italicized" segment will indicate an HCA designated segment exists in the pipeline segment. If no segment appears "italicized", verify an HCA area exists.[3] Each folder listed under the "System" should be color coded blue. If a folder color is yellow, there is data in an attribute(s) that is needed. The user should fill in the missing data by opening the ".pir" file that was used to merge and use that data for updating the segment attribute that was missing.

7.3.3.2. Click on the "Products" folder on any of the segments that was merged or imported. Check the box labeled "Apply to Multiple Pipelines". Click on "OK" and then click on "Select All" in the next window. All of the segments should then be checked. Click "OK" to apply.

7.3.3.3. Click on the "+" sign next to the Scenario folder to expand and display each of the scenarios to be evaluated. Clicking on the '+" sign next to each scenario will further expand the folder to display each segment listed under the system folder.

7.3.3.4. Using the output from the PIPER spreadsheet from Section 7.2.1, locate the first segment in the System folder on the PIPER spreadsheet. Identify each scenario to be evaluated by noting the activity in the column header for each "X" in the row for that segment. Multiple scenarios for each segment may be present.

7.3.3.5. In PIRAMID™, open a scenario to be evaluated by double clicking on the scenario folder. A new window named "Scenario Properties" will open with the scenario name in the Name window. Highlight "Modify Attributes Action1" in the Action window to activate the choices Add, Edit, Copy or Remove. Click on the Edit button to modify attributes. See Figure 7.4.

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[3] Open the attributes folder and go the HCA attributes. Check if any rechain segment is listed as "Yes" in the "HCA – PIC with 20+ SIHO" attribute or there is an entry in the "HCA – PIC with identified site" attribute other than "No". If there is an HCA, then the segment needs to be re-segmented. Re-segment if needed. If no, then no HCA exists on that segment and no evaluation will be required.

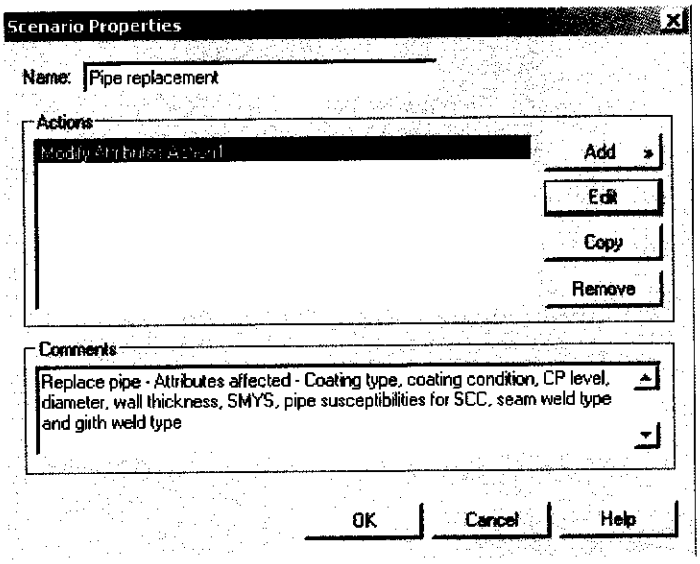



Figure 7.4 - Scenario Properties

7.3.3.6. A new window named Modify Line Attributes will open. (See Figure 7.5) Pipe replacement will be used as an example. In this window, the user will modify each segment in the left hand window that lists pipe replacement as a mitigative measure from the PIPER spreadsheet. Using the filter on the top right, attributes associated with pipe replacement will be shown. All other attributes still remain but are filtered out or hidden. Modifications are made to the attribute(s), however, not every attribute needs to be modified. (As an example – If the pipe being replaced is the same diameter, that attribute does not need to be modified.) When an attribute has been modified, a red "*" appears next to the attribute in the right window. Once modifications are completed for the attributes on the pipe segment folder, the user can click on the next segment requiring a pipe replacement action. An initial cost for implementing the scenarios will need to be entered under "Initial Cost ($1000's)". A red checkmark will appear when changes have been made to a folder. Be aware that if the user has imported many segments into the ".pir" file, pipe replacement may not apply to every one of them.

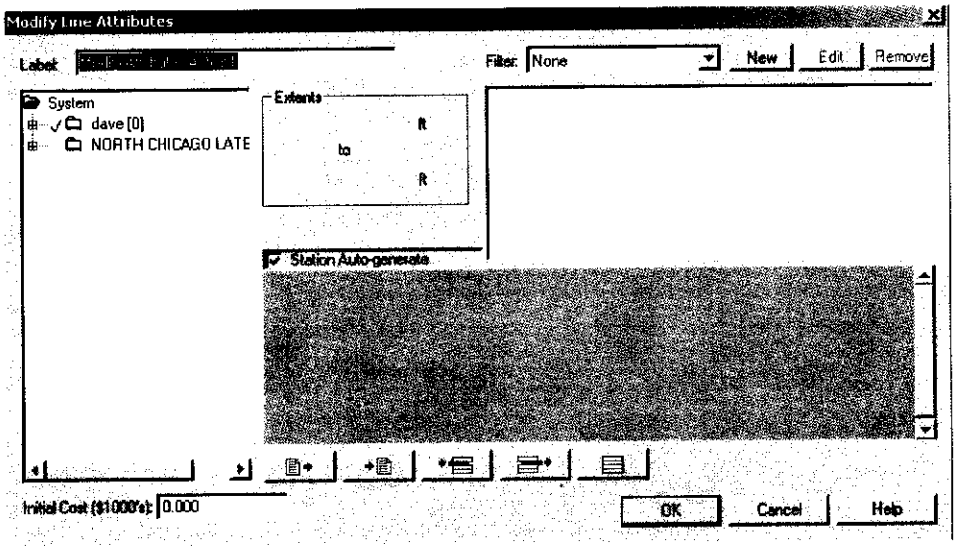



Figure 7.5 - Modify Line Attributes

7.3.3.7. Click on the "+" sign to the left of the line segment to be modified under the System folder. This will expand the line to display each segment including the "italicized" HCA's. Click to highlight the italicized segment. All the attributes will be displayed for that segment in the right window with pipeline information and current attribute value in the large window below "Station Auto-generate".

