U.S. Department
of Transportation

Pipeline and Hazardous Materials
Safety Administration

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. Ira Rosen, P.E.
Project Manager
Alaska Department of Environmental Conservation
P.O. Box 111800
Juneau, AK 99811

Dear Mr. Rosen:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) appreciates the opportunity to provide comments on the Proposed Risk Assessment Methodology for the Alaska Risk Assessment of Oil and Gas Infrastructure. PHMSA believes a comprehensive state-wide risk assessment of the oil and gas infrastructure will help focus efforts on the high-risk infrastructure.

We have reviewed the proposed methodology and our comments are attached. If the State Agency Oversight Team or others would like to get further explanation or have a discussion concerning our comments please let us know.

Sincerely,

Dennis W. Hinnah

Dennis Hinnah
Deputy Director, Western Region
Pipeline and Hazardous Materials Safety Administration

Enclosure: *PHMSA Integrated Comments on the ARA Methodology*

Integrated Comments on the ARA Methodology
May 26, 2009

Overall Reaction

PHMSA believes that the concept of doing a risk assessment including all segments of Alaska's energy production and transmission infrastructure has great potential value. If implemented successfully, it will give regulators and decision makers a balanced view of the relative risks of the different segments. This view will support any needed strengthening of regulation or regulatory oversight, and allow both agency and operator resources to be allocated where the greatest risk reduction can be achieved.

PHMSA has structured our comments below to support Alaska's objectives. All are provided with a view to support the State of Alaska in realizing the greatest benefit possible from the considerable resources committed to the effort. Our review comments have been structured around the following major categories:

- Study Objectives
- Relationship of Study Team to Stakeholders
- Scope, Methodology & Data
- Risk Comparisons
- Consideration of Alternative Approaches
- Appendices

Under these six categories we have integrated both top-level observations (which are numbered and **highlighted in bold** and presented immediately below each category heading) and detailed comments. Comments are based on the methodology as documented in the "Proposed Risk Assessment Methodology for the Comprehensive Evaluation and Risk Assessment of Alaska's Oil and Gas Infrastructure". We recognize that the final methodology has yet to be selected, but offer our comments to support the Alaska ADEC in selecting a methodology that will realize the project potential.

PHMSA Comments - Study Objectives

1. **Achieving the stated ARA objectives will require cooperation from operators**, both in completing the assessment and in implementing risk mitigation or management measures. Operator understanding and acceptance of study objectives, a clearly documented methodology to characterize risks, and the opportunity to collaborate in identifying mitigation or management measures will probably be necessary to secure that cooperation. From the ARA Methodology document, it is unclear how operator involvement is to be secured. Several sub-objectives in the approach seem likely to undermine securing operator participation (e.g., the sub-objective related to determining how much money should reasonably be spent on risk management). In addition, the methodology to be used in the event that operator cooperation is not forthcoming should be clearly described.

2. **It appears that the Objective "recommend measures to mitigate or manage risks" should be the focus of the assessment**, and should be pursued by application of a methodology designed to systematically seek answers to the following six questions:
    a. Which segments of the state's energy infrastructure is the study to assess (inventory)?
    b. What is known about the factors affecting the risk of these segments?
    c. What does available information say about current risk of these segments?
    d. How completely are known risks regulated?
    e. What (unregulated) management practices are critical to sustainable performance in managing risks?
    f. What management & mitigative measures should be undertaken to reduce risk?

3. **ADEC should consider rewording the Objective "quantify & rigorously evaluate risks" to focus the assessment on *evaluating & characterizing* the risks** in a manner that supports the following functions: (a) comparison of the *relative risks* of different segments of the energy infrastructure, and (b) identification and evaluation of risk reducing measures. Because it is not clear how the proposed methodology will support rigorous quantification of risk (as discussed below), the methodologies presented in the ARA Methodology document are unlikely to successfully support either function.

PHMSA Comments - Relationship of Study Team to Stakeholders

4. **The scope and nature of regulatory oversight authority of the state and federal governments needs to be explicitly identified** to help clarify which agency should take action based on proposed management and mitigation measures. If the ARA is to support understanding and management of risks in the future, special consideration should be given to agency responsibility for regulation of the design, construction and operation of new pipeline facilities.

The risk assessment methodology and results must be "transparent" to ensure operators, regulators, and the public are able to understand the source and potential value of recommendations for new pipeline management and mitigation strategies. Study transparency, the quality of operator input, and the prospect of operator support for implementing meaningful mitigation & management measures would all be improved by a more active operator role in the assessment.

The makeup of the "Risk Advisory Team" and its responsibilities are not clearly defined. At a minimum, an operator role on this team and representation from jurisdictional agencies seems prudent.

PHMSA Comments - Scope, Methodology & Data

5. **It is unclear how the scope and methodology selected support attainment of the stated top-level objectives.** Study objectives must drive the selection of scope and methodology. [These objectives have been stated as: (a) identify safety, environmental & operational risks (b) quantify & rigorously evaluate those risks, and (c) recommend measures to mitigate or manage those risks.] Details are discussed below.