7.3.3.8. Click on the "down" *arrow* next to "None" in the Filter window. Highlight "pipe replacement" from the drop down window. This will display the attributes associated with a pipe replacement.

7.3.3.9. The user will be required to have the new attribute values prior to running the scenarios. These values can be obtained from Project Management, Operations or SME's. As an example – if the current pipe has a wall thickness of 0.280 in and a SMYS of 52K – the replacement pipe might be 0.325 in and 60K.

7.3.3.10. Click on each attribute in the top right window and make the pipe replacement modifications in the lower window by changing the attribute value. Some modifications may also require changes to the rechain numbers as well. Clicking on the down arrow next to an attribute in the lower window will open a drop down with attribute choices. Choose a new attribute if allowed from the drop down or enter the modification manually.

7.3.3.11. When all attribute modifications have been made to the current line segment, the user can select the next line segment in the left window to modify.

7.3.3.12. Repeat step 7.3.3.10 for each new segment for that particular activity.

7.3.3.13. The initial cost is the sum of each individual segment that was modified in the scenario. The unit costs must be the same for each diameter of pipe. As an example, for pipe replacement in 3 separate segments for 30" pipe, the cost for each segment should be the same cost per mile. If the segments are 1000', 2000' and 3000', and the unit cost is $500/foot, the initial cost sum is $3MM and 3000 will be entered in as the initial cost. If the unit costs are not the same, a new scenario will need to be created for those segments that are subject to a different unit cost.

7.3.3.14. When all the modifications have been made to the first scenario, Click on the "OK" button to close it and Click "OK" again. A "Scenario Update" screen will appear to show the progress.

7.3.3.15. After each scenario has been selected and the modifications have been made, the user will Click on "Calculate" in the main toolbar and Click on "All" from the drop down menu. As PIRAMID™ calculates the data; a window will appear and display the progress of the calculation.

7.3.3.16. After the calculation is complete, all folders that have been modified will turn blue. Save the changes by Clicking on "File" in the main toolbar and click "Save".

7.3.4. Evaluate PIRAMID™ data

The Segment and Decision Analysis functions in PIRAMID™ are used to evaluate the scenarios for further review by the SME's and possible implementation.

7.3.4.1. Open the Evaluation menu on the top toolbar and click on "Options" from the drop down menu. There are two tabs. On the Risk display tab, verify the Component Risk Units and Segment Risk Units in per segment-yr are checked. Modify if needed. See Figure 7.6.

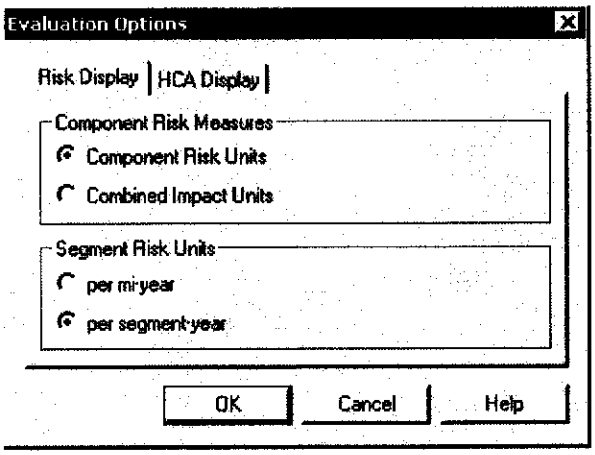



Figure 7.6 – Evaluation Options – Risk Display

7.3.4.2. Click on the HCA Display tab and check "Show HCA segments only". Click "OK" to save the changes.

7.3.5. Segment Analysis

7.3.5.1. Open the Evaluation menu on the top toolbar; highlight Segment Analysis and then "Define". Check the box to the left of PIRAMID™. Checkmarks will appear in all the remaining boxes. The user also has the option to check each box individually.

7.3.5.2. Click on "OK" to start the segment analysis. A window will open showing the progress of the analysis. When the calculation is complete, a new window will open named "Define Segment Analysis. See Figure 7.7 below.

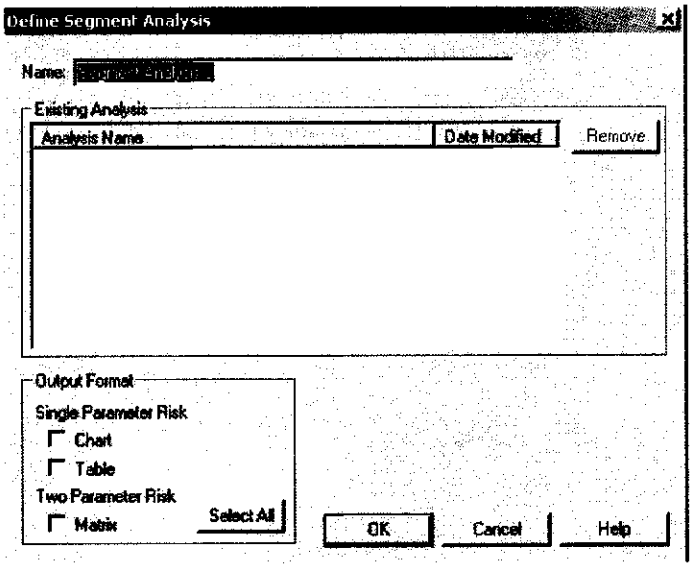
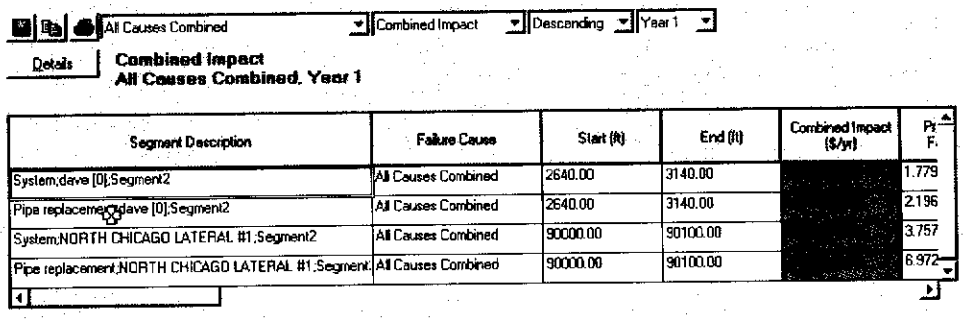



Figure 7.7 – Define Segment Analysis window

7.3.5.3. The user should change the name of the output to indicate what was calculated. (As an example – Scenarios for all GC #1 HCAs.) Check the box next to "Table" under the Output Format. Click OK to calculate. The output from this analysis is used to evaluate risk reduction.

7.3.6. Saving PIRAMID™ Segment Analysis output

7.3.6.1. Using the left mouse button, highlight the cells labeled under the headers Segment *Description*, Failure Cause, Start, End and Combined Impact (See Figure 7.8 below). Click on the icon *labeled* "  " to copy the data.




| Segment Description | Failure Cause | Start (ft) | End (ft) | Combined Impact ($/yr) | Pi F. |
|---|---|---|---|---|---|
| System;dave [0];Segment2 | All Causes Combined | 2640.00 | 3140.00 | | 1.779 |
| Pipa replacemer dave [0];Segment2 | All Causes Combined | 2640.00 | 3140.00 | | 2.196 |
| System;NORTH CHICAGO LATERAL #1;Segment2 | All Causes Combined | 90000.00 | 90100.00 | | 3.757 |
| Pipe replacement;NORTH CHICAGO LATERAL #1;Segment | All Causes Combined | 90000.00 | 90100.00 | | 6.972 |

Figure 7.8 – PIRAMID™ Segment Analysis Output

7.3.6.2. Paste the data into the Scenario Segment Analysis spreadsheet. The spreadsheet is located in the folder All_Engr\RiskEngineering\Risk Ranking\Post Piramid/Segment Analysis_Scenarios. The user will need to append to the spreadsheet as data is added from the evaluation of additional scenarios. The spreadsheet will contain a macro that calculates the risk reduction for each activity that was chosen. The risk reduction percentage and the total combined impact cost will be used for evaluating the P&MM activity.

7.3.7. Calculate Benefit-Cost ratio

7.3.7.1. Open the Evaluation menu on the top toolbar; highlight Decision Analysis and then "Define". A new window will open that lists the Available Segments and Scenarios to Analyze. (See figure 7.9.)