6. **The ARA Methodology document did not adequately explain how the proposed methodology would lead to a quantification of risk.**

7. **ADEC should consider an alternative methodology to risk quantification for all segments of the energy infrastructure**. Such a methodology might involve initial screening & categorization of risks and characterization of sources of risk, followed by detailed risk quantification *only as needed* to establish relative risks of dissimilar segments should be considered. Risk quantification as proposed in the ARA Methodology document is unlikely to meet the stated objectives of the risk assessment. The alternative noted above is a more efficient means of identifying and evaluating the value of mitigative and management measures to reduce risk.

8. **The methodology selected for the ARA should make the greatest use possible of the existing risk assessments.** These assessments have resulted from substantial resource expenditure by Alaska operators in complying with provisions of the Integrity Management Program regulation, and in support of operator internal decision making. Note that the ARA states it will evaluate the "sufficiency" of Integrity Management (pp 16, 17) but fails to explain what this evaluation will entail. The ARA states that multiple cycles of integrity programs have not occurred and that multiple cycles will be required to identify potential threats due to time-dependent mechanisms of primary concern. This statement reflects a clear misunderstanding of the IM regulatory requirements.

From the description provided in the proposed methodology, it is very difficult to tell what method or methods are being proposed to estimate the failure frequency for pipeline segments and how the methods employed will allow meaningful results to be generated and the study objectives to be achieved.

While good reasons may exist for limiting the project scope, exclusion of distribution systems may impede evaluation of feedback effects on transmission systems (e.g., the study will consider the interruption of electric power to pumps, motors, etc., but not evaluate the causes of that disruption which might be loss of gas flow to a generating station). Additionally, failures in these systems have the potential impacts to public and worker safety, the environment, and state revenues.

Some outside force threats that have had a significant impact on both loss of product and disruption of operations are excluded from the scope. An example of this is the release due to a bullet hole in TAPS. Study results should be presented with note that exclusion of distribution systems and certain outside force threats will likely skew safety and environmental results.

Defining “acceptable consequences” is a resource-intensive activity, potentially fraught with controversy, and unnecessary given that new management & mitigation measure implementation will be resource constrained to address the most significant risks. Consequence “binning” (i.e., categorizing consequences as “high”, “medium” or “low”) may be both easier and more effective in meeting program objectives.

There is very limited data on the reliability performance of oil and gas industry components, especially in environments found in Alaska (e.g., high winds, sub-zero temperatures, ice buildup, and dust as a result of high winds). The contractor has proposed multiple data sources, many of which are not applicable to pipeline components. The resultant quantification of pipeline reliability may be questionable. Military and nuclear power electronic component failure data must be used judiciously as those components are probably designed to different standards than those used in the oil and gas industries and the impact of adverse environmental conditions may not be adequately reflected.

It is not clear how statistical failure data and Bayesian Analysis are to be used to support the project objectives. Models like Muhlbauer's pipeline risk index do not use failure rate data. It appears a combination of quantitative and qualitative methods is being proposed, but the approach to be taken is not clearly described. Also, it is not clear how single value methods are being combined with distributions through Bayesian Analysis, or how the results are to be applied.

For pipelines subject to provisions of the Integrity Management (IM) regulation, the proposed approach will produce relative risk indices similar to those developed in response to the IM regulation. Consideration needs to be given to the value of carrying out a redundant assessment, how to make use of the existing IM-driven assessments, and how to assure meaningful comparisons among dissimilar segments or segments assessed using dissimilar methodologies.

As stated by the ADEC representative during a public meeting, more focus will be placed on assessing non-regulated portions of an operators system. The proposed methodology report does not address how this will be achieved.

The preliminary risk screening appears to be subjective in nature and will require collaboration with stakeholders that are very familiar with the specific segments or nodes to effectively determine the susceptibility of identified nodes to specific initiating events. It was not clear in the ARA Methodology document whether this participation would be secured.

The preliminary risk screening relies on ruling out "acceptable" consequence, but there is not a clear justification for the premise on which the safety and environmental consequences are considered to be "acceptable". Further background should be provided to support the position that consequences of fewer than 5 worker fatalities or less than 10 barrels are "acceptable". This is not consistent with PHMSA or State guidelines as identified in applicable regulation.

The definition of Common Cause used in this study is not typical CCA. Typically, "common cause" refers to a cause that leads to failures affecting several systems or redundant levels of protection. For example, a deficient corrosion prevention program may cause failures across a system. In this study, a common cause seems to refer to a single event that causes failure in several [typically adjacent] nodes. Consider using wording consistent with practice to avoid confusion.

The initiating events currently proposed include: fires and explosions, spills and leaks, equipment malfunctions, loss of infrastructure support systems, changes in process conditions, and human errors. We recommend using the threat categories given in ASME B31.8S and commonly used in the liquid and gas pipeline industry and by pipeline regulatory agencies. These categories include: Corrosion, Natural Force Damage, Excavation Damage, Other Outside Force Damage, Material Failure of Pipe or Weld, Equipment Failure, and Incorrect Operation. Because these categories were developed specifically for pipelines, a logically developed modification of these categories that supports the needs of this specific assessment would be an alternative.