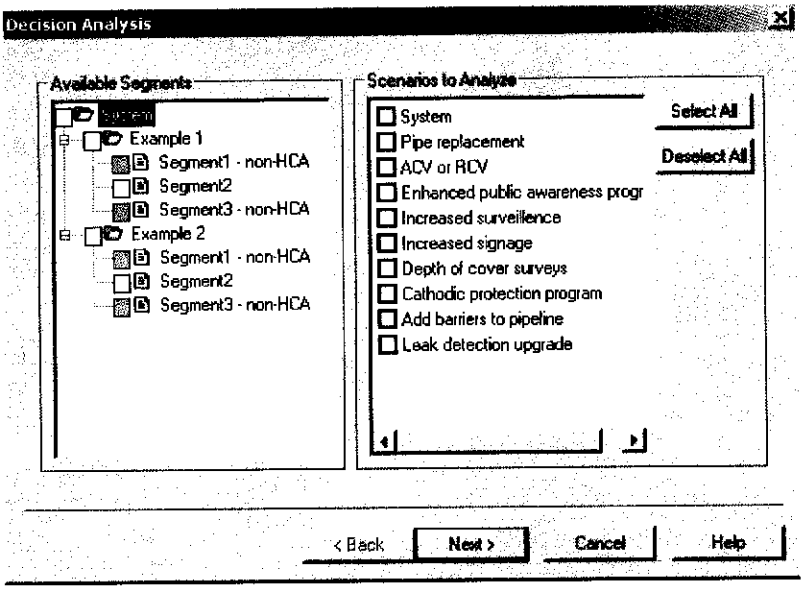


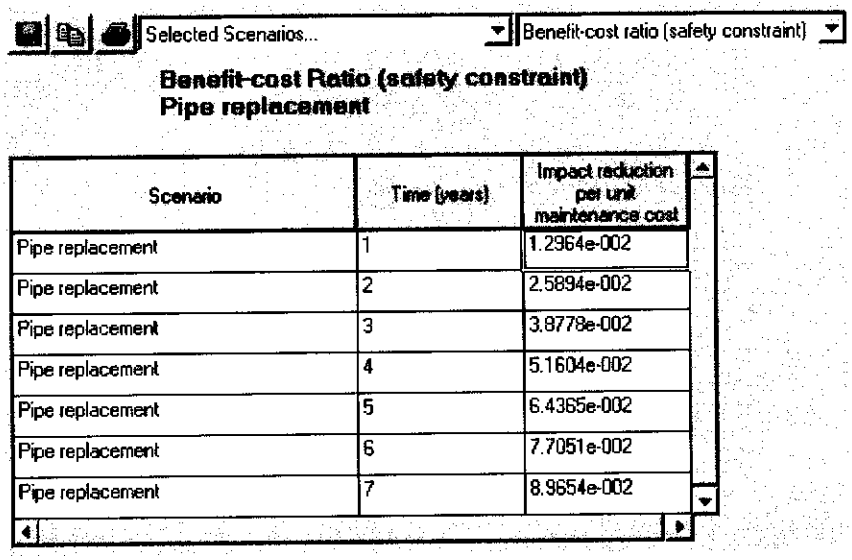

Figure 7.9 - Decision Analysis Window

7.3.7.2. Check the box to the left of System under the Available Segments window. Checkmarks will appear in the boxes next to the segments to be analyzed.

7.3.7.3. Check each box to the left of "System" and each scenario under the Scenarios to Analyze window. Click "Next".

7.3.7.4. Check the circle next to Benefit-cost ratio and then click on the "Add" button. The Benefit-cost ratios will appear in the "Selected Options" window. Click on 'Finish" and PIRAMID™ will calculate the benefit-cost ratios and show the progress of the calculation.

7.3.7.5. A new window will open and the user can change the name of the output to indicate what was calculated. Check the box next to "Table" under the Output Format. Click OK to calculate. A window will open that displays the calculated results. (See Figure 7.10 below). The output from this analysis is used to evaluate the benefit cost.




| Scenario | Time (years) | Impact reduction per unit maintenance cost |
|---|---|---|
| Pipe replacement | 1 | 1.2964e-002 |
| Pipe replacement | 2 | 2.5894e-002 |
| Pipe replacement | 3 | 3.8778e-002 |
| Pipe replacement | 4 | 5.1604e-002 |
| Pipe replacement | 5 | 6.4365e-002 |
| Pipe replacement | 6 | 7.7051e-002 |
| Pipe replacement | 7 | 8.9654e-002 |

Figure 7.10 – PIRAMID™ Benefit Cost output

7.3.7.6. Using the left mouse button, highlight the cells labeled under the headers Scenario, Time and Impact Reduction per unit maintenance cost. Click on the icon labeled "  " to copy the data.

7.3.7.7. Paste the data into the second tab of the Scenario Segment Analysis spreadsheet. The spreadsheet is located in the folder All_Engr\Risk Engineering\Risk Ranking\Post Piramid/Segment Analysis_Scenarios. The user will need to append to the spreadsheet as data is added from the evaluation of additional scenarios. The spreadsheet will contain a macro that calculates whether the benefit cost is greater than or equal to 1. It will also show the year(s) where the benefit/cost meets that criterion. The benefit/cost will be used for evaluating the P&MM activity.

7.4. Evaluation of P&MM activities using PIRAMID™ output.

The total combined impact cost in $/year and the benefit/cost ratio outputs from PIRAMID™ are the criteria to be used for scenario evaluation. The total combined impact cost is used to calculate a reduction in risk. Percentage in risk reduction is calculated by determining the difference between the total combined impact cost for the system and the scenario. The initial criterion to be used is benefit/cost to develop the list for review by the SME's.

7.4.1. Benefit/Cost Criteria

7.4.1.1. The benefit/cost must be greater than or equal to 1 (>=1). If the ratio is less than 1, the cost to implement the activity exceeds the benefit and will not be considered. The risk reduction percentages and the total combined impact costs for those activities meeting the benefit/cost criteria will be identified in the evaluation spreadsheet. This spreadsheet will be used for review with the field operations personnel and the SME's.

7.5. Subject Matter Expert (SME) review of viable P&MMs

7.5.1. The risk engineer will meet with the SME's to discuss the results of the P&MM evaluation. The list of HCA segments along with their associated P&MM(s) will be used. SMEs will review and confirm the measures currently being performed for each threat on a line by line basis.

7.5.2. The results of the SME review meeting to discuss the implementation of each specific P&MM will be documented. A documented reason for not implementing a specific P&MM activity will also be provided.

7.6. Implement P&MMs

7.6.1. The finalized list of HCA segments along with their associated P&MM(s) evaluated by the SME's will be used for budgeting purposes.

# Appendix B

## Table of Contents



## 1. Applicability

☒ Gathering
☒ Processing
☒ Transmission/Regulated Onshore Gathering
☒ Kinder Morgan Power Company

## 2. Scope

The Management of Change (MOC) process aids in managing technical, physical, procedural and organizational changes, whether permanent or temporary, that affect a facility's safe operation or integrity. It helps to ensure that management, field and/or staff personnel review proposed changes to identify any specific issues that need resolution before accepting and implementing changes. The Action Decision Committee must review all permanent changes and emergency variances to Company Engineering Standards and O&M Procedures Manual. See **O&M Procedure 001**.

## 3. Core Information and Requirements

The MOC process entails reviewing all Field Initiated proposed changes to operations facilities, Field Initiated design changes, changes to an existing PSM facility, and to the **Pipeline Integrity Management Program** (IMP), including:

- Technical changes – changes or upgrades to equipment and processes or using new technology or changes to a process in the IMP program
- Physical changes – changes to equipment or piping.
- **Reductions of the MOP of a pipeline due to Pipeline Integrity Assessment results.**
- Procedural changes – site-specific procedures (SSPs) or the IMP
- Organizational changes – changes to IMP management or supervisory responsibilities
- Changes to chemicals used in the process
- Changes to operational and mechanical procedures and equipment

The MOC process addresses planning and the unique nature of each circumstance. The MOC field operations analysis applies to changes involving equipment at compressor stations, meter stations, regulator stations, valve locations and pipelines The MOC IMP analysis shall identify and take into consideration the impact of changes to pipeline systems and their integrity.

The MOC request shall include the following:

- Reason for change
- Analysis of implications (include the expected revised process or design information before and after the change is put in place)
- Required work permits and timing for receiving them (ensure that all necessary permits are identified and acquired prior to performing the work)
- Identity of affected parties and communication process to them
- Factors that will limit the timing of the change

- Operator Qualification (OQ) issues (i.e., will the change affect who will be qualified to do the task?) and new training requirements for added responsibilities
- Impact upon the current IMP or schedule of assessments
- Specific proposals that require a waiver or notification to DOT/OPS or a state agency

### 3.1. When Management of Change is Needed

For pipeline operations, any Field Initiated deviation from normal design conditions or design parameters is a change. In addition, if there is a change to an existing PSM facility, an MOC is required. Normal conditions are defined during the facility's design, construction or operation and may or may not be written. Management will ensure that all employees understand normal condition limits, typically found in the facility operating procedures.

For the IMP, any deviation from the Baseline Assessment Plan or approved program is a change. The Director, Risk Engineering is responsible for evaluating any changes to the program or schedule. Jurisdictional Gathering pipelines are not included in the IMP.

All employees may propose changes. This procedure must be followed for all changes that are beyond or outside normal condition limits or that modify the existing IMP to ensure that changes are adequately reviewed.

Examples of changes that may need to be reviewed are:

- Replacing any piece of equipment, valve, pipe or fitting: Replacement in kind is replacing a device with a new piece of equipment of the same pressure, temperature and flow rating that is intended for the same use, is made of the same materials and (if required) has been pressure tested and certified. Note: A replacement in kind does not require further review.
- Changing operating or mechanical procedures (written or undocumented)
- Installing new equipment, valves, pipe or fittings
- Changing operating parameters or status (out-of-service, bypassing a system, abnormal condition)
- A Gas Quality waiver is implemented.
- Changing a chemical or catalyst used in the process: Revisions to chemicals, equipment or procedures, including but not limited to:
  - Chemicals used in the process such as catalysts, anti-foulants, absorbents, amines or process feed
  - Equipment where material, rating, intended service, etc. is different from the piece to be replaced
  - Operating parameters (temperatures, pressures, flows, etc.) that are outside of documented or generally understood ranges
- Procedures for maintaining ongoing equipment integrity
- A new work procedure
- A temporary change
- A permanent change
- A repetitious change - making the same change on different pieces of equipment. Previous documentation should be available. If so, the change can be considered repetitious and does not require another **OM100-15 -- Management of Change Form**. Upstream and downstream operations and operating procedures shall be reviewed to verify a repetitious change. One **OM100-15 -- Management of Change Form** is sufficient for the same change to multiple pieces of equipment
- Any item listed in the Qualification section on **OM100-15 -- Management of Change Form**

Examples of when changes to the Pipeline Integrity Management Program/Baseline Assessment Plan may need to be reviewed are:

- Any change that occurs in a high consequence area (HCA) that could affect pipeline safety or risk assessment
- Any significant change in the IMP plan.
- Any significant change to the Baseline Assessment Plan.
- Reductions of the MOP of a pipeline due to Pipeline Integrity assessment results.

- A new transportation load (considering the effects of cyclical loading and fatigue, internal corrosion or OPP capacity) that could affect a downstream HCA.
- Any item listed in the Qualification Section on **OM100-15-IMP**

### 3.2. Management of Change Form

To determine what type of change is proposed, the employee who proposed the change will complete **OM100-15 -- Management of Change Form** or **OM100-15-IMP** (see Attachment 1). Each form shows the type of change proposed in the Qualification Section.

3.2.1. **OM100-15 -- Management of Change Form**:

- If all answers on the form Qualification Section are checked "NO," the change is a replacement in kind. Proceed with the change. Retention of the form will be for the duration of the project. If the change is to equipment or facility status, refer to **Engineering Standard E1700, Project Closure Documentation** for documentation requirements.
- If any answer in the Qualification Section is checked "YES," the proposed change is not in kind and requires further review. The Plant Manager, Operations Manager, Technical Manager or designee will make sure a Project/Field Engineer is assigned to oversee the MOC if required and complete any additional information required on **OM100-15 -- Management of Change Form**. This form will be kept in the facilities' files for the life of the facility.
- For a Temporary MOC, if any answer in the Qualification Section is checked "YES", the proposed change is not in kind and requires further review. The Plant Manager, Operations Manager, Technical Manager or designee will make sure a Project/Field Engineer is assigned to oversee the MOC if required and complete any additional information required on **OM100-15 – Management of Change Form**. This form will be kept for the duration of the temporary modification.

Number MOCs using a system that identifies the facility, year and MOC number (e.g., 302-06-01). After completing the form, the employee will review the proposed change with the applicable Plant Manager, Operations Manager, Operations Coordinator, Technical Manager or designee.