Safety Risk

There is often a correlation between initiating events and corresponding consequences. Consequence analyses that stem from specific initiating events may be an effective way to consider this point, but was not clear in the ARA Methodology. It is unclear how Figure 7-4 (Potential Incident Outcome Overview) will be utilized in the absence of more specific information. If the initiating events are modified to be consistent with pipeline industry practice (as suggested above), the event trees will be much cleaner and more intuitive. The potential for immediate ignition and human presence will be strongly related to the initiating event and/or failure location. For example, if the immediate cause is excavation damage, there will most likely be an ignition source and people will be present regardless of location. But if the cause is corrosion, there could be a lower likelihood of people being present, particularly if the failure location is in a rural area.

The industry (including Muhlbauer) has moved away from the old Muhlbauer risk index model as proposed for the ARA. If applied without specific consideration of operating history and conditions, it can produce misleading results.

Public meetings identified several concerns that should be addressed, including:

- The impact of snow within secondary containment on the ability to retain spilled petroleum
- The impact of crude temperature on snow loading on storage tanks (a validation of design basis)
- The potential for support structure collapse resulting from permafrost instability leading to a sink hole (a validation of design basis)
- Ability to respond to spills in remote locations during severe weather (a validation of the spill response plans)
- Methane hydrates where the potential exists.

Environmental Risk

Relative risk rankings are developed based on predefined categories and indices that "cannot be correlated to any physical meaning based on the absolute value of the numbers or index that is assigned to each factor." However, the environmental impacts are defined based on these indices in Table 7-6. As in characterizing safety risk, event trees could be used to estimate likelihood of environmental risk based on the nature of the initiating event and failure location.

Reliability Risk

Where is the measurement made for the purpose of determining state revenues? This may be important in clarifying the scope of the project. For example, if the state revenue measurement is made upstream of Valdez or Drift River, should components downstream of the measurement point be included in the reliability analysis? An example scenario: high winds shutdown tanker loading at Valdez but TAPS flow continues because there is available storage capacity versus storage capacity is unavailable which interrupts TAPS flow. If measurement for state revenue purposes is the output of TAPS, one scenario has an impact and the other doesn't, but neither is related to VMT component reliability.

Natural Hazards Risk Assessment

The design basis of systems must be considered in determining the failure probabilities from natural hazards. Systems with different design bases would have different susceptibilities to the same severity of natural hazard. For example, if TAPS earthquake design basis is the same as the "high hazard level" in Table 8.2, then the risk to TAPS from such an event would not necessarily be "high". The design basis or each operating system needs to be considered in evaluating risk from natural hazards.

PHMSA Comments - Risk Comparisons

Risk Comparisons: There is a statement in the methodology document that "agencies have assigned an explicit value to a life lost due to an accident". Use of dollar values for deaths and injuries vary considerably, even among Federal Agencies. Agreeing upon values will be controversial, may not be necessary to achieve study objectives, and will dilute resources assigned to the assessment. The methodology indicates that some assignment will need to be made to answer *"How much money should reasonably be spent on risk management?"* Inferring the value of human life from recent events (e.g., Bellingham, Carlsbad, and Walnut Creek), the dollar value of a fatality is in the tens of millions of dollars, much greater than the value used in US DOT cost-benefit analyses.

PHMSA Comments - Consideration of Alternative Approaches

9. **A process by which results and recommendations are updated should be implemented for the ARA to have lasting value.** Meaningful characterization of risk is a dynamic process, one that recognizes and integrates changing operating conditions and experience into the characterization.

10. **Provisions should be included in the risk characterization and updates to consider operator management of system integrity.** Experience has shown that the effectiveness of management systems, including their impact on safety culture, play a major role in determining the level of risk.

In moving toward finalization of the ARA methodology, ADEC might consider focusing contractor efforts on the following major elements:

- Inventory and segment the systems to be studies

- Assemble information to support characterization of the segments, including their condition
- Identify and evaluate the consequences of major failure modes for the segments
- Integrate the information and characterize the risk
- Identify high risk segments and the reasons they are high risk
- Characterize the effectiveness of the regulatory environment in addressing the major risk contributors
- Identify measures to address major risk contributors

PHMSA Comments - Appendices

Appendix B: The maximum probable spill for the North Slope is 4800 barrels in an OTL. This is less than the 2006 release of an estimated 5000 barrels which was detected by smell rather than by a Leak Detection System (LDS). Without human intervention, the release could have been much worse since it was under a snow pack, was not visible to the eye, and was below the detection capability of the LDS.

Appendix D: Possible magnitude of releases should be based on the type of LDS employed by an operator. Releases through small diameter defects could result in higher volume releases because they are below detection thresholds. Releases through large diameter defects would result in early detection and termination. In addition, there are exceptions such as the bullet-hole release. This is another area in which access to existing operator analysis could reduce project resource expenditures.

Appendix E: The probability of jet fires without ignition sources needs to be accounted for. Ignition could be caused by the heat of friction when high pressure gas is released through a small diameter defect.