3.2.2. **OM100-15-IMP** Management of Change Form - Integrity Management Program:

- If all answers on the form Qualification Section are checked "NO," no further review is required.
- If any answer on the form is checked "YES," further evaluation is required. The originator should sign the form and send it to the Director, Risk Engineering for any additional review steps and retention. This form will be kept in the facilities' files for the life of the facility.
- The Director, Risk Engineering or designee will assign a unique number for MOCs submitted on **OM100-15-IMP**

Reviewers will sign the **OM100-15 -- Management of Change Form** or **OM100-15-IMP** indicating the initial review is complete.

### 3.3. Emergency Repairs

When emergency repairs that normally require going through the MOC process are necessary, the Plant Manager, Operations Manager, Technical Manager or designee may approve the change and document the process as soon as possible after the fact.

### 3.4. Management of Change Review Process – Field Operations

Evaluate all changes identified as revisions or not "in kind" to determine the effects on employee safety and health. Complete **OM100-15 -- Management of Change Form**, as follows:

3.4.1. Change Description

The MOC originator, Plant Manager or Project/Field Engineer will:

- Document what is being changed
- Provide a description of the change, including enough detail to evaluate impacts on employee safety and health

**Note**: If the change involves equipment, establish the technical basis for the change. At this point, change design should take place. The size and complexity of the change (e.g., capital projects) will determine the requirements for completing this step.

3.4.2. Impact Evaluation

While planning for the change, the MOC originator, Plant/Operations Manager, Director, Risk Engineering (if related to HCA) and/or project/field engineer will evaluate the impacts on:

- Operability (Operations Manager or designee)
- Mechanical design (Technical Manager or designee)
- Safety, health and environment (Environmental, Health and Safety [EHS] representative or designee)
- Other parts of the system
- The **Pipeline Integrity Management Program**

The MOC originator, Plant Manager or project/field engineer will provide a schedule for changes to ensure compliance with **Pipeline Integrity Management Program** requirements.

**Note**: At this point, perform a process hazard analysis (PHA) if required.

Use **OM100-27, "What-If" Checklist** as a reference during the evaluation. If a more detailed PHA is required, contact the PSM Coordinator. Check off all applicable items under the Updates Required Section of **OM100-15 -- Management of Change Form**. Document action items that require resolution prior to implementing the change. Use **OM100-23, Action Item Summary Report**. Following the review, document whether the proposed change is safe.

3.4.3. Implementing the Change

The Operations Manager, Technical Manager or designee has approval authority and shall:

- Make the change and train affected employees when the change is to operating and maintenance procedures or to the **Pipeline Integrity Management Program**
- When the change is to equipment, chemicals, materials or personnel:
  - Install the equipment
  - Ensure Subject Matter Expert reviews change (document the SME's qualification in the report)
  - Write or update procedures
  - Train employees
- Complete **OM100-14, Pre-Startup Safety Review Checklist**

3.4.4. Change Startup

The Operations Manager, Technical Manager or designee will ensure the following requirements are completed before change startup:

- Evaluate impacts on employee safety and health, including DOT OQ compliance. The change may require training to ensure that employees are qualified to effect the change and to operate the facilities post-change.
- Ensure the change is safe
- Resolve all action items from the PHA (if conducted) that have safety implications
- Update all affected procedures (see **O&M Procedure 001**)
  - Notify and if required, train all affected employees

Complete **OM100-14, Pre-Startup Safety Review Checklist** (if required) addressing all action items:

- Approve startup
- Make sure all temporary changes to conditions are returned to conditions as they were before the change

3.4.5. MOC Signoff/Closure

- Review **OM100-15 -- Management of Change Form** and sign off, indicating that the MOC process has been followed
- Ensure all process safety information and procedures are updated in conformance with the change
- Compare the actual operating results with the expected results after the change is made. Modify the change made if the expectations are not met and revise the MOC file copy to indicate the adjustment made
- File the form in the appropriate MOC file if retention is required per Section 3.2.

3.4.6. Management of Change Review Process – Integrity Management Program

The Director, Risk Engineering or designee will coordinate evaluating any proposed change submitted on **OM100-15-IMP** or **OM100-15 -- Management of Change Form** to determine the effects on pipeline integrity or the Integrity Management Program. The evaluation can include using Subject Matter Experts, Field Operations personnel and other qualified people. The Director, Risk Engineering or designee will provide a copy of an approved MOC to all affected field offices and departments.

## 4. Training

Not applicable

## 5. Documentation

Retain MOC documentation in local files for the life of the facility if retention is required per Section 3.2. If the change is to equipment or facility status, refer to **Engineering Standard E1700, Project Closure Documentation** for requirements. If the change is to MAOP/MOP only, send a copy of the completed MOC documentation to the Engineering Records Department in Lakewood.

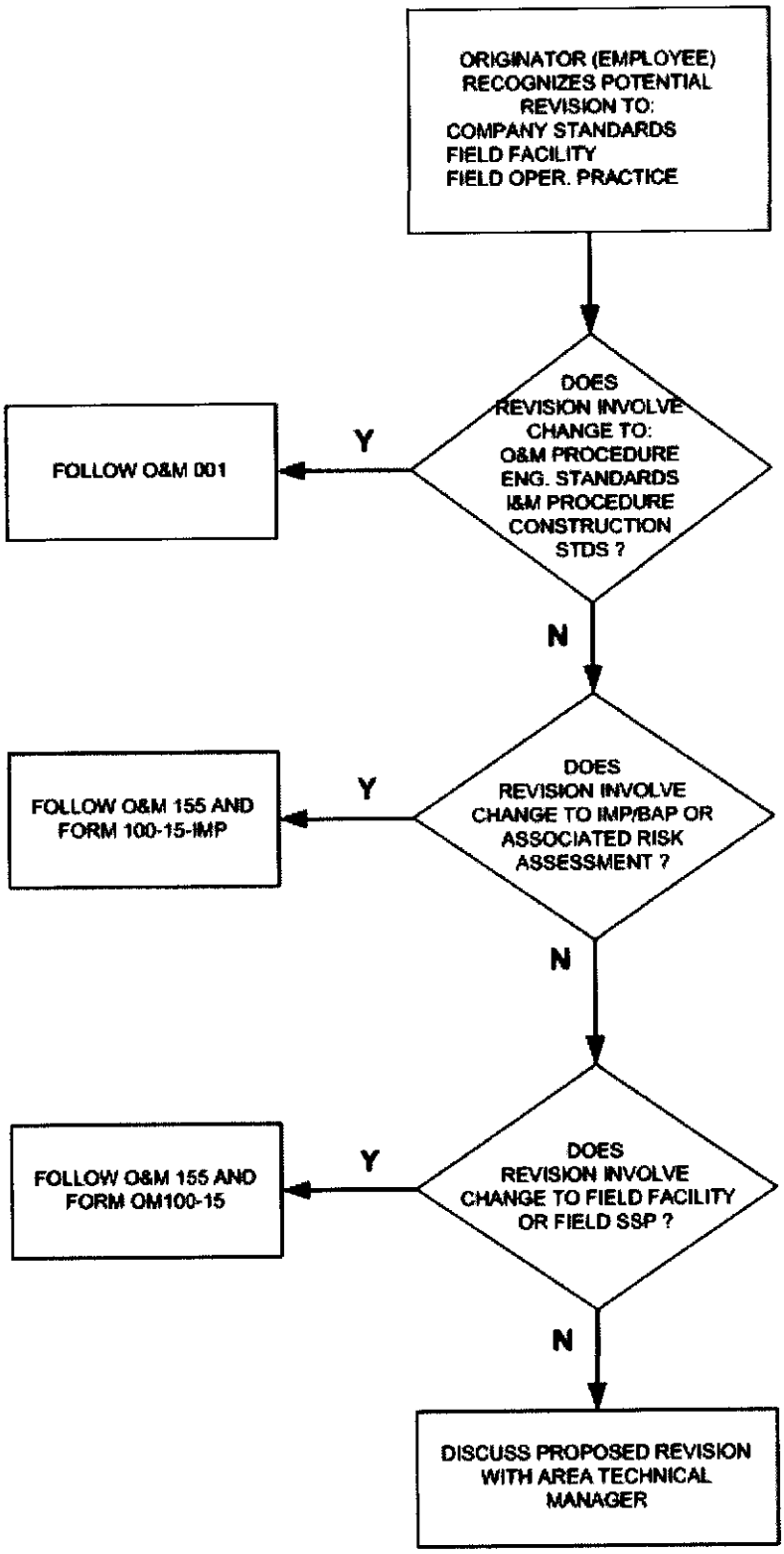
The PSM Coordinator will also maintain Field Operations' MOC documentation. For PSM/RMP facilities, send a copy to the PSM Coordinator.

The Director, Risk Engineering will maintain original **OM100-15-IMP** forms for the life of the Integrity Management Program.

## 6. References

- 49 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals
- 49 CFR Part 192.911(k), 192.947(d)
- **O&M Procedure 001 – Standards Modification**
- **O&M Procedure 100 – Employees'O&M Responsibilities**
- **O&M Procedure 156 – Pre-Startup Safety Reviews**
- **O&M Procedure 157 – Process Hazard Analysis**
- **O&M Form OM100-14 – Pre-Startup Safety Review Checklist**
- **OM100-15 -- Management of Change Form**
- **OM100-23, Action Item Summary Report**
- **OM100-27, "What-If" Checklist**
- **Kinder Morgan - EHS - Process Safety Management (PSM) Program Plan**
- **Pipeline Integrity Management Program**

## Attachment 1 – O&M 155 MOC PROCESS FLOW CHART



KINDER MORGAN

# MANAGEMENT OF CHANGE FORM
# INTEGRITY MANAGEMENT PROGRAM

**CHANGE ORIGINATOR (RESPONSIBLE PARTY):** COMPLETE THE FOLLOWING QUALIFICATION FORM TO DETERMINE IF MANAGEMENT OF CHANGE APPLIES.

**BRIEF DESCRIPTION OF THE CHANGE:**

**BRIEF REASON FOR THE CHANGE:**

## QUALIFICATION SECTION:

| **Does the proposed change include one of the following:** | **YES** | **NO** |
|---|---|---|
| Reassessment period change due to lack of internal inspection tools (192.943(a)(1)) – see Note 1 | ☐ | ☐ |
| Reassessment period change to maintain product supply (192.943 (a)(2)) - see Note 1 | ☐ | ☐ |
| Plan modification due to changes in the Baseline Assessment Plan (BAP) – see Note 2 | ☐ | ☐ |
| Reduction in the MOP due to Pipeline Integrity Assessment results | ☐ | ☐ |
| Program change that significantly modifies the Integrity Management Program (192.909(b)) – see Note 2 | ☐ | ☐ |
| Program change that significantly modifies carrying out the program elements (192.909(b)) – see Note 2 | ☐ | ☐ |
| Use of other technology not currently being used for integrity evaluation (192.937(c)(4)) – see Note 3 | ☐ | ☐ |
| Management or supervisor responsibilities significantly changed from current policies (192.915) | ☐ | ☐ |
| Method of conducting risk assessment significantly changed from current policies (192.917(c), 192.947(d)) | ☐ | ☐ |
| Plan modification due to program review (192.947(d)) | ☐ | ☐ |
| Knowledge and/or training requirements changed for management, supervisory or SME (192.915) | ☐ | ☐ |
| Modification that is considered significant by Originator (192.947) | ☐ | ☐ |

**If the answer to any of the questions on this form is marked "YES," the change is subject to further review.**

**If all of the questions are checked "NO," the change should be considered an administrative change not requiring documentation or else the Originator should discuss the item with the Risk Engineering Director for further clarification.**

☐ **NO** "**STOP**" Further Integrity Mgmt review is not required. The change is an administrative change or may require field MOC review (OM100-15).

☐ **YES** Further evaluation is required. Fill out the remainder of this page and press the "Send to Risk Engineering" button below.

**Note 1** – DOT waiver required at least 180 days before end of the required reassessment interval (see 192.943(b), 192.949)

**Note 2** – DOT/State notification required within 30 days after adopting change (192.909, 192.911, 192.949)

**Note 3** – OPS notification required 180 days before conducting the assessment (192.937(a)(4), 192.949)

**Originator (or Responsible Party):** DATE:

**Director-Risk Engineering or Designee:** DATE

Send to Risk Engineering

**MOC / REVIEW**

**MOC NO:** _____
*(assigned by Director, Risk Engineering)*

**DATE:**

**WHAT IS BEING CHANGED?**

**DESCRIPTION OF THE CHANGE:**

GUIDANCE: Provide sufficient detail for evaluating the impacts of the change. Attach design information, technical basis, sketches, current and/or new procedures, SME recommendations, etc.

**DURATION FOR CHANGE**: ☐ PERMANENT ☐ TEMPORARY – expires on _____ (date)

If the change is a reduction in MOP include the following:

- Anomaly criteria that initiated the reduction?
- Is the anomaly in an HCA?
- What is the pressure reduction requirement (i.e. 80% of recent high pressure, based on RSTRENG safe pressure)?
- What actions were taken to initiate the reduction and when?
- Date the target pressure reduction achieved?

**EVALUATION OF IMPACTS UPON PROGRAM OR SCHEDULE (if applicable)**

GUIDANCE: Provide a Program or Schedule Impact evaluation.
1). What are the impacts of the proposed change upon: Baseline or Reassessment Schedule, improvement in overall Risk Assessment program, additional training requirements, etc.?
2). Document the impacts. If none, say NO IMPACTS.

**OPERABILITY REVIEW OF IMPACTS:**

| | | |
|---|---|---|
| ☐ **YES**: The requirements have been addressed. | Reviewed and approved by Director-Risk Engineering or Designee: | |

Date: _____

**EVALUATION OF NEW TECHNOLOGY (if applicable)**

GUIDANCE: Provide an evaluation of the proposed new technology use for risk assessment.
1) Provide a detailed description of how an equivalent understanding of the condition of the pipe will be determined over current procedures, equipment to be used, etc.
2) Attach relevant documentation, study results, SME recommendation, etc. that can be used for DOT submittal
3) Discuss any additional training, procedures, capital or equipment expenses, etc. required for use of the new technology
4) Document the impacts. If none, say "NO IMPACTS".

| | | |
|---|---|---|
| ☐ **YES**: The requirements have been addressed. | Reviewed and approved by Director - Risk Engineering or Designee: | |

Date: _____

| EVALUATION OF PLAN MODIFICATION OR KNOWLEDGE/TRAINING MODIFICATION (if applicable) | | |
|---|---|---|
| GUIDANCE: Provide an evaluation of proposed changes to the Integrity Management Plan.<br>1) Provide wording change and location in IMP and expected improvement.<br>2) Discuss change in knowledge or training requirements and expected program improvement.<br>3) Discuss change in management or supervisory responsibilities and impact on program.<br>4) Document the impacts. If none, say "NO IMPACTS". | | |
| | | |
| ☐ **YES**: The requirements have been addressed. | Reviewed and approved by Director-Risk Engineering or Designee: | |

Date: _____

| UPDATES REQUIRED | | |
|---|---|---|
| **CHECK IF REQUIRED** | **DATE COMP/SCHEDULED** | **RISK ENGINEERING SIGN OFF** |
| ☐ IMP MODIFIED | | |
| ☐ O & M PROCEDURES REVISED (ADC APPROVAL REQUIRED) | | |
| ☐ SPECIFIC OPERATING PROCEDURES DEVELOPED AND COMMUNICATED | | |
| ☐ MANAGEMENT, SUPERVISORY, SME TRAINING/EDUCATION DOCUMENTED | | |
| ☐ BASELINE / REASSESSMENT SCHEDULE CHANGED | | |
| ☐ DOT / STATE NOTIFICATIONS SENT:<br>180 DAY WAIVER / NOTIFICATION SENT: _____(date)<br>30 DAY NOTIFICATION SENT: _____ (date) | | |
| ☐ TEMPORARY CHANGE EXPIRES _____<br>☐ DATE MOP RESTORED _____ | | |
| ☐ OTHER | | |

| ACKNOWLEDGEMENT OF MOC COMPLETION | |
|---|---|
| ☐ EVALUATION COMPLETE WITH SIGNOFF<br>☐ OPERATING PROCEDURES UPDATED<br>☐ NOTIFICATION / TRAINING COMPLETED<br>☐ SCHEDULE CHANGED<br>☐ DOT / STATE NOTIFICATIONS COMPLETED | ALL REQUIREMENTS FOR CHANGE HAVE BEEN MET.<br>BY: _____<br>*Director, Risk Engineering or Designee*<br>DATE: |

COMMENTS: