



JOINT PIPELINE OFFICE

Comprehensive Monitoring Program Reports

Evaluation of Alyeska Pipeline Service Company's:

- **Operation of the Trans-Alaska Pipeline
1999/2000**
- **Trans-Alaska Pipeline Construction Program
1999/2000**
- **Trans-Alaska Pipeline Maintenance Program
1999/2000**

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Executive Summary

The Joint Pipeline Office (JPO) is incorporating three of its Comprehensive Monitoring Program (CMP) reports, Operations, Construction and Maintenance, into one report. This document represents the eighth, ninth and tenth CMP reports and, for the first time, re-examines functional areas covered in prior CMP reports. All three CMP reports had their scope specified in JPO's 1999 workplan and involve a 20-month assessment of activities along the Trans-Alaska Pipeline System (TAPS) including the Valdez Marine Terminal.

These CMP reports assemble the results and status of many varied JPO investigations (called surveillances, assessments or engineering reports, individually released over the 20-month period). Therefore, the reports do not reveal new issues for either JPO or the Alyeska Pipeline Service Company (the common agent for the TAPS owner companies). CMP reports attempt to provide perspective, context and background for more general audiences and are workplan driven. No report attempts to cover all the aspects of a functional area, rather it addresses those aspects JPO staff covered in the prior eighteen to twenty months.

Additional executive summaries can be found in the construction and maintenance reports. Selected issues from each CMP report are presented below.

Operations:

The most significant issue has been Alyeska's lack of an approved cold restart process for TAPS. To oversimplify, in worse case conditions, restarting TAPS could become difficult five to seven days after shutdown. Reduced available horsepower due to pump station shutdowns and changing crude characteristics all play a part.

Considerable work on this topic has been completed. In fact, a cold restart procedure is currently under review by JPO. JPO's concern about completing this study was clearly expressed in our February, 1999 CMP report for Operations. JPO subsequently issued an order on this subject primarily to emphasize JPO concern about the priority of this study and to insure prompt scheduling of this complex, multistep-engineering evaluation.

The Operations CMP also covers JPO's recap of several operational incidents as well as updates from issues remaining from the last Operations CMP report. The most significant finding covers Alyeska's difficulty in managing change to procedures or processes. The examined incidents were usually caused by unanticipated effects of changes to valve timing, pig cleaning procedures or start-up procedures. Although competent people were involved and in no case were changes made in a careless manner, these problems were preventable. Monitoring change management has been and will continue to be a JPO compliance focus. A significant Alyeska/JPO review of change management processes is currently underway.

Construction:

JPO's review of sixteen projects found seven where the records (drawings, procedures, specifications or other documents) were either not updated in a timely manner or not identified. JPO finds that in this respect, Alyeska is deficient in complying with Grant and Lease Stipulation 1.18.3 which requires Alyeska to "maintain complete and up-to-date records on construction, operation, maintenance and termination activities performed in connection with the Pipeline System. Such records shall include...modification records...."

JPO's focus here is on the timely update of permanent records of system modifications. Workers have access to current, or what is commonly known as "redlined" drawings and procedures. Nevertheless, timely update of permanent records is required, especially given the use of computers to access and view master records. JPO used a six-month timeframe to judge reasonable timeliness for document updates, a more lenient performance measure than Alyeska's internal goal. The problem is that the document update process is not timely. Alyeska asserts that its performance in document revision is improving. Future JPO compliance reviews will verify if this situation has been remedied.

Maintenance:

Four of the topic areas deserve emphasis: corrosion, slope stability, corrective actions, and upcoming reliability centered maintenance evaluations.

The Maintenance CMP report provides the first summary of JPO corrosion monitoring efforts in the CMP report series. No noncompliances are identified, but the narrative provides important background information for understanding the suite of efforts, agreements, investigations and expenditures to both monitor and remediate corrosion.

This maintenance report summarizes much of the follow-up work done to assess slope stability. Slope stability was a significant issue in the 1999 Maintenance CMP report and the follow-up work has just recently been completed. The previously cited stipulation noncompliances have been corrected and closed by JPO.

Alyeska's own internal study found over sixty processes that yield corrective actions to correct deficiencies on TAPS. There has been no overarching tracking system and no clear path to acquire budget to fix all deficiencies. JPO believes that this lack of a comprehensive corrective action management process is the most significant driver of concerned employees. JPO believes that all deficiencies warranting correction need planning, scheduling and follow-through until completion. JPO strongly encourages Alyeska to improve the communication of its deficiency correction scheduling, including decisions to defer or delay corrections to give priority to higher risk projects.

JPO's upcoming Reliability Centered Maintenance (RCM) reviews of the critical TAPS systems is discussed in detail. The first RCM analysis covers the Valdez Marine Terminal Ballast Water Treatment (BWT) system. A detailed plan and schedule for all analyses is under development.

Use of Terms and Acronyms.

This report uses both "Alyeska" and the acronym "APSC" to refer to the Alyeska Pipeline Service Company. Both terms are used frequently and interchangeably by JPO.

Similarly, the terms "noncompliance," "aspect of noncompliance" and "stipulation deficiency" used in this and prior JPO reports are all describing a situation where Alyeska needs to remedy some condition to fully comply with the Grant and Lease. JPO's use of these terms should not be confused with the formal lease termination, renewal or system modification authorities that the Department of the Interior and the State Department of Natural Resources have under law. Rather, these terms are used and reported to inform governmental policy makers and the public about the issues JPO is working on with Alyeska and how the issues relate to the Grant and Lease.

Future CMP Reports:

These will be the last of the reports organized around functional areas such as operations, maintenance, and construction. JPO adopted functional work planning and reporting to expand JPO monitoring from the environmental, surface protection, oil spill contingency and corrosion project focus that it had in the late 1980s to mid 1990s timeframe. With ten functional reports published, future JPO CMP reports will be organized to address compliance or system integrity issues. The next integrity CMP report will feature results of the RCM studies. The next compliance report will focus on Grant and Lease stipulation compliance, including some of the requirements that have recently been monitored by JPO.

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JOINT PIPELINE OFFICE

Comprehensive Monitoring Program Report

A Look at Alyeska Pipeline Service Company's Operation of the Trans-Alaska Pipeline System 1999/2000

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Joint Pipeline Office

Comprehensive Monitoring Program - Operations

1.0 Introduction and Purpose

The Comprehensive Monitoring Program (CMP) was reorganized in 1999 to focus on four key oversight areas: Construction, Maintenance, Operations, and Culture. This report presents the Joint Pipeline Office's (JPO) principle oversight results in the area of operations. This report does not comprehensively include all areas of operations on the Trans-Alaska Pipeline System (TAPS). The majority of work presented in this report consists of follow up monitoring on issues originally presented in the February 1999 Operations CMP. The scope of this CMP is expanded from the 1999 Operations CMP with the inclusion of results from two assessments of Alyeska's Risk Management Program. Close scrutiny is also given to significant operational incidents which occurred on TAPS since the 1999 Operations CMP.

2.0 Methodology/Scope

The scope of this report includes JPO oversight of TAPS operations from January 1999 through December 2000. This report focuses on the procedures, equipment, software and training that assure the TAPS pipeline runs safely and can deal with contingency situations. The analysis answers the following three questions:

- Is the pipeline system operating safely and in accordance with the Grant/Lease and regulatory requirements during normal operation?
- Are adequate procedures and hardware safety barriers in place in the case of abnormal operation?
- Are adequate contingency plans in place to deal with emergency situations?

2.1 Normal Operations

In order to assure that the pipeline is operating within safe operating limits, pipeline controllers must accurately know existing pipeline pressures. Procedures must be in place and followed to shutdown and startup the pipeline under a variety of conditions. Leak detection systems must be monitored to assure that pipeline integrity has been maintained and the Supervisory Control and Data Acquisition System (SCADA) must function adequately. In addition, contingency plans must be in place in case of emergencies. In this regard the following areas are assessed:

- Pressure Set Points and Calibration
- Pipeline Hydraulic Model

- Operating Pressure at the Pinch Points
- Planned Shutdown and Restarting of the Pipeline
- TAPS Leak Detection
- Year 2000 (Y2K) Readiness and Performance
- Cold Restart Plan
- Atigun Pass Heat Pipe Operation
- Mainline Refrigeration Site No. 2 Operation
- System Control and Data Acquisition (SCADA)
- Oil Spill Contingency Plans

2.2 Risk Management

In order to assure TAPS can be operated safely under Normal Operating conditions, risk management is essential. Alyeska's Risk Management Program provides policies and procedures for identifying risks to ensure the safe and efficient operations of TAPS, estimating the severity and likelihood of the identified risks, developing risk mitigation recommendations and providing timely guidelines for risk mitigation implementation. Although the program is primarily a non-regulated discretionary activity, the timely and adequate closure of the recommendations made by the risk management program are essential to the safe operations of TAPS. The following areas were assessed:

- Adequacy of the Follow Up System
- Closure Time Requirements
- Adequacy of Closure Documentation

2.3 Abnormal Operations

Assessment of major pipeline operational difficulties to determine their root cause and consequence are essential to minimize reoccurrence. This report examines the following incidents:

- The Pipeline Overpressure of August 5, 1998 (Follow up from 1999 Operations CMP)
- Backpressure System Damage/Pig#4 Incident
- Milepost 170 Pipeline Movement
- Check Valve 74 Incident

2.4 Audit Item Resolution

The previous Operations CMP reported that 5 audit items remained opened from the 1993 TAPS Audits out of 4920 identified audit action items. Currently 2 audit items remain open. This report will examine the status of previously reported 5 items:

- AAI Item 2113- Qualification and Development Program

- AAI Item 5052 – Pump Station Tank Farm Containment
- AAI Item 2076 – RGV Control System Replacement
- AAI Item 1955 – Host Audit Item
- AAI Item 50528 – Access Road and Workpad Bridges

3.0 Grant/Lease and Regulatory Requirements

3.1 Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline

The following requirements of the Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline are the primary operations requirements under review:

Principle 3: Permittees shall manage, supervise and implement the construction, operation, maintenance, and termination of the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology. In the exercise of these functions, Permittees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance, and termination of the Pipeline System as are provided for in this Agreement and other applicable authorizations. The parties intend that this Agreement shall not in any way derogate from, or be construed as being inconsistent with, the provisions of Section 203 (d) of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 585 (1973), relating the National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. 4321 *et seq.*

Stipulation 1.21.1: Conduct of Operations: Permittees shall perform all Pipeline System operations in a safe and workmanlike manner so as to ensure the safety and integrity of the Pipeline System, and shall at all times employ and maintain personnel and equipment sufficient for that purpose. Permittees shall immediately notify the Authorized Officer of any conditions, problem, malfunction, or other occurrence which in any way threatens the integrity of the Pipeline System.

Stipulation 3.2.1.1: Pipeline System Standards: All design, material and construction, operation, maintenance and termination practices employed in the Pipeline System shall be in accordance with safe and proven engineering practice and shall meet or exceed the following standards...

3.2 Right-of-Way Lease for Trans-Alaska Pipeline

The following requirements of the Right-of-Way Lease for Trans-Alaska Pipeline are the primary operations requirements under review:

Principle 3: Leesees shall manage, supervise and implement the construction, operation, maintenance and termination of the Pipeline in accordance with the best practicable engineering technology available, particularly with regard to permafrost and seismic areas, to the extent allowed by the state of the art and the development of technology. In

the exercise of these functions, Lessees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance, and termination of the Pipeline as are provided for in this Lease and other applicable authorizations.

Stipulation 1.21.1 Conduct of Operations: Lessees shall perform all Pipeline operations in a safe and workmanlike manner so as to ensure the safety and integrity of the Pipeline, and shall at all times employ and maintain personnel and equipment sufficient for that purpose. Lessees shall immediately notify the Pipeline Coordinator of any condition, problem, malfunction, or other occurrence which in any way threatens the integrity of the Pipeline.

Stipulation 3.2.1.1 Pipeline System Standards: All design, material and construction, operation, maintenance, and termination practices employed in the Pipeline shall be in accordance with safe and proven engineering practice and shall meet or exceed the following standards:

4.0 Results

4.1 Normal Operations

4.1.1 Instrumentation and Calibration

- **1999 Status:** The previous Operations CMP found that Alyeska did not follow their quality control practices for calibrating and maintaining pressure control devices and documenting the results. However, they had implemented corrective action plans to fix this problem, including a plan to increase surveillance of tracking and controlling pressure relief system devices to prevent the problems from recurring.
- **2000 Status:** JPO conducted surveillances in April 1999 at specific pump stations that verified Alyeska is following their quality control practices for calibrating and maintaining pressure control devices and documenting the results.¹ JPO will continue to monitor pipeline pressure control devices on a regular basis to ensure Alyeska is in compliance with all applicable policies, procedures, laws and regulations.

Regulatory Compliance

In accordance with 49 CFR, Part 195.428, United States Department of Transportation Office of Pipeline Safety (OPS) conducted a system wide pressure control systems analysis in July 2000 to verify settings of pressure switches according to OCC-3.01 procedures and to open as many relief valves on TAPS as possible to verify their ability to function. From the Operations Control Center in Valdez, Alyeska reduced the pressure controller set points at pump stations PS01,

¹ JPO-99-S-009 and JPO-99-S-089 surveillance reports dated 04/21/99 and 08/9/99 respectively.

PS05, PS07 and PS12 until the relief valves opened. All systems operated normally. In October 2000, OPS also conducted surveillances of pressure control system maintenance at PS01, PS03 and PS07 to determine maintenance intervals, procedure adequacy, technician training, and calibration accuracy. Alyeska was found to be in-compliance.²

In October 2000, USDOT/OPS verified that all TAPS pump stations were operating within the established hydraulic parameters, that all suction and discharge relief controllers and high pressure switches were set in accordance with OCC-3.01 and that all pressure control devices were properly calibrated and labeled.³

Details:

TAPS has safety mechanisms in place to maintain oil pressure within safe operating limits and prevent overpressure along the pipeline. Alyeska's Quality Assurance Program is to ensure proper procedures are in place to maintain the integrity of the pipeline. Pipeline pressure is controlled and maintained according to Alyeska's quality control procedures. Each operating pump station along TAPS has pressure control devices to prevent oil pressure from exceeding safe operating limits.

Pipeline controllers follow written procedures for maintaining pressure control. The procedures cover both normal and abnormal operation. Controllers must use specific settings when adjusting devices to control oil pressure. These settings are referred to as pressure control set points. Set points are critical because they control relief valves that help to prevent exceeding maximum oil pressures allowed by U.S. Department of Transportation regulations. For example, if oil pressures exceed the set point value, relief valves automatically open to reduce the pressure. Alyeska's hydraulic engineers have calculated set point values for each pump station based on flow rate and pipeline configuration. The set point values are identified in Alyeska's operating manuals. The Operations Control Center (OCC) in Valdez has the responsibility for ensuring the settings and maintenance of the field pressure control set points along TAPS. OCC controllers input the set point values in the automated pressure control system for the entire pipeline.

JPO conducted surveillance activities referenced in the 1999 Operation CMP Report to: 1) verify that the OCC controllers were operating the pipeline in accordance with the pressure control set points developed by Alyeska's hydraulic engineers, and 2) verify that the equipment used to support the operation of the pressure relief system was calibrated in accordance with Alyeska's quality program. Controllers were using the set points specified by hydraulic engineers, but Alyeska had problems following their quality control practices for calibrating and maintaining the pump station pressure control devices. Set points were not consistently documented and labeled on some of the devices used to control pipeline pressure. JPO could not verify calibration and frequency of calibration due to: 1) missing labels on the pressure control devices, and 2) missing calibration documentation. Alyeska requires calibration labels to be attached to

² REF:DOT-IOCS 89849

³ REF:DOT-IOCS 87023

all pressure control equipment, since they contain essential set point value information. Without them, pipeline controllers cannot be assured the settings are maintained within the safe operating parameter. Alyeska concurred with the finding and took action to re-calibrate pressure control devices and revise their tracking and documentation procedures.

In a follow-up to the February 1999 CMP report, JPO committed to continue monitoring critical process instrumentation pressure control set points as referenced in *DO-14, Trans-Alaska Pipeline Controller Manual*. JPO conducted surveillances in April 1999 at specific pump stations that verified Alyeska is following their quality control practices for calibrating and maintaining pressure control devices and documenting the results.⁴ JPO will continue to monitor pipeline pressure control devices on a regular basis to ensure Alyeska is in compliance with all applicable policies, procedures, laws and regulations.

4.1.2 Pipeline Hydraulic Model

•**1999 Status:** In the 1999 Operations CMP it was found that the procedures for the use and maintenance of the pipeline hydraulic model need clarification in Alyeska's manuals. While major problems were not found, much confusion could be eliminated if procedures for the hydraulic model were clearly stated in the appropriate manuals.

•**2000 Status:** JPO verified that the Alyeska commitments were met by conducting a surveillance in January 2000.⁵

Details: The hydraulics and internal pressures of the pipeline are continuously displayed and monitored on the OCC pipeline controller's computer screen. The "pipeline hydraulics model" is a tool controllers use to determine pipeline pressures during near steady state operations. A 1998 JPO surveillance contained two findings: 1) The Oil Movements Gradient Drawing had not been recently updated, and 2) milepost calculations in Alyeska's Engineering Data Management System (EDM) were inaccurate.⁶ It was reported in the previous Operations CMP that Alyeska had agreed to clarify their manual procedures and update the EDM to remove inconsistencies.⁷ JPO verified that the Alyeska commitments were met by conducting a surveillance in January 2000.⁸

⁴ JPO-99-S-009 and JPO-99-S-089 surveillance reports dated 04/21/99 and 08/9/99 respectively.

⁵ JPO-00-S-007 surveillance report dated 1/13/00

⁶ JPO-98-S-059 surveillance report dated 04/28/98

⁷ Alyeska Letter No. 98-13134 dated 06/12/00

⁸ JPO-00-S-007 surveillance report dated 1/13/00

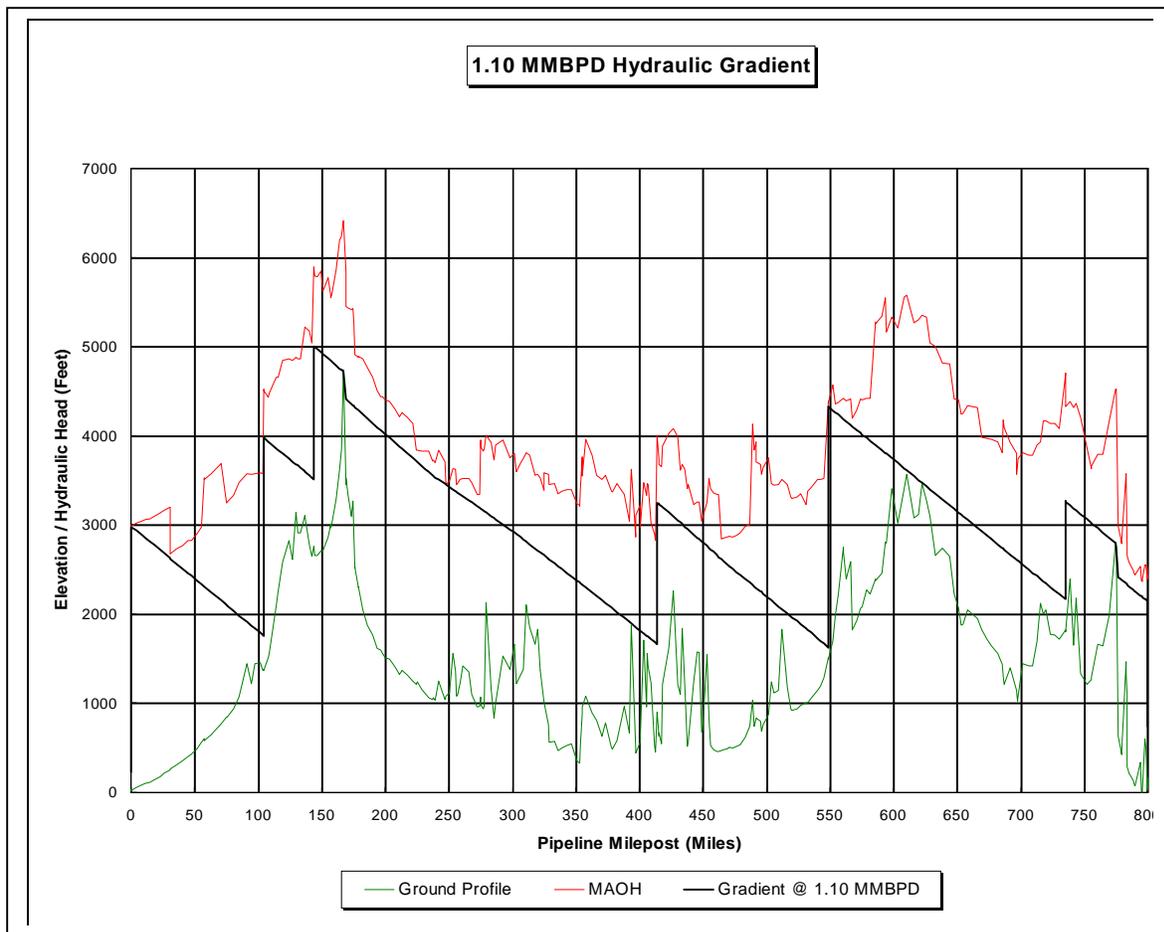


Figure 1 Hydraulic Gradient - Pipeline Head Pressure Must be Maintained Below the Maximum Allowable Operating Head (MAOH) Line

4.1.3 Verification of Safe Operation Pressures During Normal Operations

1999 Status: New Initiative in 2000.

2000 Status: A review was conducted to measure Alyeska's compliance with the Maximum Allowable Operating Pressure (MAOP) limitation set forth in 49 CFR Part 195 and to determine if known corrosion damaged pipe identified by corrosion pig surveys were being prudently managed from a pipeline integrity standpoint. Over the scope of this study Alyeska is found to be managing the operating pressure of the pipeline in a safe manner so as to ensure the safety and integrity of the Pipeline System.

Details: The TAPS mainline internal operating pressure data was sampled on randomly selected days at nine locations along the pipeline. The nine locations were selected based on the hydraulic significance (pinch points), corrosion derates and pig calls. The investigation found

that at one location, milepost 247, the MAOP was exceeded by a slight margin (less than .5%) on several occasions during three of the four days sampled.

A maximum pressure of 905 psi at 2000 hours on 1/1/99 was recorded with a median pressure of 878 psi for the sample data at MP 247, as compared to a MAOP of 901 psi. A review of the data suggests the OCC Controller took prompt actions to bring pipeline pressure back to or below MAOP.⁹

4.1.4 Planned Shutdown and Re-starting of the Pipeline

•**1999 Status:** Alyeska's performance in re-starting the pipeline system improved during the last shutdown covered in the 1999 reporting period. However Alyeska needed to better plan restarts to 1) ensure attention to detail on procedure revision, 2) complete functional testing of new and repaired hardware, 3) document changes in operating status, and 4) develop contingencies for activities conducted during shutdowns to avoid reoccurrence of events from previous re-starts.

•**2000 Status:** Four planned pipeline shutdowns and restarts were observed during this reporting period. Other than 1 variance from the written procedure during the September 1999 shutdown, which did not affect pipeline integrity, all planned pipeline shutdown and restarts were conducted in accordance with procedure. Alyeska is found to be conducting planned pipeline shutdowns and restarts in a safe manner.

Details:

The JPO records of pipeline maintenance shutdowns from August 1, 1997, August 8, 1997, June 20 1998, and September 25 and 26, 1998 were reviewed and compared to the shutdown of September 11 and 12, 1999. Alyeska appeared to have initiated a high level of preplanning and oversight for the September 11 and 12, 1999 shutdown. The implementation of the Incident Command Center at the Fairbanks War Room provided a central point of coordination for the activities associated with the shutdown. JPO surveillance noted that Alyeska personnel at Operations Control Center (OCC) at Valdez allowed a variance from the OCC-2.05 procedure during the pipeline re-start.¹⁰ This is similar to the situation reported by JPO during a start up in 1997, when Temporary Operating Procedure 1.05 was modified during the activity.¹¹ In 1997, the modification deleted requirements intended to prevent over pressuring the pipeline. In 1999, the variance from the established procedure did not affect pipeline integrity. This still reflected the continued practice of changing procedures without following the quality program.¹²

A second planned pipeline shutdown and restart was observed by JPO on November 13, 1999. The pipeline was restarted in accordance with procedure. After the September 1999 startup, JPO had recommended Alyeska look at their pipeline startup procedures to provide sufficient

⁹ JPO-00-E-003 engineering report dated 01/20/00

¹⁰ JPO-99-E-025 engineering report dated 09/12/99

¹¹ JPO-97-A-005 assessment dated 08/27/97 and JPO-97-E-026 F/02 dated 08/18/97

¹² JPO-00-A-002 assessment dated 02/01/2000

flexibility for pipeline controllers along with appropriate cautions. The result of Alyeska's review was reflected in the Nov 13, 1999 startup procedure. The procedure used provided the essential guidance and necessary flexibility for potential variation in pipeline initial startup conditions.¹³

A third planned pipeline shutdown and restart was observed by JPO on September 16-17, 2000. The pipeline was shutdown and restarted in accordance with procedure.¹⁴ Prior to the shutdown, JPO noted that the relief set points were not included in the Trans-Alaska Pipeline Controller Operating Manual (DO-14), Department Operating Procedure (DOP), OCC-3.01, Table 3.10 for PS 12, for the condition with the relief system on and PS 12 bypassed (PS 2, PS6, PS8 and PS10 Bypassed). Alyeska indicated that there was another procedure to cover this situation, SUP 0.14, Rev 0. They, however, agreed to modify Table 3.10.

A fourth planned pipeline shutdown and restart was observed by JPO on Oct 8, 2000. The pipeline was shutdown and restarted in accordance with procedure.¹⁵ JPO verified prior to the shutdown that Table 3.10 was modified with a Note (7), which specifies the criteria for determining the required relief controller setting.

4.1.5 TAPS Leak Detection System

●**1999 Status:** The new transient volume balance system (TVB) improved TAPS leak detection capability, but still needed a performance reporting capability or, in other words, a measure of how well the leak detection system was working. This recommendation was made in the 1999 Operations CMP and the *Trans-Alaska Pipeline System Pipeline Oil Discharge Prevention and Contingency Plan Finding Document and Response to Comments* under Issue #14, *Leak Detection for Crude Oil Pipelines*. Small slow leaks were undetectable by the leak detection systems.

●**2000 Status:** Alyeska implemented an automated system for measuring the performance of the TVB. The system complies with the recommendations made in the 1999 Operations CMP and the *Trans-Alaska Pipeline System Pipeline Oil Discharge Prevention and Contingency Plan*. In addition, the computer software and hardware were modified to meet the requirements of Y2K. Small slow leaks are still undetectable by the current leak detection systems.

Details: In response to the recommendations made in the 1999 Operations CMP and the *Trans-Alaska Pipeline System Pipeline Oil Discharge Prevention and Contingency Plan*, Alyeska has been providing monthly Transient Volume Balance Leak Detection System (TVB) performance data since January 1999 which include: analysis of false alarms per month categorized into causal groups; a performance summary characterizing the quality of the data input; a monthly summary of the median threshold range for each segment for the 30 minute, 2 hour and 8 hour

¹³ JPO-99-S-129 surveillance report dated 12/08/99

¹⁴ JPO-00-S-055 surveillance report dated 09/18/00

¹⁵ JPO-00-S-057 surveillance report dated 10/08/00

averaging periods. Except for the leak alarm categorization, the reporting has been an automated function since January 2000. Due to Y2K concerns, the TVB system was converted to a new computer platform and went into operation just prior to January 2000. The new system operated successfully through Y2K.¹⁶

The Leading Edge Flow Meters (LEFM) performance was monitored during the September 2000 shutdown.¹⁷ The LEFMs monitor the flow rate of oil through the pipeline segments. It was noted that LEFMs produced erratic readings during the low flow conditions of shutdown and startup. There was a need to reboot many of the LEFMs during startup. The bad data during shutdowns increases detection thresholds. The increase of detection thresholds gradually improves as the bad data works its way out of the long-term flow balance averages. Alyeska indicated that a study to determine how to improve the LEFM performance had been initiated.

4.1.6 Year 2000 (Y2K) Compliance

1999 Status: JPO found Alyeska's Year 2000 (Y2K) effort to be well planned and organized. Alyeska's late start may have increased the cost of the Y2K program but there was no concern about its effectiveness.

2000 Status: JPO observed no significant problems with Alyeska transition through the Y2K dates. It should be noted that not all equipment that could cause Y2K problems in the future was removed. Some equipment was only deemed ready for its current use and the fix did not include equipment capabilities not currently in use. In order to track the "ready" system, Alyeska created a comprehensive inventory database of all SCADA/Process Control systems and devices which contained embedded chips. In addition, warehouse spares are identified in the Alyeska PassPort database as Y2K compliant or ready. The JPO considers the use of this and other Y2K tools critical to an adequate management of change program. JPO notes that there is no mention of these important databases in Alyeska's current PM-2001 manual. JPO will monitor the use of these tools as part of our future oversight.

Details: The Y2K problem arises because for many years computer programmers ignored the two digits which denote the century. This problem could affect hardware, embedded firmware, computer languages and their compilers, operating system, security services, database management, real time processing, control systems and literally any phase of operations which has been touched by the computer age. Alyeska approached the Y2K problem with a structured approach which included assigning criticality ratings to system and devices, conducting detailed inventories of Y2K system and devices, performing assessments to determine Y2K compliance, remediation and testing. In addition, Alyeska prepared contingency plans in event of Y2K failures. JPO participated in drills and monitored Alyeska program preparedness.

Prior to the Y2K cross over date, JPO conducted surveillance that randomly sampled Alyeska critical system documented preparedness. All systems sampled were found to be documented as

¹⁶ JPO-00-S-002 surveillance report dated 01/06/00

¹⁷ JPO-00-S-055 surveillance report dated 09/18/00

prepared for Y2K.¹⁸ JPO personnel monitored the status of the TAPS Y2K cross over from Wednesday, December 29, 1999 through January 2, 2000. Situation Reports were distributed to the JPO Executive Council, selected staff, agency officials, and the California Energy Commission throughout the weekend. A formal surveillance was conducted at OCC in Valdez to verify that the TAPS critical systems were still operational through the Y2K transition.¹⁹ The TAPS pipeline system operated normally through the Y2K transition.

Alyeska successfully dealt with the Y2K problem. Their remediation effort, however, did not render all equipment Y2K compliant; some equipment was just deemed Y2K ready. A “compliant system”²⁰ will accurately process date/time data for rollover into the twenty-first century and for leap-year calculations. “Ready systems” are suitable for continued use as installed, but could create problems later if modifications are made or if systems are tied together. In order to track the “ready” system, Alyeska created a comprehensive inventory database of all SCADA/Process Control systems and devices which contained embedded chips, and a comprehensive list of manufacturers and suppliers for current and obsolete devices. This information is critical for future maintenance and modifications. Warehouse spares are identified in PassPort as Y2K compliant or ready.

4.1.7 Cold Restart

1999 Status: The ramp down of PS 6,8,10 combined with modifications made at PS 5 made the original TAPS Design Basis cold restart plan unusable. This situation was not addressed by Alyeska during the ramp down planning process. Ongoing communications between Alyeska and the JPO regarding the cold restart were unsuccessful in producing a new cold restart procedure.

2000 Status: On November 5, 1999, JPO ordered Alyeska to provide a reliable schedule for the final development and implementation of a cold restart procedure. On October 31, 2000, Alyeska delivered a draft interim cool restart plan.²¹ The cool restart plan is designed to assure that the pipeline will not be overpressured if the pipeline is restarted with crude oil temperatures below 40° F. It does not provide assurance that the pipeline could be restarted in extended winter shutdown conditions. The data necessary to determine if the pipeline could be restarted under the design basis requirements of a 21-day shutdown with an ambient air temperature of -40° F is still being analyzed by Alyeska. To assure restart, under extended winter shutdown conditions, Alyeska indicates that it will install additional equipment in 2001. After the equipment is installed, Alyeska will provide a final cold restart procedure. Until Alyeska has a final cold restart procedure and has adequate equipment in place to implement this plan, Alyeska is not in compliance with the TAPS Design Basis (DB-180), and its ability to restart the pipeline under these extreme conditions remains uncertain.

¹⁸ JPO-99-S-145 surveillance report dated 12/17/99

¹⁹ JPO-00-S-002 surveillance report dated 01/06/00

²⁰ Alyeska Y2K SCADA Control Compliance Specification, 06/29/98, Computational resources that “satisfy the General integrity, Date integrity, Explicit century and Implicit century criteria” is considered “Year 2000 Compliant.”

²¹ Alyeska Letter NO. 00-16439, dated 10/31/00

Details:

On December 17, 1996, JPO requested Alyeska update the TAPS Design Basis regarding the ability to restart the pipeline under an extended winter shutdown. The ramp down of PS 6,8,10 combined with modifications made at PS 5 made the original TAPS Design Basis cold restart plan unusable. This situation was not addressed by Alyeska during the ramp down planning process and was not discovered by the JPO until after the ramp down process was complete. Ongoing communications between Alyeska and the JPO regarding the cold restart was initially unsuccessful in producing a new cold restart procedure.²²

JPO ordered Alyeska to provide a reliable schedule for the final development and implementation of a cold restart procedure on November 5, 1999.²³ On December 22, 1999, JPO required that interim deliverables be formally provided to the JPO, so progress could be tracked for the completion of the cold restart procedure.²⁴ JPO met with Alyeska in June 2000 to discuss the progress made on cold restart. The fundamental problem identified in the studies is that the oil had higher than expected strength (yield point) at low temperatures. This high yield point would greatly increase the required pressure during startup of the pipeline after an extended shutdown under winter conditions. Earlier Alyeska crude tests had not indicated problematic yield strengths. Later tests in which Alyeska cooled the oil more slowly, more akin to what would happen in a real world cold shutdown, indicated a significant rise in yield strengths.

Alyeska indicated that because of results from tests on the current crude oil mix, the revised cold restart procedure development would be delayed by one year. Alyeska proposed to provide an interim cold restart plan by November 2000.²⁵ Alyeska delivered an interim cold restart plan on October 31, 2000. The cool restart plan is designed to assure that the pipeline will not be overpressured if an attempt is made to restart the pipeline with crude oil temperatures below 40° F. The data necessary to determine if the pipeline could be restarted under the design basis requirements of a 21-day shutdown with an ambient air temperature of -40° F is still being analyzed by Alyeska.

To assure restart under extended winter shutdown conditions, Alyeska indicates that it will install additional equipment in 2001. After the equipment is installed, Alyeska will provide a final cold restart procedure.

²² JPO Engineering Report JPO-00-E-025, dated 08/04/00

²³ JPO Letter Number 99-083-JH dated 11/05/99

²⁴ JPO Letter Number 00-097-JH dated 12/22/99

²⁵ Alyeska Government Letter No. 00-16047, dated 07/24/2000

4.1.8 Atigun Pass Heat Pipes



Figure 2: Forest of Heat Pipes to Keep Ground Frozen Near Atigun Pass

1999 Status: In parts of Atigun Pass the pipeline is buried in bedrock laced with ice. In order to keep the ground frozen, freestanding heat pipes were installed in conjunction with the insulated boxes. It was reported in the 1999 Operation CMP that the heat pipes were no longer functioning at pipeline milepost 167.2. In addition, installation of a thermistor string was needed to determine the effectiveness of the existing heat pipes.

2000 Status: JPO conducted surveillance which found that thermistor strings were installed and heat pipes damaged by avalanches were replaced in September 1999.^{26 27}

²⁶ JPO-99-S-111, surveillance report dated 10/20/99

²⁷ JPO Letter, JPO-99-082-JH dated 11/09/99

4.1.9 Mainline Refrigeration Site No. 2



Figure 3: MLR-2, Pipeline Buried with Thermistor String (white) and Monitoring Rods (blue), Refrigeration Plant Building in Foreground

1999 Status: The Main Line Refrigeration Site No 2 (MLR-2) is a 2-mile long buried section of pipeline near the Gulkana River north of Glennallen, Alaska. This area of the pipeline system requires mechanical refrigeration to ensure the soils remain frozen to prevent pipeline settlement. Because of lack of adequate refrigeration, some of the soils below the pipe at MLR-2 thawed, resulting in settlement and curvature of the pipeline. Analysis by Alyeska and review by JPO indicated that the pipe curvature at the Mainline Refrigeration Site No. 2 (MLR-2) is not a pipeline integrity concern provided: 1) the curvature remains constant or decreases, 2) oil temperature does not significantly increase, and 3) pipe wall wrinkling does not occur. JPO requested that Alyeska monitor the pipe monthly until the new permanent refrigeration plants were on line, verify that no wrinkles formed in the pipe, and submit a design basis waiver to address the conditions at MLR-2.

2000 Status: New permanent refrigeration plants are now in operation. Alyeska analysis of the VETCO deformation pig data and JPO's review of the data indicated that no pipe wall deformation has occurred in the areas of highest curvature.²⁸ JPO's analysis of the monitoring rod data indicates that in areas of highest curvature the pipe is rebounding at a rate of about 0.8 inches/year.²⁹ Alyeska submitted a design basis waiver for MLR-2, which is currently under review by the JPO. JPO will continue to review the monitoring rod data and will review the curvature pig data from the August 2000 run.

²⁸ Alyeska Letter No. 99-14091 dated 02/18/99

²⁹ Alyeska Monitoring Rod Data 1997, 1998, 1999, 2000

Regulatory Compliance

On February 10, 2000, the USDOT/OPS issued a Notice of Probable Violation (NOPV) relating to a 49 CFR 195.401(b) non-compliance. OPS alleges that Alyeska was aware as early as 1992 that the underground insulation at the MLR-2 site was surrounded by water and that no cathodic protection was provided. Therefore, Alyeska operated a section of TAPS at a level of safety lower than that required by regulation and did not correct it within a reasonable amount of time. Alyeska disputes the finding and has requested a hearing.³⁰

4.1.10 Milepost 710.77 Corrosion Dig

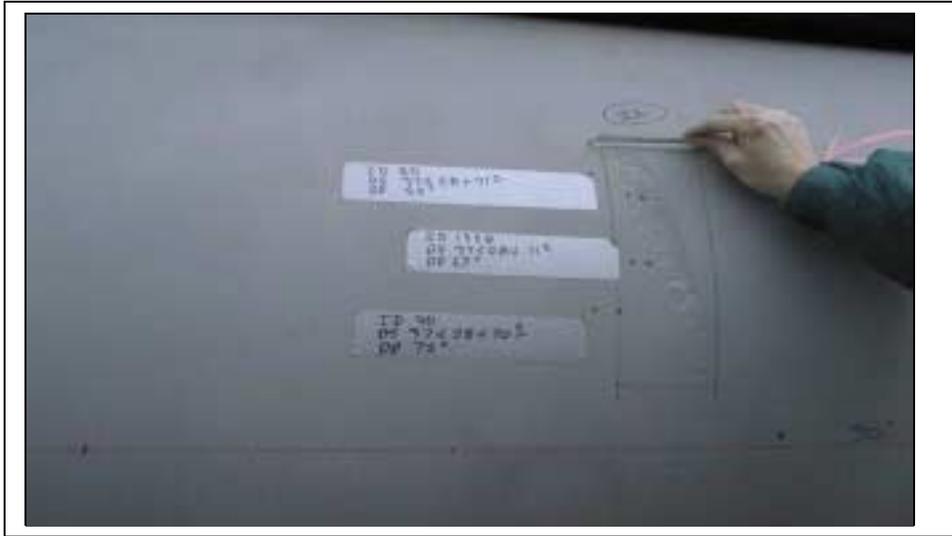


Figure 4: Milepost 710 Gouge

2000 Status: On May 19, 2000 during a scheduled underground corrosion investigation at MP 710 on TAPS, Alyeska discovered mechanical damage to the pipeline. The damage included gouges to the outside of the pipeline in 5 areas, which appear to have been caused by mechanical equipment during construction. The deepest gouge was 80% of the pipe wall thickness. Repairs have been completed, which included smoothing and grinding the sharp edges of the gouges, installing steel sleeves, recoating, and derating the maximum operating pressure from 901 to 838 psi. Presently, the pipeline is operating at 620 psi at a throughput of 1.1 million bbls/day. Further, because the corrosion pig underestimated the extent of the pipe damage, JPO/OPS is evaluating the magnetic and transverse flux pigs to determine their ability to better define the extent of pipe damage due to gouges and corrosion at girth welds.

Regulatory Compliance

USDOT/OPS asserts that Alyeska increased the pressure at MP 710.76 at a time when it had been discovered that the pipeline was in indeterminate condition caused from a severe

³⁰ REF:DOT-CPF 520000002

mechanical damage to the pipe wall. OPS is pursuing a Notice of Probable Violation (NOPV) relating to a 49 CFR 195.422 (pipeline repair) non-compliance.³¹

4.1.11 System Control and Data Acquisition (SCADA)

2000 Status: During the September 2000 system wide shutdown of TAPS, JPO/OPS personnel conducted an assessment of the SCADA system on TAPS. The SCADA systems assessed included SCADA coverage, platform, architecture, control rooms, applications, displays, operations and training. The current SCADA system was installed in 1985. Although the original computer hardware has been replaced, the SCADA monitoring and control software is of the original vintage and no vendor-provided support is available for the installed SCADA platform. There are very few companies who are still using this particular SCADA software. In addition, the current hardware platforms are approaching the end of their expected service lives and the processor loads during peak times reach into the 90% utilization range.

Alyeska's OCC and SCADA system are stable and mature. The base SCADA software does provide the typical features and abilities of 1985 technology, but it has not been upgraded since that time. There have been no recent internal reviews conducted on data points and alarm parameters. However, there have been additions to the basic SCADA functions. Sophisticated computer models have been developed and enhanced over the years and are in place to assist pipeline controllers with line balance and transient condition monitoring.

Management has recently established an elaborate development program to guide the training and performance measurement of the controller staff. Although technical support personnel over the years have developed a thorough knowledge of the SCADA system, technical support personnel do not receive formal training, have no performance measurement system, and rarely participate in formal technical training.

Although a number of low order concerns were identified during the OPS evaluation, no major exposures that would be directly detrimental to pipeline safety were found. Alyeska has modest exposures to business limitations and interruptions from aging computer hardware and SCADA software and a limited pool of technical resources to support these systems.³²

4.1.12 Contingency Plans – Stipulation 2.14

These stipulations state that no discharge of oil or other pollutant should occur on land or water; and that Permittees must recognize their prime responsibility for the protection of the public and the environment from the effects of spillage. Multiple agencies are involved in the review and approval of Alyeska's oil spill contingency plans, and the Alaska Department of Environmental Conservation (ADEC), the Environmental Protection Agency (EPA) and the Bureau of Land Management (BLM) each have staff in the JPO who coordinate joint reviews of the plans. Presently, the oil spill contingency plans in place for the pipeline and the Valdez Marine

³¹ REF: DOT-IOCS 87026

³² REF DOT:IOCS 87026

Terminal are in compliance with Grant requirements and the requirements of ADEC, EPA, the US Department of Transportation and the US Coast Guard.

During the review and approval process for the Pipeline Oil Discharge Prevention and Contingency Plan (Alyeska Document CP-35-1), ADEC and BLM imposed 21 conditions on the plan approval. The conditions ranged from better spill prevention measures at storage tanks to completion of the testing of the mainline valves to improved response capability in the Copper River Drainage. Most of the conditions are now complete and require no further actions. Several conditions, although complete, are ongoing, as they require periodic submissions, such as monthly updates to the emergency telephone directory and quarterly reports on drills and exercises. Only a limited number of conditions are not yet met. One of these conditions requires the demonstration of adequate corrosion protection under Tank 190 or a leak detection system as required in state regulations. All other open conditions are fundamentally resolved but require further documentation before closure. In August 2000, Alyeska entered into a Settlement Agreement with the Alaska Department of Environmental Conservation in response to a Notice of Violation issued by the Department in June 2000. As a result of this enforcement action, monthly leak testing of pipeline turbine fuel tanks was begun, thus closing out a condition of approval.

All conditions identified in the 1997 approval of Alyeska's Valdez Marine Terminal Oil Discharge Prevention and Contingency Plan (Alyeska Document CP-35-2) have been met and closed. A revised edition of the plan was reviewed in late 1999 and approved in early 2000. ADEC and BLM imposed conditions on the approval of the new plan version. There are ten Conditions of Approval that range from holding monthly meetings with oversight agencies to a multi-year exercise schedule to improving on-land response by reviewing existing drainage/settling ponds and developing a tactics guide to aid responders. Because it is still fairly early in the three-year plan cycle, only a few conditions came due during fall 2000, most of the conditions are now actively being worked.

4.2 Risk Management

1998 Status: An initial JPO assessment³³ of Alyeska's Risk Management Program found that: 1) the Alyeska Passport Action Tracking System Database (PassPort) contained an incomplete record of Alyeska's risk assessments; 2) many risk mitigation recommendations, some of which dated back to 1995, had not been brought to closure; 3) existing procedures applied by Alyeska to ensure that risk recommendations are recorded, tracked and closed did not appear to be adequate or implemented.

2000 Status: Alyeska now has an adequate system in place to track risk assessment recommendations finds.³⁴ Alyeska has made significant progress in reducing the backlog of unresolved risk assessment recommendations. The greatest weakness found in the program is that projects are delayed without a documented process in place to assess the risk of delay. In addition, a thorough written justification is not provided for declining many recent risk assessment recommendations. The lack of this written justification makes it difficult to judge from the database record the significance of not taking or completing the recommended actions.

Details:

Alyeska formally defined its Risk Management Program in 1995 in Section 16 of its Safety Manual SA-38. The program primarily provides a set of procedures and policies for conducting and tracking risk assessments. The use of these tools is primarily discretionary. The Risk Management Program does not comprehensively capture and prioritize all Alyeska sources of issues and potential corrective actions which might cause TAPS to be out of compliance with the Federal Grant and State Lease of Right of Way. A recent special review of the corrective action Process by Alyeska identified over 60 sources of independent and informal sources of issues to be considered for corrective actions. Alyeska indicates that it is now developing a comprehensive corrective action program. Until Alyeska prioritizes its many recommended corrective actions by risk ranking, its Risk Management Program will not be a comprehensive program for managing risk. It will simply be a set of procedures and policies for conducting and tracking risk assessments.

JPO's latest assessment follows the JPO's February 1998 Assessment of Alyeska's Risk Management Program. It reviewed the recording, tracking, and closure of risk assessment recommendations through May 5, 2000 as evidenced by the Alyeska PASSPORT Action Tracking Request Report.

Alyeska has made significant progress in reducing the backlog of unresolved risk assessment recommendations. Significantly, Alyeska has closed out twenty-seven risk assessments with their associated recommendation in 1999. The February 1998 assessment (sampled 09/18/97) found that only 5% of the 1995 risk assessments, 17% of the 1996 risk assessments and 0% of the 1997 risk assessments had been closed out. As of May 5, 2000, 90% of the 1995 risk

³³ JPO-98-A-003 assessment dated 02/10/98

³⁴ JPO-00-A-005 assessment dated 06/30/00

assessments, 83% of the 1996 risk assessments and 67% of the 1997 risk assessments were closed out.

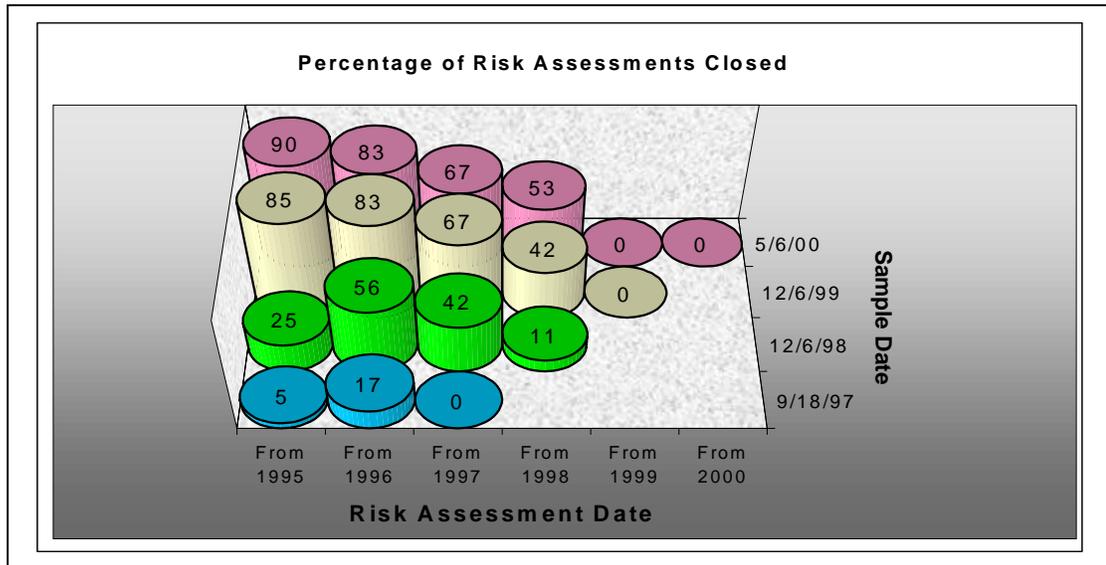


Figure 5: Recommendation Closure Trends

Alyeska Risk Program could be enhanced by addressing the following observations:

- As of May 5, 2000, there were 26 risk assessments, 2 dating back to 1995 with open risk recommendations. Of these 26 risk assessments, 16 had their due dates changed from the original proposed time lines.
- A thorough written justification is not provided for declining many recent risk recommendations. The lack of this written justification makes it difficult to judge from the database record the significance of not completing the recommended action. Alyeska has closed out the majority of the risk recommendations for recent scheduled risk assessments: Pipeline System HAZOP (85%), Pipeline Control System QRA (50%) and OCC Controller Human Factor Analysis (75%) with the single phrase “Not a system integrity issue.” In general the scheduled risk assessments have a broader scope and bring in outside expertise to facilitate the risk assessment process. Alyeska’s Risk Coordinator indicated that recommendations were carefully reviewed and the risk level 2 recommendations concerned financial loss and loss of production and not matters of safety, environment, or pipeline integrity.

4.3 Abnormal Operations

4.3.1 Pipeline Overpressure of August 5, 1998

1999 Status: The previous Operations CMP noted that an Alyeska engineering review concluded that pipeline damage was unlikely, however JPO was in the process of evaluating past overpressure pipeline pig data to verify Alyeska’s conclusion. It was also noted that it was an oversight priority to ensure Alyeska implements preventive measures in order to minimize future occurrences.

Regulatory Compliance

On March 15, 1999, the USDOT/OPS issued a Notice of Probable Violation (NOPV) relating to 49 CFR 195. 406(b). OPS alleged that on August 5, 1998, the pressure in the pipeline exceeded 130 % of the maximum allowable operating pressure (MAOP). Further, on August 2, 1997 the pressure in the pipeline exceeded 119% of MAOP. Alyeska did not contest the finding, they paid the civil penalty and have completed the requirements of the Compliance Order.³⁵

2000 Status: JPO compared the deformation pig data prior to the August 5, 1998 incident to deformation data measured in October 1998 after the event and verified Alyeska’s conclusion that there was no observable damage. JPO also verified that additional logic changes had been implemented in the pipeline control system to reduce the likelihood of this type of event in the future.

Details:

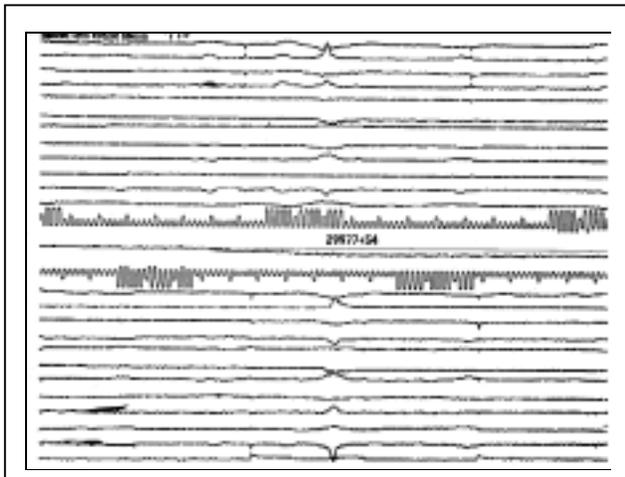


Figure 6: July 1998 VETCO Pig Data Prior to Overpressure Event Showing 1 inch Dent at 6:00 Position

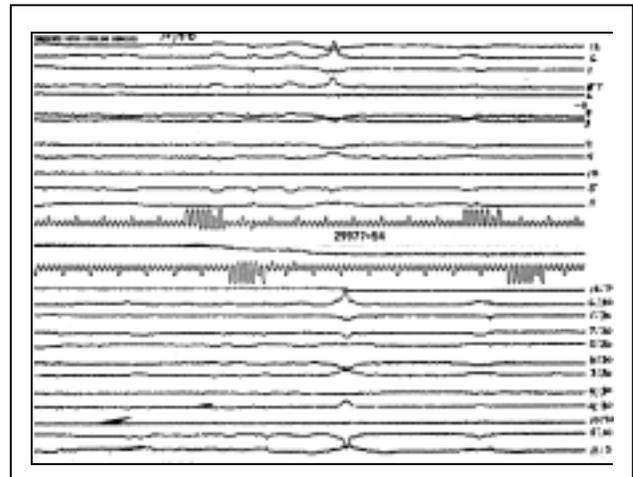


Figure 7: October 1998 VETCO Pig Data After Overpressure Event Showing no Change

³⁵ REF:DOT-CPF 59502

On August 5, 1998, a significant overpressure of the Trans-Alaska Pipeline System occurred. Hydraulic pressure exceeded 110% maximum allowable operating pressure (MAOP) in the 32-mile segment between Pump Station 9 and 10. Alyeska completed a hydraulic analysis indicating that the pressure had peaked at 130% MAOP near Pipeline Milepost 568, south of Delta Junction, Alaska. Alyeska investigated the condition of the pipe after the event with the VETCO Deformation Pig. Alyeska found no change in the condition of the pipe after comparing the deformation data to previous Deformation Pig investigations.³⁶ JPO verified the analysis by comparing deformation data before and after overpressure event.³⁷ No change in pipe condition was found.

Alyeska implemented auto control logic changes to make it more difficult for a controller to make the same mistakes that occurred during the August 5, 1998 event. JPO monitored the testing of the new logic during the November 13, 1999 planned shutdown. The logic appeared to work as designed.³⁸ Other enhancements proposed by Alyeska such as enhanced OCC visibility of the pipeline during MV20000 failure are dependent on the completion and implementation of the new RGV control system.

4.3.2 Backpressure System Damage/Pig#4 Incident



Figure 8: Backpressure System Valve B, 18" Oil Entrance Filled with 48" Pig Cups



Figure 9: Steel Screen Destroyed by Pig

³⁶ Alyeska report "Pig Data Review PS09 to PS10" dated 01/22/00

³⁷ JPO-00-S-053 surveillance report dated 10/02/00

³⁸ JPO-00-S-129 surveillance report dated 12/08/99

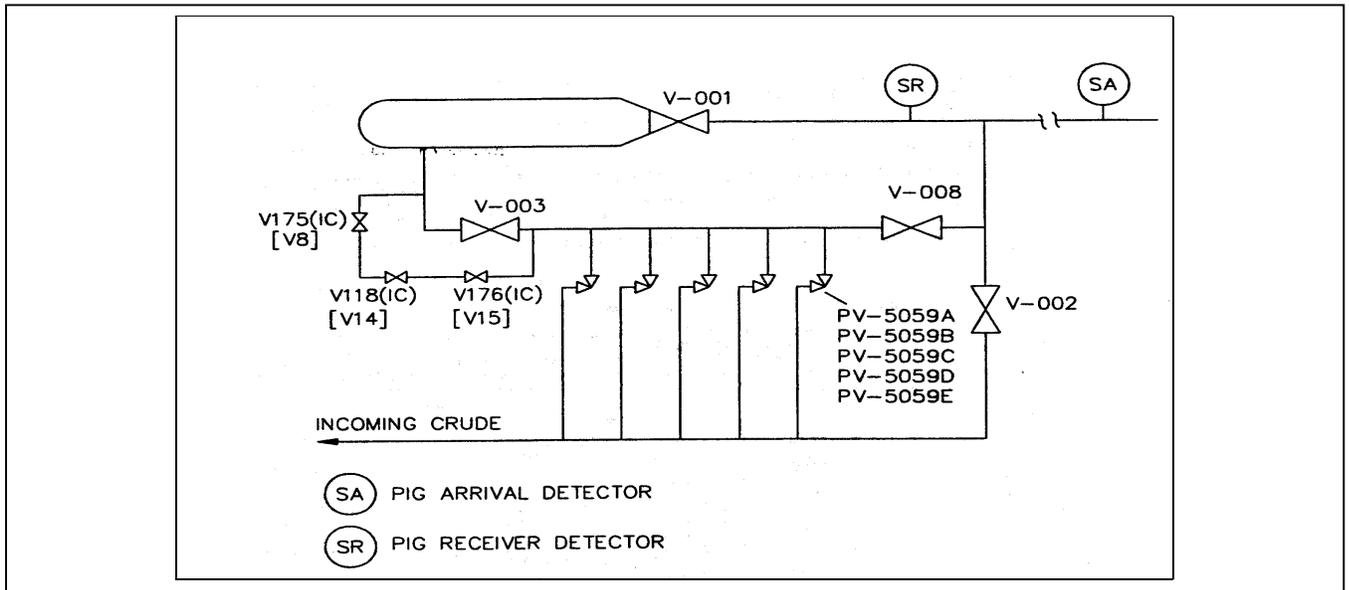


Figure 10: Piping & Valves Connection Pig Trap and Backpressure System

2000 Status: On January 30, 2000, the backpressure system at the Valdez Marine Terminal was damaged primarily as the result of failing to follow and use procedures for the capture of a scraper pig in the pig trap. In addition, the management of change process was not followed to prepare a procedure for receipt of two pigs in the pig trap. The failure to follow procedure and poor change management represents an incident where safe and workmanlike pipeline operations were not followed as required by Grant and Lease Stipulation 1.21. The damage to the backpressure system has been repaired and is now in operation. Without the backpressure system in operation and with oil flow rate below 1.4 million/barrel day, vibrations due to oil vapor bubble collapse are induced into the TAPS pipeline just below Thompson Pass. JPO directed Alyeska to report the effect of the vibrations on pipeline integrity. The report's calculations show that the worst location, if the backpressure system remained offline, that in 1.5 years the pipe would reach an indeterminate condition for continued operations. There would be a 2% chance of the initiation of a crack in the pipe. The length of time to propagate this crack through the pipe wall is unknown. If the backpressure system is kept online and with 12 shutdowns/year it would take 24 years to reach a cumulative design fatigue damage of 100%.³⁹

JPO will evaluate the TAPS maintenance and useful life requirements in a comprehensive manner by conducting reliability centered maintenance analyses of critical TAPS systems. This analysis includes the backpressure system and the pipe at Thompson Pass. Further details of this analysis can be found in the 2000 TAPS Maintenance CMP.

³⁹ SSD, Inc., "Extension of Fatigue Damage Calculations for Additional Dent Locations South of Thompson Pass" dated, August 2000

Details: On January 30, 2000, the backpressure system at the Valdez Marine Terminal was damaged primarily as the result of failing to follow and use procedures during the capture of a scraper pig.⁴⁰ JPO directed Alyeska to provide: 1) a plan and schedule for the repair of the backpressure system; 2) a briefing on the causal factor analysis of the damage to the backpressure system; 3) an estimate of how long the backpressure system could remain off line without a danger to the integrity of the pipeline.⁴¹

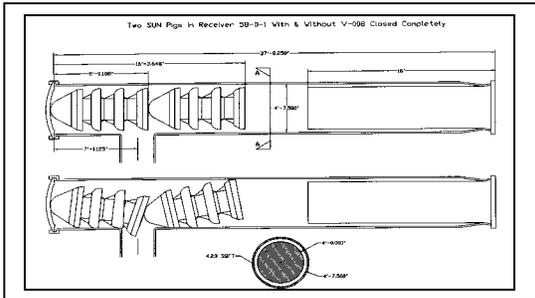


Figure 11: Effect of Two Pigs in Pig Trap (modified from Alyeska RCA)

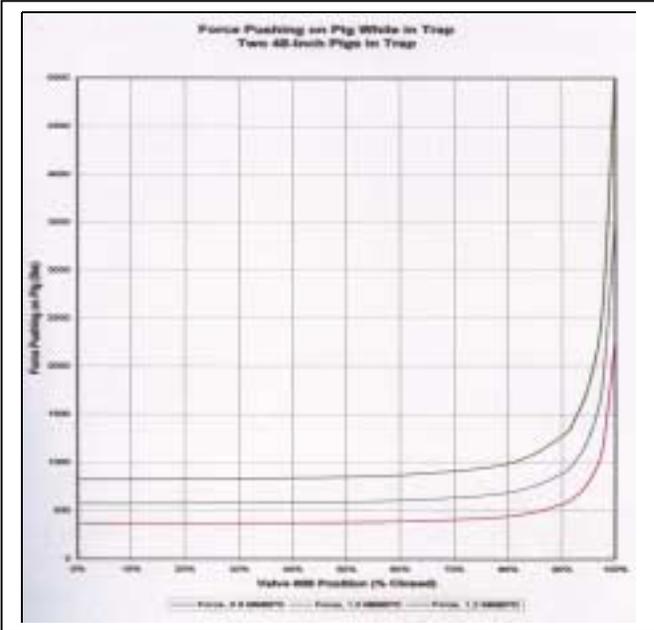


Figure 12 Effect of Closing Valve 008 (modified from Alyeska RCA)

Alyeska brought the backpressure system back on line February 21, 2000.⁴² JPO personnel participated in the causal factor analysis which was completed on April 5, 2000.⁴³ The incident was caused by closing valve V-008 more than 75% forcing the cleaning pig into the backpressure system. Alyeska completed its incident investigation and found a number of contributing causes including not following QA36-1, PIP 3.6 Change Management & PIP 5.2 Controlled Work Site and Department Procedures, and not developing Temporary Operating Procedures for washing pigs (*the pig is left in the pig traps with oil flowing over it to wash away the accumulated wax, oil and other grit*) with two pigs in the receiver.⁴⁴ Alyeska noted that two incidents similar to this one occurred in the past at PS-10. JPO’s analysis of the event concur

⁴⁰ JPO-00-S-015 surveillance report Finding#1, dated 02/01/00
⁴¹ JPO Letter No. 00-007-JH dated 05/11/00
⁴² Alyeska Letter No. 00-15476, dated February 24, 2000
⁴³ Alyeska “Pig Run #4 Incident Investigation Report, April 7, 2000”
⁴⁴ Alyeska “Pig Run #4 Incident Investigation Report, April 7, 2000”

with the causal factor findings.⁴⁵ JPO is satisfied that Alyeska has taken adequate steps to prevent this incident from repeating.

Without the backpressure system in operation and with oil flow rate below 1.4 million/barrel day, vibrations due to oil vapor bubble collapse are induced into the TAPS pipeline just below Thompson Pass. These vibrations could induce fatigue damage, and subsequent crack development in the pipe if the vibrations are large enough and happen often enough. Because of the concern of potential fatigue damage JPO directed Alyeska to report on the effect of the vibrations on pipeline integrity. Alyeska reported back to JPO the results of their contractor's analysis.⁴⁶ The report shows the need for keeping the backpressure system online. The report calculations show that the worst location would reach indeterminacy in 1.5 years. If the backpressure system were kept online, with 12 shutdowns/year, it would take 24 years to reach a cumulative design fatigue damage of 100%.⁴⁷

⁴⁵ JPO-00-S-015 surveillance report Finding#1, dated 02/01/00

⁴⁶ Alyeska Letter No. 00-16280, dated September 18, 2000

⁴⁷ SSD, Inc., "Extension of Fatigue Damage Calculations for Additional Dent Locations South of Thompson Pass" dated, August 2000

4.3.3 Milepost 170 Pipeline Movement



Figure 13: View of Pipeline near Milepost 170 from Road after Event



Figure 14: Pipeline Shoe Nearly Off Support



Figure 15: Anchor Platform Moved Against VSM

2000 Status: A design change of August 22, 1999 did not adequately take into account the hydraulic conditions resulting from timing of the opening of RGV-31, given a slack line condition below RGV-31. A pressure pulse was generated. The forces generated tripped seven pipeline anchors, sheared steel bolts on the anchor frames and moved the pipeline south up to 23 inches. Alyeska surveillance failed to find the damage until over a month after the incident is believed to have taken place. Subsequently, Alyeska has changed the timing at RGV-31, conducted soil gas monitoring and found no anomalous soil gas readings at the other below ground valves and modified their surveillance process by painting orange marker lines on the pipe anchor supports to make movement more evident.

Alyeska management of change process was inadequate for the change valve opening timing at RGV-31 because it did not identify critical conditions to be considered for an adequate design. In addition, availability of critical records did not appear to be adequate given that the reasons for the original 25% open condition were not readily apparent to the design team.

Alyeska's surveillance and monitoring were inadequate since they failed to find the damage until at least a month after its occurrence. There were indications that prior pressure pulse events may have moved the pipe from its optimal position along the supports in this pipeline segment.

Regulatory Compliance

USDOT/OPS conducted an investigation into the tripped anchor incident at MP 170 on TAPS and has concluded that Alyeska is in probable violation of the following safety regulations:

- 1) 49 CFR 195.401(a): Alyeska failed to recognize all the hydraulic factors associated with the timing of opening RGV-31 and that elimination of the 15 minute hold time during start-up contributed to a significant pressure pulse being generated.
- 2) 49 CFR 195.402 (c) (3): Alyeska personnel did not follow normal operating procedures when they removed the RGV-35A control card for maintenance without first requesting OCC to inhibit the RGV Auto Control logic, which caused the pipeline to shutdown to prevent overpressure.
- 3) 49 CFR 195.402 (d) (1): Alyeska did not respond to, investigate, and correct the cause of the abnormal condition on TAPS which occurred on November 13, 1999 and February 10, 2000. OPS is pursuing a NOPV for above mentioned regulatory non-compliance.⁴⁸

Details: May 15, 2000 a pipeline pig launch crew discovered seven tripped pipeline anchors north of RGV-31. In addition to the tripped anchors, subsequent investigation found that the pipe had moved south up to 23 inches and some anchor frames' steel bolts were sheared off. A JPO surveillance specialist was dispatched to the incident site. JPO directed Alyeska to provide a formal briefing on the incident, measures taken to prevent its reoccurrence, and surveillance procedures to assure quick detection of similar events in the future.⁴⁹ In addition, JPO directed Alyeska to monitor all culverts, drainage pipes, galleries, pipeline surface-subsurface entry and exit points, and any other areas south along Atigun Pass where oil might appear if a release

⁴⁸ REF:DOT-IOCS 87023

⁴⁹ JPO Letter No. 00-086-LM dated 05/17/00

occurred in an adjacent buried section of pipeline. Alyeska was also directed to monitor all buried valves between RGV 31 and Pump Station 5 for possible oil vapors indicating a leak.⁵⁰

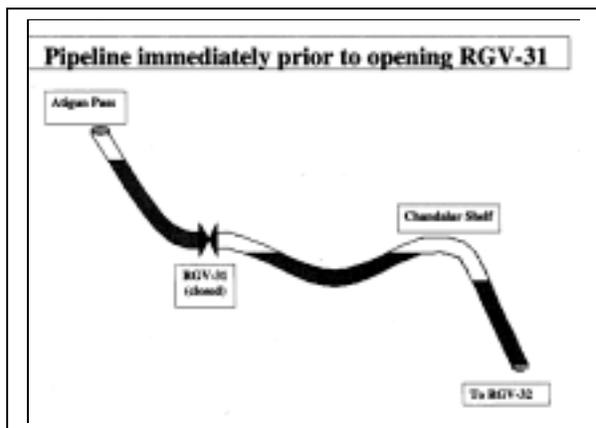


Figure 16: Oil Position Prior to RGV 31 Opening (modified from Alyeska RCA)

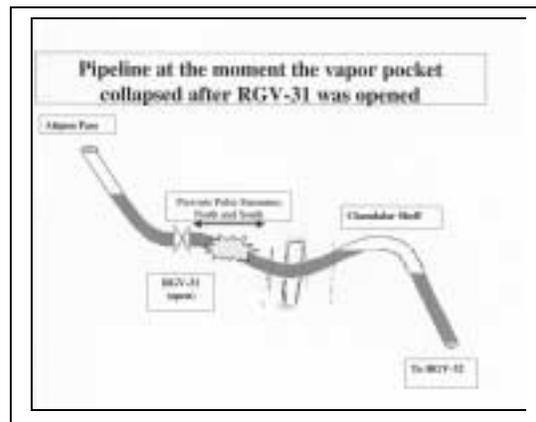


Figure 17: Collision of Oil Columns (modified from Alyeska RCA)

The Alyeska root cause analysis (Alyeska RCA) found that a pressure pulse was caused by the collapse of a vapor pocket just south of RGV-31 when RGV-31 was reopened after a pipeline shutdown on April 17, 2000.⁵¹ This pressure pulse caused the damage to the pipeline supports. Figure 16 (above) shows the position of the oil in the pipeline prior to the opening of RGV-31. Once RGV-31 was fully open, the oil column above RGV-31 traveled and collided with the column down stream shown in Figure 17. The impact caused a pressure pulse to move downstream and upstream. Most of the upstream section of pipe is aboveground. The above ground pipe is designed to move in a controlled manner and absorb energy using various sacrificial elements such as aluminum honeycomb absorbers at the pipeline anchors. The below ground pipe is restrained by the surrounding soil and does not experience lateral or transverse movement.

The root cause of the pressure pulse was a failure of the design which was implemented on August 22, 1999, by Project B023, to recognize all the hydraulic requirements associated with the timing of the opening of RGV-31.⁵² Prior to August 22, 1999, pipeline restart for RGV-31 was held at 25% open for 15 minutes before allowing full opening of the valve. The hold point was removed to speed up restart. Alyeska engineering reviewed and approved the change based on extensive prior analysis of valve closure analysis.⁵³ Even though a management of change process was undertaken, it proved inadequate because the analysis was based on a faulty assumption. The opening sequence should have taken into account the slack line condition down stream of RGV-31.

⁵⁰ JPO Letter No. 00-092-LM, dated 05/26/00

⁵¹ Alyeska report: "Milepost 170 Pipeline Movement Root Cause Analysis," dated 06/23/00

⁵² Alyeska report: "Milepost 170 Pipeline Movement Root Cause Analysis," dated 06/23/00

⁵³ Alyeska Briefing: "TAPS Milepost 170 Pipe Movement"

The Alyeska root cause analysis subsequent to the event did a thorough job identifying the cause of the event. Significant findings included:

- Two other pipeline restarts generated pressure pulses prior to the April 17, 2000 event, one on November 13, 1999 and another on February 10, 2000. The cumulative effect of these events might have moved the pipe to its final position, although no movement was noted by Alyeska surveillance for the previous events.
- The pressure data acquisition rate does not allow an accurate measurement of the pressure pulse; thus OCC would not be aware of the magnitude of event. The pressure sensor only transmits the pressure every minute yet the pressure pulse is only 8 seconds wide. It is therefore unlikely that the true pulse height would be captured. Counter to the effect of under estimating the pulse height because of sampling rate, is the amplification of a rapid pressure change by nitrogen left in the pressure sensing line. The nitrogen is inserted to keep wax and drag reducing agent from plugging the line. The current pressure measurement sensors are designed to measure slow changes in pressure, not the rapid rise pulse produced by this event.
- Alyeska estimated the magnitude of the pressure pulses by modeling with their surge analysis program PAULA. The primary variables were the amount of oil trapped behind RGV-31 prior to opening, size of the slack line gap below RGV-31 and the timing of the opening. These variables determined the speed and momentum of the oil “train” flowing down hill.
- Modeling indicated that even the valve opening of 25% could create a significant pressure pulse. The causal factor analysis reviewed history of past events and found that anchors were tripped north of RGV-31 in 1995.
- Alyeska’s surge analysis indicates that pressure reached 109.8% of the Maximum Allowable Operating Pressure (MAOP) at milepost 169.27, which is just below the DOT 110% limit for abnormal events. This represents 63.6% of the Specified Minimum Yield (SMYS) of the pipe. The actual damage to the pipe supports is related to the rapid rate of change of the pressure wave, not the absolute value of the pressure.

Conclusion: JPO concluded that:

- Alyeska management of change process was inadequate for the logic change at RGV-31 because it did not identify critical conditions which should be considered for an adequate design. In addition, availability of critical records does not appear to be adequate given that the reasons for the original 25% open condition requirement were not readily available to the design team.
- Alyeska’s surveillance and monitoring were inadequate since the damage was not discovered until at least a month after its occurrence. There are indications that prior

pressure pulse events may have moved the pipe from its optimal position along the supports.

- **Follow up:**
- Alyeska changed the opening sequence at RGV-31 to allow only 20% initial opening for ten minutes. Surge calculations indicate that this will prevent similar events in the future.⁵⁴
- Alyeska conducted soil gas monitoring and found no anomalous soil gas readings⁵⁵ and modified its surveillance process by painting orange marker lines on the pipe anchor supports to make movement more evident.⁵⁶
- Alyeska has completed the repair of the pipe supports at MP 170.
- JPO awaits the Curvature/Deformation Pig data to verify the condition of the below ground pipe downstream from RGV-31. The pig was run August 2000. The data is expected to be available by early in the year 2001.

4.3.4 Check Valve 74 Incident



Figure 18: Check Valve 74 Seat Ring on BJ Curvature Pig

2000 Status

⁵⁴ Alyeska Change Management for OCC Personnel: “RGV-31 Triconex Ladder Logic Modifications”, dated 09/14/00.

⁵⁵ Alyeska Letter No. 00-16069 dated 07/31/00

⁵⁶ Alyeska Briefing: “TAPS Milepost 170 Pipe Movement”

On June 26, 2000, Alyeska launched a scraper and curvature (instrumented) pig from PS04 through the 48" pipeline. On July 4, 2000, the scraper pig arrived at the Valdez Marine Terminal (VMT) with significant damage to the scraper disks. On July 6, 2000, the curvature pig arrived with a seat ring from a WKM check valve attached. Data analysis confirmed that a check valve seat ring was missing from CV-74. Further analysis indicated that the damage to the pig occurred at CV-81. It was therefore concluded that the scraper dislodged the valve seat ring at CV-74, carried it to CV-81, and the curvature pig hit the seat ring and carried it to Valdez. As a result, on September 16, during a scheduled TAPS shutdown, Alyeska replaced CV-74.

JPO/OPS personnel reviewed the CV-74 replacement procedures and the critical path management plan. The replacement of CV-74 was successfully completed in 48 hours. Subsequently, JPO/OPS personnel conducted an internal valve/pipeline inspection of CV-74 to determine the extent of damage caused by the seat ring dislodging. The pipe did not sustain any internal damage. The check valve sustained minor ring scraping on the inside body of the valve.⁵⁷

Details

CV-74 Causal Factor analysis

Alyeska conducted a causal factor analysis in August 2000 to determine the reason the seat ring dislodged from the CV-74 valve body. It was determined that the retaining pins were not properly seated into the seat ring. At least 2 of the 12 retaining pins did not sufficiently protrude beyond the outside diameter of the seat ring, thus not securing the ring to the valve body. The analysis concluded that an error in assembly of the retaining pins was the primary reason the ring became disengaged from the valve body.

CV-74 Risk Assessment

A risk assessment was conducted on September 26, 2000 to determine possible risks to pipeline integrity. JPO/OPS personnel participated with the Alyeska risk assessment team to identify potential hazard/accident scenarios.⁵⁸ The highest risk scenarios included:

- The valve ring could gouge the inside of the pipe at 3-D bends (Tanana/Taslina rivers) and could gouge existing internal pipeline dents that are over 1" in height.
- Risk of losing additional seat rings from valves due to pigging.

Recommendations for corrective actions include:

- Assessing the feasibility of pigging the pipeline with a tool that accurately assesses longitudinal oriented defects.

⁵⁷ REF:DOT-IOCS 89849

⁵⁸ Alyeska Risk Assessment: "Check Valve Seat Extraction Risk Assessment Final Report", December 1, 2000.

- Performing UT (ultrasonic) inspections on the 3-D bends at Tanana/Tazlina rivers
- Compare the 2001 instrumented pig data against 1998 pig data at known dent locations
- Consider installing a pig receiver/launcher at PS09 to minimize the impact on valves due to pigging.

Conclusion: JPO is monitoring Alyeska's development of corrective and preventive risk mitigation plans.

4.4 Audit Action Items Resolution

- **Alyeska closed two of the remaining five open Audit Items since the previous Operations CMP dated February 1999.**

4.4.1 AAI Item 2113 Closed - Qualification and Development Program (QDP)

The qualification and development program initiated during 1994 was the result of the 1992 owners safety audit, the BLM audit and the TAPS assessment addressing the technician capabilities. The final Audit Action Item 2113 was closed by JPO after surveillance confirmed Alyeska's Qualification and Development Program was fully implemented and satisfied the implied requirement of Stipulation 1.21.1 of the Grant and Lease, i.e., trained pipeline controllers are implicit in operating TAPS in a "safe and workmanlike" manner.⁵⁹ The surveillance checked to see that the QDP identified the qualification of workers assigned core task. The surveillance confirmed that job disciplines were identified and core elements within each discipline were identified. Workers were required to demonstrate that they were proficient at each core task before they were allowed to perform the task unsupervised. It was found that records were kept which were current and accurate.

4.4.2 AAI Item 5052 Closed – Pump Station 1 Tank Farm Containment

AAI 5052 found evidence that the containment dike for Pump Station 1 appeared to be inadequate to contain a spill generated by a major rupture of the tanks at Pump Station 1. Alyeska completed work to rectify this condition in 1999. The work included constructing a gravel berm and adding material to raise the pads to approximately 30 feet elevation to create an adequate containment volume. The completion of the work was confirmed by JPO surveillance and the AAI was closed.⁶⁰ Because of the underlying permafrost, JPO will revisit the site to confirm that there is no significant settlement in the berm or the pads that could impact the spill containment volume.

4.4.3 AAI Item 50528 Closed – Access Road and Workpad Bridges

Status: The primary purpose of this audit item was to bring the access road and workpad bridges in conformance with Alyeska operational requirement of being able to withstand a 50-year flood, seismic requirements and to resolve the requirements for low-temperature steel. JPO has verified the work for workpad bridges is complete.⁶¹

⁵⁹ JPO-00-S-017 surveillance report dated 02/16/00

⁶⁰ JPO-99-S-146 surveillance report dated 12/14/99

⁶¹ JPO surveillances: JPO-00-S-028, 029, 030, 031, 037, 038, 039, 040, 041, 042, 043, 044, 051, 073, 074, 083, 084, 085, 086, 087, 088, 089, 090, 091, 092, 093



Figure 19: Pungs Crossing Workpad Bridge

4.5 Audit Action Items Remaining Open

4.5.1 AAI Item 2076 – RGV Control System Replacement

AAI 2076 Closure action plan was designed to minimize the chance for unplanned Remote Gate Valve (RGV) closures. The audit item references 3 unplanned closures as reasons for the need for a change to the RGV Control System.

Status: By the end of 1999, Alyeska had completed all actions required by the plan except replacing the old Systronic master terminal units at the pump stations with triple modular redundant control units. This project is also discussed in the Construction CMP.

Details: The upgrades installed include:

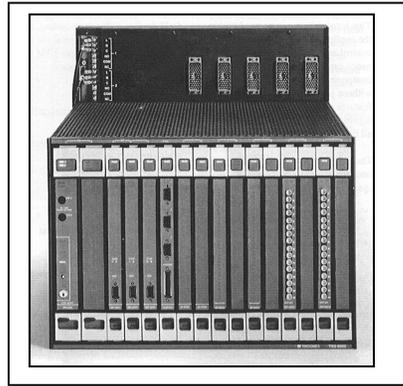


Figure 20: Triconlite Remote Terminal Unit

- New triple redundant remote terminal unit at all 62 RGV sites.
- Current sensors that monitor the valve movement which alerts the remote terminal unit to abort an uncommanded closure.
- Lengthened valve closure time to allow a response by the OCC to valve closure.
- Redundant power supplies for the remote terminal units.
- New motor control centers at each RGV.

In addition to these items, Alyeska has implemented an operation procedure to shutdown the pipeline if the status of the RGV can not be confirmed by OCC. The procedure was discussed in detail in the previous Operation CMP.

At the OCC SCADA host computer Alyeska has implemented software to automatically shutdown the pipeline if the RGV's begin a move that is not uncommanded. This software is called Auto Logic.

Work Remaining: The Master Terminal Units at the Pump Stations have yet to be installed. The installation of the Master Terminal Units was halted because Alyeska found the Kanas Fiber Optics System did not meet contractual reliability requirements.⁶² The additional bandwidth was required to use the full capabilities of the new control system.

4.5.2 AAI Item 1955 – Host Audit Item for 15 other AAIs.

⁶² Alyeska Letter No. 00-16511 dated 11/28/00

Status: This audit item remains open. Details are discussed in the Construction CMP. The audit item is a designated host for 15 other AAIs with programmatic similarities such as TAPS drawings and data not being current and inaccurately representing the existing systems.

4.6 Conclusions:

4.6.1 Normal Operations:

This reports finds that TAPS mainline pressure control devices are calibrated, maintained and operational. Four pipeline start and restarts were observed during this reporting period. Other than 1 variance from the written procedure during the September 1999 shutdown, which did not effect pipeline integrity, all planned pipeline shutdowns and restarts, observed from OCC, were conducted in accordance with procedure. In addition, it was verified that the Alyeska qualification and development program was fully implemented, thus a training program is in place.

4.6.2 Abnormal Operations:

Three major incidents that occurred since the 1999 Operations CMP and a follow up on a fourth incident were reviewed in this report. The incidents were the follow up on the Pipeline Overpressure of August 5, 1998, the Backpressure System Damage/Pig#4 Incident, the Milepost 170 Pipeline Movement and the Check Valve 74 Incident.

Pipeline Overpressure of August 5, 1998: USDOT/OPS issued a NOPV on March 15, 1999 relating to 49 CFR 195.406(b). Alyeska did not contest the finding; paid a civil penalty and completed the requirements of the Compliance Order. JPO has verified that the overpressure event caused no change in pipe shape by comparing deformation data before and after the overpressure event. JPO verified Alyeska has implemented auto control logic changes to make it more difficult for a controller to make the same mistakes that occurred during the August 5, 1998 event.

Backpressure System Damage/Pig#4 Incident: Alyeska completed its incident investigation and found a number of contributing causes including not following Alyeska's procedures. JPO's analysis of the event concurs with the causal factor findings. JPO is currently satisfied with Alyeska's corrective actions and considers this instance of noncompliance as remedied.

Milepost 170 Pipeline Movement: USDOT/OPS is pursuing a NOPV because of probable violation of safety regulation 49 CFR 195.401(a), 195.402(c), 195.402(d) related to this incident. JPO concludes that Alyeska's management of change process was inadequate for the logic changes at RGV-31 because it did not consider critical conditions which should be considered for an adequate design. Deficiencies in change management accounted for approximately 40% of the 1993 Quality Technology Company audit findings. JPO is currently satisfied with Alyeska's corrective actions and considers this instance of noncompliance as remedied. However, the general issue of adequate management of change remains an open issue from last year's Operations CMP.

Alyeska's surveillance and monitoring were inadequate since they failed to find the damage until at least a month after its occurrence. JPO is still reviewing Alyeska pipeline surveillance program.

The Check Valve 74 Incident: JPO views this incident as a case of latent construction deficiency. JPO will monitor implementation of the risk assessment recommendations.

JOINT PIPELINE OFFICE

Comprehensive Monitoring Program Report

TAPS Construction Program 1999/2000

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APPENDIX A – SECTIONS AND STIPULATIONS OF THE GRANT OF RIGHT-OF WAY MEASURED AS A RESULT OF CONSTRUCTION OVERSIGHT

APPENDIX B – BIBLIOGRAPHY OF JPO REPORTS GENERATED BY CONSTRUCTION OVERSIGHT

APPENDIX C – CONSTRUCTION PHOTOS

EXECUTIVE SUMMARY

Purpose

The Joint Pipeline Office (JPO), 1999/2000 Construction Comprehensive Monitoring Program (CMP) provided oversight of construction activities, defined as the process by which modifications are made to the Trans Alaska Pipeline System (TAPS). Oversight of this process provided a unique opportunity for the JPO to assess compliance of several Grant/Lease requirements for many different TAPS facilities, throughout the 800-mile pipeline system.

Additionally, this CMP effort served to measure readiness for closure of Audit Action Item (AAI) 1955, one of only two remaining priority-one audit items from the 1993 BLM audit of TAPS. The deficiency identified by AAI 1955 was that drawings and data were not current and inaccurately represented the installed systems, leading to allegations that TAPS was "indeterminate."

Scope/Methodology

The construction oversight strategy implemented by JPO incorporated the entire life of a construction project, from the conceptual design phase through to the closeout phase and the associated document revision process. While JPO monitored all phases of construction activities, the scope of this report is heavily focused on the document revision process. The effectiveness of this process is integral to closure of AAI 1955 as well as compliance to the Grant/Lease requirement for maintenance of current and accurate records.

Alyeska Pipeline Service Company (APSC) governs the design, implementation, and closeout of modifications through adherence to the TAPS Engineering Manual (PM-2001) and, therefore, JPO oversight included measurement of compliance to this program. Compliance determinations were made by assessing the adequacy of both: 1) the documents identified as affected by a particular modification, and 2) the timely completion of those document revisions.

A representative sample of 26 projects was selected based primarily on integrity, environmental, and safety issues. The selected projects included the following subject areas:

- Valve Maintenance and Repair
- Corrosion Investigation and Repair
- Valve Control System Upgrades
- Civil Maintenance due to River Hydrology Changes
- Pipeline Bridge Investigation and Repair
- Y2K implementation

- Fuel Gas Line Remediation
- Upgrades to Control Systems Associated with Vapor Control

In addition to its own construction monitoring program, JPO leveraged information accrued from the self-diagnostic audits and surveillances performed by APSC's Audit Group to effectively focus oversight.

Results/Conclusions

Of the 26 projects selected for oversight; 5 were not implemented, 2 were not monitored by JPO, and 3 were not required to comply with PM-2001. Seven of the remaining 16 projects were determined to be out of compliance with the Grant and Lease requirements for maintenance of current and accurate records. The overall change management performance was poor and provided little justification for closure of AAI 1955.

The evidence and conclusions presented in this report, however, are from projects implemented in 1999. APSC has spent a considerable amount of time and money on efforts to improve the efficiency of this process in the interim and JPO plans to select another representative sample of projects to measure as a part of the verification process necessary to consider closure of AAI 1955.

As a result of construction oversight, JPO determined that APSC is out of compliance with certain sections and stipulations of the Federal Grant of Right-of-Way and State Right-of-Way Lease specific to individual systems or programs. They are as follows:

Section 9 of the Grant and Section 16 of the Lease - Construction Plans and Quality Assurance Program

JPO finds APSC out of compliance with this section of the Lease because the quality program controls, established to determine supplier's capability for providing items and services that assure the integrity, maintenance, and safe operation of TAPS, are inadequate. In accordance with the Grant language, the Authorized Officer will evaluate the adequacy of APSC corrective action prior to revoking quality program approval.

Stipulation 1.18 - Surveillance and Maintenance

JPO finds APSC out of compliance with Stipulation 1.18.1 as they were unable to demonstrate that the pipeline bridge inspection program adequately ensures that identified maintenance deficiencies are corrected.

JPO finds APSC 's document management practices to be inconsistent with the requirements of Stipulation 1.18.3 as they were unable to demonstrate that complete and up-to-date records on construction activities are maintained.

Stipulation 1.21 - Conduct of Operations

JPO finds APSC out of compliance with Stipulation 1.21.1 as they were unable to demonstrate that the chosen strategy for Y2K compliance will ensure the safety and integrity of the pipeline system.

JPO finds APSC's document management practices to be inconsistent with the requirements of Stipulation 1.21.1 due to the inability to demonstrate effective management of information necessary to safely operate and maintain the pipeline.

Stipulation 3.2.1.1 - Pipeline System Standards

USDOT finds APSC out of compliance with 49 CFR 192.317 and 195.703, as they have not fulfilled all the requirements of the USDOT Compliance Order, CPF 59502. This Order requires APSC to take all practicable steps to protect the Fuel Gas Line and associated appurtenances from future detrimental movement and external forces. JPO finds failure to fulfill this order a violation of Stipulation 3.2.1.1.

Stipulation 3.9.1 - Construction and Operation

JPO finds APSC to be out of compliance with this stipulation until the Fuel Gas Line corrective action program has been completed to the satisfaction of JPO and the Department of Transportation/ Office of Pipeline Safety (USDOT/OPS).

1.0 INTRODUCTION / BACKGROUND

1.1 INTRODUCTION

The Comprehensive Monitoring Program (CMP) was reorganized in 1999 to focus on four key oversight areas: Construction/Termination, Maintenance, Operations, and Culture. The impetus for reorganization of the Joint Pipeline Office (JPO) oversight structure was to focus on regulatory compliance, the requirements of the Federal Agreement and Grant of Right-of-Way, and the State Right-of-Way Lease as they relate to the Trans-Alaska Pipeline System (TAPS) facilities.

The Grant and Lease are both subject to renewal in the year 2004 and JPO has been tasked with ensuring that the verification process will sufficiently document the state of TAPS compliance. Since this is a prohibitive amount of information to digest, the CMP reports for 1999 were delineated by activity to provide an easily understood, preliminary compliance check.

1.2 BACKGROUND

1.2.1 JPO Reports

A previous CMP report released in 1998, Project Performance, dealt with construction oversight. That report identified these issues: 1) insufficient project planning; 2) inconsistent adherence to the Quality Assurance program; 3) late or inadequate response to employee concerns; and 4) repetition of audit findings. The employee concerns issue will be addressed in JPO's future CMP report on Culture. The three remaining issues are addressed in this report.

1.2.2 APSC Commitments

One of the most significant commitments Alyeska Pipeline Service Company (APSC) and the Owner Companies have made to the U.S. Congress is the resolution of audit action items (AAIs) resulting from the TAPS audits. This report will serve as a measure of readiness for closure of AAI 1955, one of only two remaining priority-one audit items. AAI 1955 resulted from the report *Audit of the Trans-Alaska Pipeline System*, written by Quality Technology Company (QTC) for the Bureau of Land Management (BLM). This AAI was designated a "host" for fifteen other AAIs of programmatic similarity; the citing of TAPS drawings and data for not being current and inaccurately representing the installed systems.¹ The number and extent of these citations resulted in the allegation that TAPS was "indeterminate."

¹ JPO Assessment No. JPO-98-A-009, dated September 1, 1998

"Indeterminate" means that the information associated with the TAPS may not reflect the state of the physical equipment. The significance of this disparity between records and equipment can be illustrated by the following example: If a technician is using a drawing to perform maintenance on an electrical system which has been modified, but the drawing has not been revised to reflect that modification, a serious accident could occur.

One of the corrective actions for this audit, committed to by APSC, was the implementation of a configuration management system. Configuration management refers to the process by which information relevant to the safe operation and maintenance of TAPS is managed in a controlled and disciplined manner, resulting in current and accurate records.²

Herein lies the relevance to construction activities. Modifications not only represent a physical change to the TAPS system, but a change to the documentation associated with that system as well. And while APSC has been quite successful in implementing physical changes to the pipeline system, they have not effectively managed the associated information. Any assessment of APSC's ability to successfully steward their construction program must measure, in concert, the documentation revision process, which provides for "determinacy" of the system.

2.0 PURPOSE, SCOPE & METHODOLOGY

2.1 PURPOSE

The purpose of this CMP report is to address oversight of construction activities, defined as the process by which modifications are made to the TAPS. Oversight of this process provides a unique opportunity for the JPO to assess compliance of several Grant/Lease requirements, for many different TAPS facilities, throughout the 800-mile pipeline system.

This modification process involves nearly every functional organization within APSC as it progresses from problem identification to corrective action. To fully understand JPO's oversight program, an explanation of the relationship between the Maintenance and Construction CMP programs must be made. Construction projects very often result from recommendations made by the APSC surveillance, monitoring, and maintenance organizations; projects being the avenue of corrective action. Assessment of this cradle to grave process includes both maintenance and construction issues; therefore, to avoid duplication, some relevant information will reside in the Maintenance CMP report.

The life of a construction project can be divided into the three phases of design, implementation, and closeout. 1) The design phase originates after a deficiency or need

² JPO Engineering Report No. JPO-00-001, dated February 8, 2000

is identified and involves the consideration of solution alternatives, resulting in a scope of work. 2) The implementation of a project entails the actual modification work, such as physically replacing a valve. 3) Closeout refers to the acceptance by the owner facility of the modification work and associated documentation. JPO monitors all phases of construction activities and conducts oversight from the several different perspectives presented below.

This report will:

- Discuss JPO's approach to construction oversight and explain the methodology used in selecting projects for oversight.
- Discuss whether the construction program at APSC is serving as an effective corrective action avenue and successfully ensuring the integrity of the pipeline while protecting the environment and worker safety.
- Provide an assessment of APSC configuration management practices. Configuration management refers to the process by which current and accurate records are maintained, which reflect changes or modifications to the TAPS. Meeting the commitment to evidence an effective configuration management process is a significant part of the closure requirement for AAI 1955. This report will include an assessment of the adequacy of the configuration management performance specific to each of the projects selected for oversight. (Note: Configuration management is often referred to by APSC as change management.)
- Present Grant and Lease compliance issues identified through monitoring of construction activities.

2.2 SCOPE / METHODOLOGY

JPO oversight efforts can be categorized in two ways, planned and unplanned. Most of the information presented in this report relates to the planned construction oversight program developed for 1999. JPO resources, however, are frequently diverted by unanticipated events or issues, resulting in reports which fall outside the scope of planned work. Documentation associated with unexpected incidents such as natural disasters, oil spills, equipment failures, and accidents resulting from human error will be incorporated into the Operations CMP report. This report will include some information relative to construction activities which was generated as a result of emerging issues and concerned employee investigations.

2.2.1 Planned - Project Oversight

JPO 1999/2000 oversight of TAPS construction activities incorporated the entire life of a construction project, from the conceptual design phase through to closeout and the associated document revision process. The scope of this CMP report is heavily focused on the closeout phase of a project, which as previously discussed, is integral to the

closure of AAI 1955. The maintenance of current and accurate records is also a requirement of Grant Stipulation 1.18.3, Surveillance and Maintenance. The JPO methodology used to assess the adequacy of the document revision process was to measure compliance to the APSC TAPS Engineering Manual, PM-2001.

APSC annually manages over 150 major projects, as well as numerous smaller modification efforts. As the JPO does not monitor all the construction activities performed on TAPS, a representative sample was selected for oversight. JPO selected 26 projects from APSC's 1999 Project Plan using the following selection criteria: 1) integrity level, 2) permit requirements, 3) design basis waiver requests, 4) audit action items, 5) safety concerns, 6) environmental or oil spill contingency plan considerations, 7) risk, and, 8) employee concern issues.

The 26 projects selected were separated into two distinct oversight categories: active and passive. This allowed JPO to focus on issues of major significance with maximum efficiency. Oversight of the *active* projects involved the coordinated efforts of a JPO team consisting of engineers, environmental specialists, field personnel, and agency representatives. The teams met in advance of project implementation to focus the field oversight efforts on relevant issues and to identify the appropriate surveillance attributes and their connection to Grant/Lease requirements.

The strategy utilized for projects selected for *passive* oversight was primarily a documentation review, with field surveillance conducted on a case by case basis. Projects can and do have an extensive paper trail comprised of the following: 1) design and implementation packages; 2) design change packages; 3) corrective action and non-conformance reports; 4) periodic construction reports; and 5) turnover and closeout packages. JPO followed the progress of these projects by review of this associated documentation and performed field oversight only if indicated. The following are the projects selected for *active* and *passive* monitoring:

2.2.1.1 Actively Monitored Projects:

- Z029 - Check Valve (CKV) 122 Repair
- F041 - Remote Gate Valve (RGV) - 80 Replacement
- F064 - Mainline Valve Remediation
- B023 - RGV Control System Upgrade
- B146 - Mainline Valve Testing Program
- X019 - Mainline Corrosion Investigation and Repair
- F086/F022 - Linewide Buried Check Valve Investigation/Repair
- F075 - Flood Damage Repairs
- F066 - Pipeline Bridge Inspection/Repair
- Y2K Implementation

2.2.1.2 Passively Monitored Projects:

- F081 - Valve Operator/Actuators
- Z021 - Transient Volume Balance (TVB) Leak Detection

- V309 - Mainline Remedial Anode Installations
- V109 - Pump Station (PS) Cathodic Protection (CP) Systems Upgrades
- X029 - PS Deadleg Inspections
- F065 - Mainline Coupon Program
- F087/F002 - Mainline Block & Bypass Valve Maintenance
- X080 - Cooperative Corrosion Agreement Program
- F088 - Valve Operator/Actuator
- F068 - Fuel Gas Line Remediation Program
- F062 - Ledeen Actuator Check Valves
- Z065 - PS 12 Tazlina River Crossing Erosion Repairs
- Z052 - Power Vapor Distributed Control System Upgrades
- Z073 - Vapor Control System Instrumentation Control Information Upgrades
- X059 - Valdez Marine Terminal (VMT) Tank Inspection/CP
- V119 - VMT CP System Upgrade

In addition to its internal construction oversight program, JPO utilized APSC self-assessments. APSC has an Audit Group which conducts periodic, self-diagnostic audits and surveillances. Compliance determinations accrued as a result of these reviews were used by JPO to effectively focus oversight efforts.

2.2.2 Additional Construction Oversight Efforts

2.2.2.1 Assessment of APSC's Supplier Evaluation Process

This assessment evaluated APSC's compliance with internal quality program requirements designed to assure suppliers are capable of providing items and/or services that ensure the integrity, maintenance, and operation of TAPS.

2.2.2.2 North Pole Metering Station

The Authorized Officer of the JPO directed an inter-agency investigation of the North Pole Metering Station (NPMS) Project, #B176, in response to allegations from a concerned employee. The concerned individual, a TAPS contract employee, alleged Quality Program requirements were being ignored and over a hundred "deficiencies" existed with the project. The investigation team focused on code, regulatory, and Grant/Lease compliance for selected piping and valves. The investigation was not an evaluation of APSC's procedural or manual compliance.

3.0 REQUIREMENTS

3.1 GRANT/LEASE REQUIREMENTS

The sections and stipulations of the Grant of Right-of-Way measured as a result of construction oversight are as follows:

- Principle (1)
- Principle (3)
- Section 9 – Construction Plans and Quality Assurance Program
- Section 10 – Compliance With Notices To Proceed
- Section 16 – Laws and Regulations
- Stipulation 1.1.1.24 – Related Facilities
- Stipulation 1.3 - Authorized Officer
- Stipulation 1.7 – Notices to Proceed
- Stipulation 1.12 – Regulation of Public Access
- Stipulation 1.17 – Fire Prevention and Suppression
- Stipulation 1.18 – Surveillance and Maintenance
- Stipulation 1.20 – Health and Safety
- Stipulation 1.21 – Conduct of Operations
- Stipulation 2.1 – Environmental Briefing
- Stipulation 2.2 – Pollution Control
- Stipulation 2.3 – Buffer Strips
- Stipulation 2.4 – Erosion Control
- Stipulation 2.6 – Material Sites
- Stipulation 2.7 – Clearing
- Stipulation 2.8 – Disturbance of Natural Water
- Stipulation 2.9 – Off Right-of-Way Traffic
- Stipulation 2.12 – Restoration
- Stipulation 2.14 – Contingency Plans
- Stipulation 3.2 – Pipeline System Standards
- Stipulation 3.6 - Stream and Flood Plain Crossings and Erosion
- Stipulation 3.9 - Construction and Operation
- Stipulation 3.10 - Pipeline Corrosion

These Sections and Stipulations can be found in their entirety as Appendix A to this report.

3.2 APSC REQUIREMENTS

APSC has proclaimed that their programs incorporate the requirements of the Grant/Lease. As such, there are a number of APSC programs that construction activities must adhere to in order to evidence compliance with Grant/Lease requirements. The list includes, but is not limited to:

- TAPS Engineering Manual (PM-2001)
- Maintenance Systems Manual (MP-167)
- Trans-Alaska Pipeline Maintenance Repair Manual (MR-48)
- Quality Program Manual (QA-36)
- Corporate Safety Manual (SA-38)
- Environmental Protection Manual (EN-43)
- Regulatory Compliance Manual (OM-1, FG-78)

The TAPS Engineering Manual (PM-2001) is the APSC program that governs the design, implementation, and closeout phases of a construction project. As described in Section 2, JPO's oversight methodology includes measurement of compliance to PM-2001 requirements, specifically the requirements for project closeout (i.e. document revision process) as this directly relates to Grant/Lease Stipulation 1.18.3, which requires current and accurate records. Measurement of compliance to PM-2001 also relates directly to the closure of AAI 1955. AAI 1955, as previously outlined, includes APSC's formal commitment to configuration management (ensuring that accurate and current records result from modifications to TAPS). Since PM-2001 contains the working level instructions for meeting that commitment, assessment of this particular program was a significant part of JPO's construction oversight strategy.

The focus of measuring compliance to PM-2001 was assessing the adequacy of: 1) the documents identified as affected by a particular modification; and 2) the timely completion of those document revisions (APSC set a performance standard of 120 days from the end of implementation to closeout). JPO requested³ this information from APSC for each of the projects presented in this report and the results of PM-2001 compliance are presented, by project, in the next section.

4.0 APSC SELF-ASSESSMENTS

APSC's Audit Group, which conducts self-assessments, performed several surveillances during 1999, on individual projects selected for oversight by JPO. The findings associated with these surveillances are presented, by project, in Section 5 - Results.

In addition to the project surveillances, there were a number of audits and surveillances performed, measuring compliance to various APSC programs, relating to construction activities and Audit Action Item 1955. Synopses of the findings associated with these programmatic audits and surveillances are presented below.

³ JPO Letter No. 00-084-LM, dated May 17, 2000

4.1 APSC AUDITS

4.1.1 Engineering Design Control Audit #99-05

Finding #1:

Project Turnover/Closeout Processes

Project turnover signifies that the equipment or system modification is completed to the point that the facility manager judges it acceptable for operation and maintenance. Project closeout signifies that the necessary work and documentation for the modification has been completed.

The implementing organization, the project lead, and the project engineer are responsible for preparing the documentation required for turnover and closeout. This documentation includes revising drawings and procedures; resolving and closing Field Action Requests (FARs) and Nonconformance Reports (NCRs); completing a Lessons Learned Report; and closing project finances.

This finding identified that lax attention to turnover and closeout process stewardship and deficient governance has resulted in inconsistent adherence to requirements. Remiss project and facility management oversight on engineered projects has resulted in incorrect, outdated drawings; the necessity to work to redlines; outdated manuals and procedures; and incorrect equipment identifying numbers.

4.1.2 Documentation and Quality Records Audit #99-12

Finding #3:

Drawing Management

- Identification of Affected Drawings –REPEAT Audit Finding
- Use of Technical Drawing and Document Index (TDDI) REPEAT Audit Finding

When modifications occur, drawings must be updated to reflect the changes. Drawings affected by the modification are identified for revision by the project or field engineers, in concert with facility personnel. Identification is achieved through resident knowledge and use of the TDDI, a database that contains information on drawings, manuals, equipment identifiers, and procedures. This finding identified the inability (due to both performance of the electronic tools, and the management of the controlling processes) to consistently identify affected drawings. Some drawings would therefore not be revised to represent the new configuration of equipment.

Finding #5:

Document Review Cycles

This finding identified that many categories of documents are not reviewed in a timely manner. Examples of documents include, but are not limited to:

- Standard Operating/Maintenance Procedures (SOPs/SMPs)
- Principle Implementing Procedures (PIPs)
- Controlled Manuals
- Generic Procedures
- Master Specifications

The significance of this finding is that documentation may no longer reflect current organization, processes, or procedures.

4.2 APSC SURVEILLANCES

4.2.1 Surveillance #99-S-VBU-015

This surveillance was conducted on a random sample of Valdez Business Unit (VBU) Piping & Instrumentation Drawings (P&ID) and various electrical drawings that have been revised and released since January 1, 1999. The focus of this surveillance was on the adequacy of the results of the drawing revision process rather than compliance with the process itself and was accomplished by a physical verification or “walk down” of the sample drawings.

Finding #1:

The verification revealed that 10 of the 25 drawings sampled contained technical discrepancies.

4.2.2 Surveillance #99-S-VBU-027

This surveillance was conducted on a random sample of VBU engineering drawings. The focus of this surveillance was to test the following questions:

- Do the AutoCad drawings (electronic files) match the approved hardcopy drawings (scanned images)? This measures whether the AutoCad files are the same as the scanned images.
- For the information outside the area marked for revision, does the information in the revised drawing match the information in the previous revision? This measures whether inadvertent changes are being made to the drawings during the revision process.

There were no findings issued and the results of the reviews indicated a satisfactory condition.

4.2.3 Surveillance #99-S-FBU-028

This unscheduled surveillance was conducted at Pump Station 1 to ensure that modification packages requiring inspection were receiving the proper review and approvals, and the TAPS Engineering Manual (PM-2001) and Maintenance System Manual (MP-167) processes were being followed.

Finding #1:

1998 and 1999 modification packages were reviewed for documentation completion and necessary inspection requirements. Nine modification packages were missing inspection memos and integrity level determinations and contained documentation that was not fully approved.

Finding #2:

Inspections on modification packages have been cancelled without proper authority.

Finding #3:

Revisions to MP-167 and PM-2001 were not always read or reviewed in a timely manner.

4.2.4 Surveillance #99-S-VBU-029

The scope of this surveillance was an unscheduled measure of the status of the Commissioning/Turnover (C/T) checklists that constitute part of the construction packages. The focus was on the timeliness of the identification of the responsibilities, actions and documentation that would be required at the completion of the project activities. This surveillance was performed, in part, as an assessment of the extent of condition documented in Surveillance #99-S-VBU-024 (presented in Section 5 – Results), which noted the absence of a C/T checklist prior to the implementation of a single project.

Finding #1:

The review of project documentation files revealed that C/T checklists for 47 out of 55 completed and/or in-progress projects were not developed as required by PM-2001.

4.2.5 Surveillance #99-S-VBU-030

This surveillance was conducted on the management of change process developed by the Operations Control Center (OCC) at the Valdez Marine Terminal and completed for the pipeline shutdown on November 13, 1999. There were no findings issued as a result of this effort and the audit team recommended that the positive management of change stewardship of the OCC should be used as an example for the rest of the company.

4.3 SIGNIFICANCE OF APSC SELF-ASSESSMENTS

The primary significance of the findings presented above is that these are merely the next iteration of a problem first identified in 1994, which has continued without correction. JPO released an assessment⁴ in 1998, which was a compilation of all the external and internal findings associated with configuration management from 1994 to 1998. That assessment illustrated a pattern of undisciplined document management practices continually repeating. The findings presented in this chapter demonstrate that the situation has remained unchanged.

The positive performance of individual organizations, such as OCC during the shutdown, should be recognized as it demonstrates that effective change management is possible at APSC. It will be necessary, however, for that level of discipline to exist company-wide to fully demonstrate APSC compliance to Grant/Lease requirements.

5.0 RESULTS

JPO selected 26 projects for 1999/2000 construction oversight and requested that APSC provide, specific to each project, evidence that: 1) the documents affected by a particular modification were identified; and 2) revisions to those identified documents were completed in a timely fashion. APSC set a performance measure of 120 days for completion of the revision process but since this performance measure was intended as a guideline, JPO did not require rigid adherence. JPO found revisions taking over six months to be inconsistent with Stipulation 1.18.3 requirements for current and accurate records. The evidence provided to JPO by October, 2000, resulted in the following determinations. Of the 26 selected projects; 5 were not implemented, 2 were not monitored by JPO, and 3 were not required to comply with PM-2001. Ten of the 16 remaining projects were determined to be out of compliance with the closeout requirements of PM-2001 due either to the inability to demonstrate the identification of affected documents or the timeliness of the revision process.

Subsequently, APSC was informally provided these determinations and requested a delay in publication of this report for consideration of additional evidence. JPO agreed and the individual project results presented below include evidence provided by APSC and VECO employees on November 8th and 9th, 2000. The results are presented by category, with a brief summary of each project scope. The categories are: 1) APSC surveillance or audit findings; 2) compliance to the TAPS Engineering Manual, PM-2001; and 3) Grant/Lease compliance issues. Appendix B to this report is a bibliography of all the JPO reports generated as a result of construction oversight for 1999/2000.

⁴ JPO Assessment No. JPO-98-A-009, dated September 1, 1998

5.1 ACTIVELY MONITORED PROJECTS

5.1.1 Project #Z029 - Check Valve 122 Repair

Project scope was to repair CKV-122, as testing of this valve had revealed extensive leak through and performance degradation.

5.1.1.1 APSC Surveillance Findings

There was one finding issued as a result of Surveillance #98-S-VBU-007. It is as follows: "One contract person arrived on the CKV-122 jobsite without APSC required training."

5.1.1.2 PM-2001 Compliance

Implementation of this project concluded on September 26, 1998. APSC provided evidence that drawings and documents affected by this modification were identified. Revisions to the drawings were completed June 28, 1999 and the System Integrity Manual (SIM) was revised July 14, 2000. This does not meet either APSC's performance measure or JPO's definition of "timely."

5.1.1.3 Grant/Lease Compliance

The document revision performance of this project was inconsistent with Stipulation 1.18.3 requirements for maintenance of current and accurate records.

5.1.2 Project #F041 - RGV 80 Replacement

Testing of RGV 80 revealed extensive leak through and performance degradation, necessitating replacement.

5.1.2.1 APSC Surveillance Findings

There was one finding issued as a result of Surveillance #99-S-FBU-029. Surveillance Finding No. 1: Three synthetic slings located on the RGV-80 work site were found to be damaged and unfit to use for lifting.

5.1.2.2 PM-2001 Compliance

Implementation of the project concluded on September 26, 1998. APSC provided evidence that affected drawings and documents were identified. Revisions to the drawings were completed June 28, 1999 and the applicable SIM manual was revised July 14, 2000. This does not meet either APSC's performance measure or JPO's definition of "timely."

5.1.2.3 Grant/Lease Compliance

The document revision performance of this project was inconsistent with Stipulation 1.18.3 requirements for maintenance of current and accurate records.

5.1.3 **Project #F064 - Mainline Valve Remediation**

Project scope was the replacement of mainline RGV- 60. Testing results for this valve, while meeting APSC's performance standards, did indicate leakage. Since RGV-60 is located in an environmentally sensitive area on the bank of the Yukon River, APSC chose to replace the old valve with a rebuilt valve.

5.1.3.1 APSC Surveillance Findings

There was a surveillance conducted on this project, Surveillance #99-S-FBU-025, but no findings were issued as a result.

5.1.3.2 PM-2001 Compliance

Implementation of this project concluded in September, 1999. APSC provided evidence that affected drawings and documents were identified. Revisions to the drawings were completed April 10, 2000 and the SIM manual was revised July 14, 2000. This does not meet either APSC's performance measure or JPO's definition of "timely."

5.1.3.3 Grant/Lease Compliance

The document revision performance of this project was inconsistent with Stipulation 1.18.3 requirements for maintenance of current and accurate records.

5.1.4 **Project #B023 - RGV Control System Upgrade**

This project was conceived to prevent uncommanded RGV closures. The scope of work for this project was the first phase of a two-phase program to upgrade the linewise control system that has direct and supervisory control at the pipeline RGVs.

5.1.4.1 APSC Surveillance Findings

There was a surveillance conducted on this project, Surveillance No. 99-S-FBU-021, but there were no findings issued as a result, and the one observation made was positive.

5.1.4.2 PM-2001 Compliance

Implementation of this project was concluded on 10/29/99 and the project was closed in July of 2000. The project team for #B023 did an excellent job of identifying all of the

associated documentation, complete with revision status, for this modification. The time taken for the revision process, however, did not meet either APSC's performance measure or JPO's definition of "timely."

5.1.4.3 Grant/Lease Compliance

The document revision performance of this project was inconsistent with Stipulation 1.18.3 requirements for maintenance of current and accurate records.

5.1.5 **Project #B146 - Mainline Valve Testing Program**

This project consisted of the 1999 scope of work for mainline valve testing, one of the elements of the TAPS Valve Program. The primary objective of the TAPS Valve Program is to determine the sealing capability of all 177 valves on TAPS. This project's testing plan called for the testing of 50 valves. Information on the overall status of the Valve Program can be found in the 1999/2000 Maintenance CMP.

5.1.5.1 APSC Surveillance Findings

There were two findings issued as a result of Surveillance #99-S-FBU-032. Finding No. 1: A review of the completed mainline valve test procedure revealed the individual participants did not initial the controlled procedure as required by Department Operating Procedure (DOP) N 6.00.02. Finding No. 2: Measuring and Test Equipment (M&TE) being used had no identification number, description, or calibration due date as required by Principal Implementing Procedure (PIP) 12.1.

5.1.5.2 PM-2001 Compliance

Implementation of this project was concluded in November of 1999. This effort is ongoing and the yearly update was issued in April of 2000. This project was not required to adhere to PM-2001, as the project status represents a funding mechanism for ongoing engineering work rather than an actual modification to the TAPS.

5.1.5.3 Grant/Lease Compliance

There were no deficiencies identified.

5.1.6 Project #X019 - Mainline Corrosion Investigation and Repair

The Mainline Corrosion Investigation program is a continuous program to investigate and remediate corrosion sites identified in the bi-annual corrosion pig surveys of the TAPS. The investigation program provides three primary functions:

- To confirm the residual wall thickness in the suspect areas by visual and stationary measurement methods and determine if a repair is required.
- To inhibit further external corrosion in the excavated area by repairing the pipe coatings and upgrading the cathodic protection systems.
- To validate corrosion pig monitoring methods and provide calibration grids for future pigging programs.

The scope of work for this project included the investigation of 20 locations; 11 above ground and 9 below ground.

5.1.6.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.1.6.2 PM-2001 Compliance

The bulk of implementation of this project was concluded in the fall of 1999, but several work items remained uncompleted due to winter conditions, delaying closeout until May, 2000. Three documents were identified as affected by this modification; two databases were updated with corrosion and test station information and one G100 Construction Record Drawing was updated to reflect the installation of 2 repair sleeves. This project complied with PM-2001 requirements.

5.1.6.3 Grant/Lease Compliance

There were no deficiencies identified.

5.1.7 Project #F086/F022 - Linewide Buried Check Valve Investigation/Repair

Check valves are designed to prevent the reverse flow of oil and have been strategically placed to limit the volume of oil spilled in the event of a pipeline leak. This project was driven by a 1996 Risk Assessment, resulting in APSC's commitment to investigate all buried TAPS check valves over a five-year period.

5.1.7.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.1.7.2 PM-2001 Compliance

This project is a multi-year, in progress, effort which is scheduled for closure in January of 2001. APSC provided the list of documents identified as affected by this modification but since the project has not been closed yet, the revisions have yet to be completed.

5.1.7.3 Grant/Lease Compliance

There were no deficiencies identified since the project has yet to be concluded.

5.1.8 Project #F075 - Flood Damage Repairs

Several river bank locations adjacent to the pipeline were damaged by flooding in 1998. This project provided for the construction of various repair structures on the Dietrich, Koyukuk, and Sagavanirktok Rivers.

5.1.8.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.1.8.2 PM-2001 Compliance

This project involved construction at three different sites. Implementation at MP 218.5 was concluded on August 31, 1999; the RGV 34 site was finished August 25, 1999; and MP 186.2 site work was concluded November 18, 1999. The project has not yet been closed due to ongoing work; APSC determined that no drawings or documents required revision as a result of this project.

5.1.8.3 Grant/Lease Compliance

There were three findings issued as a result of a JPO Assessment.⁵ They are as follows:

Finding No. 1:

APSC had not submitted a site revegetation plan prior to January 15, 2000 and had not completed revegetation by June 1, 2000 at the Dietrich River project at MP 186.2 as required by Special Condition 7 of the Bureau of Land Management (BLM) Notice to

⁵ JPO Assessment No. JPO-00-A-004, dated June, 2000

Proceed. Subsequent to the issuance of this finding, APSC submitted a plan and completed revegetation at the site. This finding is now considered closed.

Finding No. 2:

APSC had two permit violations on the Middle Fork Koyukuk River project at pipeline milepost 218.5. One violation of Alaska Department of Fish and Game (ADF&G), BLM and Alaska Department of Natural Resources (ADNR) permit requirements involved moving a temporary riprap storage site in the floodplain of the river without approval. This violation has been corrected. The second violation of ADF&G and BLM permits involved placement and removal of unauthorized fill material from Alignment Slough, a fish stream. This violation was also corrected and JPO considers this finding closed.

Finding No. 3:

JPO issued a finding of violation of Stipulation 2.9 - Off Right-of-Way Traffic, for operating equipment off right-of-way after the authorization for the activity expired. JPO considers this finding closed.

5.1.9 Project #F066 - Pipeline Bridge Inspection/Repair

APSC's pipeline bridge inspection program requires a five-year inspection for structural integrity on all pipeline bridges. The scope of work for this particular project included inspections of the Tazlina, Tanana, and Gulkana River pipeline bridges

5.1.9.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.1.9.2 PM-2001 Compliance

This project was concluded in September, 1999 and has not yet been closed. This work effort was not required to adhere to PM-2001 as it was categorized a project as a funding mechanism; it does not represent an actual modification to TAPS.

5.1.9.3 Grant/Lease Compliance

JPO finds APSC to be out of compliance with Stipulation 1.18.1 – Surveillance and Maintenance due to the following:⁶

- APSC was unable to demonstrate that the pipeline bridge inspection program adequately ensures that identified maintenance deficiencies are corrected. APSC has

⁶ JPO Engineering Report No. JPO-00-E-020, dated June 15, 2000

agreed to develop a new procedure to reside in the Integrity Monitoring Program Manual, MP-166, but this effort has yet to be completed.

- The scope of this project originally included an inspection of the Tanana River pipeline bridge, but this inspection was dropped due to lack of funding. The inspection of the Tazlina River pipeline bridge identified cable tension measurements greater than the specified design tension and/or allowable load. Since both the Tanana and the Tazlina River pipeline bridges are suspension bridges, JPO requested that the Tanana River bridge be inspected in 2000, in accordance with their five-year inspection requirement to determine the extent of condition. APSC chose to defer this inspection for another year (out of compliance with their requirements, which were negotiated with JPO and the United States Coast Guard) and therefore, JPO considers this to be a noncompliance to the referenced stipulation.

5.1.10 Y2K Implementation

This effort entailed APSC's response to the potential for computer problems associated with the processing of date/time data during and after the rollover into the twenty-first century.

5.1.10.1 APSC Surveillance Findings

There was no surveillance conducted.

5.1.10.2 PM-2001 Compliance

This was not a project and therefore not required to comply with PM-2001.

5.1.10.3 Grant/Lease Compliance

The APSC Y2K program was not a construction project per se, but rather, a work effort determined critical due to its significance to communications and operations of TAPS. JPO computer specialists monitored the preparation and documentation phases of this program and personnel were on site December 31, 1999 to measure its effectiveness. Additional information about this effort can be found in the Operations CMP report.

Preparation for the rollover was effective and no problems occurred. However, there were two categories of systems and applications designated; "compliant" and "ready". "Compliant" systems would accurately process date/time data. "Ready" systems would be suitable for continued use into the year 2000 as installed, but could create problems later if modifications were made to the original system or if systems were tied together. APSC committed to develop databases to house the information necessary for making modification decisions, and to amend PM-2001 to include Y2K requirements for project engineering and implementation. However, the amended section in PM-2001 that speaks to Year 2000 compliance does not mention the "compliant" vs. "ready" concept, nor does it mention any required database research.

Project design requirements do not adequately emphasize the potential for future modification problems. Further, successful implementation of this approach requires a level of discipline and information management that APSC has not demonstrated in the past. One of the reasons AAI 1955 has not yet been closed is that APSC has been unable to consistently identify documents (inclusive of databases) that are affected by modifications. JPO does not consider the successful passage through the critical dates to be the true test of this program and consequently finds APSC to be out of compliance with Stipulation 1.21.1 - Conduct of Operations.

5.2 PASSIVELY MONITORED PROJECTS

5.2.1 Project #F081 - Valve Operator/Actuators

This project was conceived to correct the cause of RGV and Battery Limit (BL) actuator motor failures.

This project was not implemented in 1999.

5.2.2 Project #Z021 - Transient Volume Balance (TVB) Leak Detection

The fundamental purpose of this project was to make the TVB leak detection system Y2K compliant.

5.2.2.1 APSC Surveillance Findings

There was one finding issued as the result of Surveillance #99-S-VBU-024. Finding No. 1: There was no agreed upon Project Commissioning/Turnover (C/T) Checklist.

5.2.2.2 PM-2001 Compliance

Implementation of this project ended at the Y2K transition; the project has not yet been closed. APSC provided evidence that affected drawings and documents were identified but since the project is not yet closed, the revisions are not complete. This does not meet APSC's performance measure or JPO's definition of "timely."

5.2.2.3 Grant/Lease Compliance

APSC's document management practices on this project are found to be inconsistent with the requirements of Stipulation 1.18.3 due to the inability to evidence the maintenance of current and accurate records.

5.2.3 Project #V309 - Mainline Remedial Anode Installations

The annual cathodic protection (CP) survey performed on underground piping indicated discrete areas where CP potentials fall below mandated criteria levels. This project was developed to address locations where CP equipment required repairs or modifications.

5.2.3.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.2.3.2 PM-2001 Compliance

Implementation of this project ended in October of 1999 but the project has not yet been closed out. APSC provided a list of documents, which were identified as being affected by this project, but since closeout has not been completed, the revisions have not been completed. This does not meet APSC's performance measure or JPO's definition of "timely."

5.2.3.3 Grant/Lease Compliance

APSC's document management practices on this project are found to be inconsistent with the requirements of Stipulation 1.18.3 due to the inability to evidence the maintenance of current and accurate records.

5.2.4 Project #V109 - PS CP Systems Upgrades

The project scope was to upgrade or remediate areas in the pump stations, identified by annual corrosion surveys, where minimum CP requirements were not being met.

This project was not implemented in 1999.

5.2.5 Project #X029 - PS Deadleg Inspections

The pump station deadleg inspections are part of the annual corrosion inspection program as directed in APSC's Systems Integrity Monitoring Program, MP-166.

5.2.5.1 APSC Surveillance Findings

There was no surveillance conducted.

5.2.5.2 PM-2001 Compliance

Implementation (with the exception of work at PS-12) of this project concluded in May of 2000; the project has not yet been closed out. APSC identified only the corrosion data base (CDM) as being affected by this modification and it has been updated to reflect all the data collected to date. The closeout process for this project was delayed due to resolution of PS-12 remaining work. This project complied with PM-2001 requirements.

5.2.5.3 Grant/Lease Compliance

There were no deficiencies identified.

5.2.6 Project #F065 - Mainline Coupon Program

This project was the first phase of a multi-year program for installation of up to 100 corrosion coupons per year, as negotiated with JPO.

5.2.6.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.2.6.2 PM-2001 Compliance

Implementation of this project was concluded in September of 1999. This project was closed out in April of 2000. APSC did not provide evidence that affected documentation was identified and did not meet their own performance measure or JPO's definition of "timely".

5.2.6.3 Grant/Lease Compliance

APSC's document management practices on this project are found to be inconsistent with the requirements of Stipulation 1.18.3 due to the inability to evidence the maintenance of current and accurate records.

5.2.7 Project #F087-F002 - Mainline Block & Bypass Valve Maintenance

During the 1996 Valve Winterization program, a number of deficiencies were identified and documented using the Non Conformance Reporting (NCR) system. This project was a continuation of investigation, repair, and modification efforts to address those deficiencies.

5.2.7.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.2.7.2 PM-2001 Compliance

This project is a multi-year project, still in progress, and scheduled for closure by January, 2001. APSC provided a list of documents, which were identified as potentially being affected by this project. Since closeout is not yet completed, the revisions are still in process.

5.2.7.3 Grant/Lease Compliance

There were no deficiencies identified.

5.2.8 Project #X080 - Cooperative Corrosion Agreement

APSC's Comprehensive Corrosion Program (CCP) was developed as a result of agreements reached between themselves, USDOT, and JPO. The agreed upon corrosion prevention strategy is a proactive effort to identify early stages of possible corrosion on TAPS, and then to install supplemental corrosion protection. The X080 project is a multi-year effort to implement this strategy; this report reviews the activities conducted in 1999.

5.2.8.1 APSC Surveillance Findings

There was no surveillance conducted.

5.2.8.2 PM-2001 Compliance

This project consisted of work at various sites which was initiated and concluded at different times; project closeout has not been completed. APSC provided a list of documents identified as affected by the modification, however final revisions are not completed.

5.2.8.3 Grant/Lease Compliance

There were no deficiencies identified.

5.2.9 Project #F088 - Valve Operator/Actuator

This project was developed to repair and/or replace the operator/actuators as needed, for facility or mainline valves.

This project was not implemented in 1999.

5.2.10 Project #F068 - Fuel Gas Line (FGL) Remediation Program

This project was the initial phase of a five-year corrective action plan for depth of cover, exposed pipe, and other compliance issues associated with the Fuel Gas Line.

5.2.10.1 APSC Surveillance Findings

There was a surveillance performed on the Fuel Gas Line, #99-S-FBU-019, to verify reburial of FGL pipe in the MP 12-18 area, but no findings were issued as a result.

5.2.10.2 PM-2001 Compliance

The implementation phase of this project was concluded in September, 1999. Closeout was finalized 4/18/00. APSC made the determination that no documents were affected by this modification. This project substantially complied with PM-2001 requirements.

5.2.10.3 Grant/Lease Compliance

There are two open JPO findings associated with the Fuel Gas Line.⁷ They are as follows:

Finding No. JPO-98-GS-011-F01:

Fuel Gas Line MP 12-18 has been afflicted with heave buckling or exposure by erosion. Pump Station 1 facility settlement in the main generator room is 7 inches. APSC is addressing this finding in the Fuel Gas Line five-year corrective action program, which includes five separate projects.

Finding No. JPO-98-GS-012-F01:

FGL has standing or flowing water, thermokarsting or upheaval buckling, which have resulted in less than required cover over the FGL pipe (49 CFR Part 192). Pump Station 3 also has settlement problems.

USDOT Regulatory Compliance

The Department of Transportation/Office of Pipeline Safety (USDOT/OPS) has issued a Notice of Probable Violation, Proposed Civil Penalty and Compliance Order, CPF No. 59502, relating to the fuel gas line becoming exposed at MP 13.02 and 16.57 and being washed out and lying in water at MP 78.6, 86, 84, Mile hill, and 120 APS. The Compliance Order requires APSC to take all practicable steps to protect the fuel gas line

⁷ JPO Engineering Report No. JPO-00-E-014, dated May 31, 2000

and associated appurtenances in those areas from future detrimental movement and external forces. USDOT is also taking enforcement action relating to lateral vaults on the FGL at MP 18, 47, and 70 that are filled with frozen water. The vaults must be designed to minimize the entrance of water and the valve must be readily accessible during an emergency.

APSC is not in compliance with Stipulation 3.9 – Construction and Operation, until the findings outlined above have been corrected by completion of APSC's FGL Corrective Action Program to the satisfaction of JPO and USDOT/OPS.

5.2.11 Project #F062 - Ledeen Actuator Check Valves

This project was conceived to install ledeen actuator check valves downstream of PS-9 to eliminate degradation of the Drag Reducing Agent (DRA) stream by check valve clappers.

This project was not implemented in 1999.

5.2.12 Project #Z065 - PS-12 Tazlina River Crossing Erosion Repairs

The north bank of the Tazlina River experiences periodic erosion due to flooding. This project directed the construction of a repair structure to stabilize the riverbank.

5.2.12.1 APSC Surveillance Findings

There was no surveillance conducted.

5.2.12.2 PM-2001 Compliance

The implementation phase of this project was concluded in June, 1999; closeout was completed July 16, 2000. APSC determined that no drawings or documents were affected by this modification.

5.2.12.3 Grant/Lease Compliance

There were no deficiencies identified.

5.2.13 Project #Z052 - Power Vapor Distributed Control System Upgrades

The upgrade to the power generation and vapor recovery distributed control system is driven by the following concerns:

- The plant utilities and boiler controls for two of the three boilers are combined, creating a common failure that would cause a total loss of power generation.

- Existing loops do not conform to standards set by the tanker vapor control and scanner replacement projects
- Existing single loop controllers and chart recorders are past their serviceable life.
- The DCS terminal in the incinerator MCC room does not have a full console but only a work station with PC screen.
- Operator Consoles at Power Vapor Control Room and Boiler floor are not Y2K compliant.

Due to changing priorities and work load, this project was not monitored by JPO.

5.2.14 Project #Z073 - Vapor Control System Instrumentation Control Information Upgrades

There have been a number of problems associated with the instrumentation control system. This project will:

- provide a filter differential pressure read out in the control room
- make incinerator fuel/steam control changes
- upgrade compressor enclosure gas monitor detection/control
- install new open path infrared type gas detectors in compressor module ductwork
- upgrade printer, optical disc and other archive devices
- incorporate new data server in Bailey cabinet

This project was not implemented in 1999.

5.2.15 Project #X059 - VMT Tank Inspection/CP

This project was part of the ongoing VMT tank maintenance program. The scope of work for 1999 included crude oil storage tanks 9, 11, and 81. The tanks are vertical, aboveground, steel storage tanks, which deteriorate over time due to corrosion and settlement and must be inspected and maintained to ensure integrity.

5.2.15.1 APSC Surveillance Findings

There was no surveillance conducted on this project.

5.2.15.2 PM-2001 Compliance

Implementation and closeout of this project were concluded in November of 1999. APSC provided evidence that affected drawings and documents were identified and revised.

5.2.15.3 Grant/Lease Compliance

There were no deficiencies identified.

5.2.16 Project #V119 - VMT CP System Upgrade

As part of maintenance and regulatory compliance the piping at the VMT is monitored for corrosion. This project includes approximately four excavations of crude piping in the terminal inclusive of:

- excavations of corrugated metal piping (CMP) casings at tanks 1 & 2 crude manifolds
- excavations of CMP casings at tanks 1 & 3 crude relief manifolds
- excavations of the Anode Flex above east API separators.

The project also includes installation of improvements to the cathodic protection systems at various locations at the terminal.

Due to changing priorities and work loading, this project was not monitored by JPO.

5.3 ASSESSMENT OF APSC SUPPLIER EVALUATION PROCESSES

This issue is fully documented in a JPO Assessment⁸ released this year. The following is a summary of the results:

Finding No. 1: APSC has not consistently demonstrated surveys and field inspections of contractors and subcontractors facilities were conducted by either APSC or its contractors.

Finding No. 2: APSC does not mandate surveys and field inspections of contractor and sub-contractor facilities.

⁸ JPO-00-A-006, Assessment of Alyeska Pipeline Service Company's Supplier Evaluation Processes for Compliance to Grant and Lease Requirements, September 2000.

Finding No. 3: APSC could not provide quality determination records which identify suppliers that maintain their own quality list (e.g. QSL) of sub-contractors providing items or services in support of TAPS.

5.4 NORTH POLE METERING PROJECT INVESTIGATION

This investigation is fully documented in a JPO report⁹. The following is a summary of the results of that investigation.

The concerned employee's North Pole Metering Project #B176 deficiency list quantifying 127 items lacked sufficient detail, was not linked to codes, regulations, or specifications, and was inconsistently scoped. Many "items" on the list were redundant entries, several were non-specific with no basis of deficiency.

The United States Department of Transportation (USDOT) Office of Pipeline Safety (OPS) issued a *Notice of Probable Violation, Proposed Civil Penalty, and Proposed Compliance Order* dated September 14, 2000 notifying APSC of three probable violations of pipeline safety regulations 49 CFR Part 195. The violations related to: 1) improper setting of pressure safety valves following the hydrostatic testing of the meter skid; 2) out of date maps and records; and 3) improper security of the North Pole Metering facility. APSC is complying with the Proposed Compliance Order by: 1) completing a new hydrotest of the North Pole Metering facility to a pressure of 1751 psi and setting the Maximum Operating Pressure (MOP) at 1400 psi; 2) finalizing red-lined drawings for the meter skid; and 3) repairing the North Pole Metering fences.

The Alaska Department of Labor and Workforce Development issued a *Citation and Notification of Penalty* dated August 28, 2000 notifying APSC of one violation of the Occupational Safety and Health Act of 1970. There were no National Electrical Code (NEC) or other ADOL safety violations found by the investigation team. Other issues, determined by the investigation team to be within the jurisdiction of the Alaska Department of Commerce (ADOC) and the Alaska State Fire Marshal's office have been forwarded appropriately for their action.

⁹ The JPO Analysis and Review of "Itemized Punch List of Non-compliances" Associated with Project #B176, North Pole Metering Station, October, 2000.

6.0 CONCLUSIONS

6.1 APSC PROGRAM EFFECTIVENESS

6.1.1 PM-2001 Compliance

The APSC program measured as a result of construction oversight was the engineering process associated with TAPS modifications, as defined in the TAPS Engineering Manual, PM-2001. Compliance with PM-2001 was considered by JPO to be the most significant measure of APSC's commitment to configuration management, closure of AAI 1955, and adherence to Grant/Lease requirements. An effective configuration management program contains many elements, but JPO chose to measure the most basic: the ability to identify documents affected by a modification and to complete their revision in a timely fashion.

JPO selected a representative sample of 26 projects. For various reasons, a final sample set of 16 projects was measured, resulting in 7 determinations of non-compliance. The consideration of additional evidence improved APSC's performance, largely due to the ability to demonstrate the identification of affected documentation. The remaining deficiencies primarily involved the timeliness of the revision process.

The timeliness of revising drawings and documents might appear to be an insignificant issue since any changes are reflected on the facility copy, referred to as a "redline". The "redline" version of any document is available to the operators and maintainers of the pipeline at the facility. The master document copy, referred to as a "blueprint", resides in the document control centers located in Fairbanks and Valdez. The significance of maintaining current and accurate master documents is that the facility personnel (who have access to the most current and accurate "redline" versions) are not the only users of the drawings and documents. Design engineers, for example, use master drawings to develop modifications. Using master drawings, which do not accurately reflect the existing system, could result in modification designs, which compromise the integrity and safety of the pipeline.

APSC was able to demonstrate that affected documentation was identified for most of these projects. The completeness of the identification process, however, is difficult to verify. APSC currently has the ability to link equipment to drawings through the use of the Technical Document and Drawing Index (TDDI) database, so it is possible to confirm that the appropriate drawings were selected. There is no equivalent database, however, which links equipment to the numerous other associated documents such as Standard Operating Procedures, Standard Maintenance Procedures, datasheets, vendor documents, etc. The accuracy and currency of these procedures have integrity, safety, and environmental consequences. The identification of these documents is accomplished, for each project, by utilizing the combined knowledge of various subject matter experts,

design engineers, asset managers, and facility personnel. Since this process is by nature subjective, it is not possible for APSC to assure JPO of completeness.

The results of measuring the current manual process presented in this report are of concern for the following reasons: 1) it was difficult to obtain evidence that affected documentation was identified; 2) nearly one-half of the projects in the sample set were deficient; and 3) there is no method of verifying that the affected documents necessary to operate and maintain the pipeline safely and within environmental constraints were identified. This provides insufficient justification for closure of AAI 1955.

The evidence and conclusions presented in this report, however, are from projects implemented in 1999. APSC has spent a considerable amount of time and money on efforts to improve the efficiency of this process in the interim and is currently conducting internal audits associated with closure of AAI 1955. JPO plans to select another representative sample of projects to measure as a part of the verification process necessary to consider closure of AAI 1955.

JPO finds APSC's document management practices to be inconsistent with the requirements of Stipulation 1.18.3 of the Federal Grant of Right-of-Way, due to the inability to evidence the consistent maintenance of current and accurate records associated with construction activities.

JPO also finds APSC's management of operations and maintenance information to be inconsistent with the requirements of Stipulation 1.21, Conduct of Operations.

Many of the APSC personnel interviewed indicated that operation of the pipeline with inadequate resources contributes greatly to the inability to successfully manage documentation. While JPO cannot consider individual opinions as evidence of non-compliance, the quantity of APSC personnel sharing that opinion, coupled with the evidence of documentation mismanagement, is cause for concern.

6.1.2 APSC Program of Self-Assessment

The APSC Audit group has conducted a number of investigations and published reports on management of change that are self-critical. While this level of honesty is commendable, the only result has been an annual crop of self-critical assessments, dating back to 1994. The root cause of these problems remains unsolved. While the auditors have done their job, it is of no avail if APSC does not respond to identified problems effectively. Until APSC develops a corporate-wide, disciplined approach to the management of information, JPO will continue to delay closure of AAI 1955.

6.1.3 APSC Construction Program

This report has leveled some criticism at APSC for their document management practices. It therefore needs to be said that the construction program for TAPS is far broader in scope than the issues presented here. Document management practices were

chosen as focus of oversight for this construction year as they dovetailed with closure of AAI 1955. Management of construction on TAPS is a multi-faceted and far-reaching enterprise, which relies on the expertise and professionalism of literally hundreds of APSC and contract employees. JPO oversight of project implementation resulted in few findings outside of the configuration management arena, and that is due to the high level of competence and integrity of the project personnel at APSC.

6.1.4 APSC Supplier Evaluation Processes

Grant section 9 and Lease sections 16b and 16c mandate that APSC have an approved internal quality assurance plan designed to assure JPO that APSC will ensure the integrity, maintenance, and operation of TAPS.

- APSC could not demonstrate that surveys and field inspections of their contractors' and subcontractors' facilities were consistently conducted.
- APSC's internal quality program does not mandate surveys and field inspections of their contractors and subcontractors. (JPO does note, however, that APSC's internal quality program does provide, as an option and not as a requirement, instructions for on-site survey of suppliers' facilities to verify that quality manuals/procedures or processes/practices are adequately implemented.)

6.2 CONSEQUENCES OF DELAYED OR CANCELLED PROJECTS

The JPO's interest in the effectiveness of APSC's construction program extends beyond the programmatic. The state and federal agencies responsible for regulating the pipeline require assurance that the TAPS system is being maintained in a fashion which ensures integrity, worker safety, and protection of the environment. APSC must demonstrate that this public asset has been maintained adequately. Any assessment, therefore, of the effectiveness of the construction program must question whether delayed maintenance is decreasing the safety and reliability of the pipeline system.

The need for unplanned and unexpected expenditures will always arise after the planned and budgeted work for any construction season has been decided upon. JPO has observed, however, that unplanned work does not result in an increase in the maintenance budget; but rather, a decrease in planned work. In other words, APSC delays or cancels planned projects to cover the expense of emergencies.

APSC managed over 150 major construction projects in 1999 and JPO selected, with an emphasis on integrity, environmental, and safety issues, a representative sample of 26 for oversight. Of the 26 projects selected, 5 were not implemented; nearly 20% of the representative sample. To determine the extent of condition, JPO requested the total number of projects, planned and funded, but not implemented, for construction years 1997, 1998, and 1999. This information was requested twice; first in May, 2000¹⁰ and

¹⁰ JPO Letter No. 00-123-LM, dated 5/17/00

then again in June, 2000.¹¹ A response was received in October and JPO is currently analyzing the submitted data. JPO finds APSC's non-responsiveness to be inconsistent with the requirements of Stipulation 1.3 - Authorized Officer.

The practice of delaying necessary maintenance (projects which make it through the onerous budgeting process at APSC are rarely unnecessary) on an aging pipeline concerns JPO. This concern is one of the motivations for BLM's planned systems integrity review (see 1999/2000 Maintenance CMP). If critical system performance is found to have degraded outside functional parameters (Design Basis and regulatory requirements), determinations of non-compliance to Stipulation 1.18.1 may be made.

6.3 GRANT/LEASE COMPLIANCE

As a result of construction oversight, JPO has determined that APSC is not complying with certain sections and stipulations of the Federal Grant of Right-of-Way and State Right-of-Way Lease specific to individual systems or programs. They are as follows:

6.3.1 Section 9 of the Grant and Section 16 of the Lease - Construction Plans and Quality Assurance Program

JPO finds that APSC's quality program controls, established to determine suppliers' capability for providing items and services that assure the integrity, maintenance, and safe operation of TAPS, are inadequate. In accordance with the Grant language, the Authorized Officer will evaluate adequacy of APSC corrective action prior to revoking quality program approval.

6.3.2 Stipulation 1.18 - Surveillance and Maintenance

JPO finds that APSC was unable to demonstrate that the pipeline bridge inspection program adequately ensures that identified maintenance deficiencies are corrected.

JPO finds that APSC was unable to demonstrate that complete and up-to-date records on construction activities are maintained.

6.3.3 Stipulation 1.21 - Conduct of Operations

JPO finds that APSC was unable to demonstrate that the chosen strategy for Y2K compliance will ensure the safety and integrity of the pipeline system.

JPO finds that APSC is unable to demonstrate effective management of information necessary to safely operate and maintain the pipeline.

¹¹ JPO Letter No. 00-085-LM, dated 6/30/00

6.3.4 Stipulation 3.2.1.1 -Pipeline System Standards

USDOT finds APSC out of compliance with 49 CFR, Sections 192.317 and 195.703, as they have not fulfilled all the requirements of the USDOT Compliance Order, CPF 59502. This Order requires APSC to take all practicable steps to protect the Fuel Gas Line and associated appurtenances from future detrimental movement and external forces. APSC has not complied with Stipulation 3.2.1.1 until the requirements of the Order are performed and this situation is corrected.

6.3.5 Stipulation 3.9.1 – Construction and Operation

JPO finds APSC is not in compliance with Stipulation 3.9 until the FGL Corrective Action Program has been completed to the satisfaction of JPO and USDOT/OPS.

Appendix A – Sections and Stipulations of the Grant of Right-of-Way Measured as a Result of Construction Oversight

Principle (3)

Permittees shall manage, supervise and implement the construction, operation, maintenance and termination of the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology. In the exercise of these functions, Permittees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance and termination of the Pipeline System as are Provided for in this Agreement and other applicable authorizations. The Parties intend that this Agreement shall not in any way derogate from or be construed as being inconsistent with the provisions of Section 203(d) of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 585 (1973), relating to the National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. § 4321 *et Seg.*

Section 9 – Construction Plans and Quality Assurance Program

- A. Permittees shall submit construction (including design) plans, a quality assurance program, and other related documents as deemed necessary by the Authorized Officer, for review and approval prior to his issuing Notices to Proceed.
- B. The quality assurance program shall be comprehensive and designed to assure that the environmental and technical Stipulations in this Agreement will be fully complied with throughout all phases of construction, operation, maintenance and termination of the Pipeline System.
- C. The following criteria shall be included in the quality assurance program, although Permittees are not limited to these criteria:
 - (1) Provide adequate and appropriate means and procedures for the detection and prompt abatement of any actual or potential condition that is susceptible to abatement by Permittees which arises out of, or could affect adversely, the construction, operation, maintenance or termination of all or any part of the Pipeline System and which at any time may cause or threaten to cause: (a) a hazard to the safety of workers or to public health or safety (including but not limited to personal injury or loss of life with respect to any person or persons) or (b) serious and irreparable harm or damage to the environment (including but not limited to areas of vegetation or timber, fish or other wildlife populations, or their habitats, or any other natural resource).
 - (2) Provide adequate and appropriate means and procedures for the repair and replacement of improved or tangible property and the rehabilitation of natural resources (including but not limited to revegetation, restocking fish or other wildlife populations and reestablishing their habitats) that shall be seriously damaged or destroyed if the immediate cause of the damage or destruction arises in connection with, or results from, the construction, operation, maintenance or termination of all or any part of the Pipeline System.

- (3) Provide for component and system quality through adequate quality control management and planning, and inspection and test procedures.
- (4) Assure that the selection of Permittees' contractors, subcontractors and contract purchases of materials and services are based upon the above quality control procedures.
- (5) Determine quality performance by conducting surveys and field inspections of all of the facilities of Permittees' contractors and subcontractors.
- (6) Maintain quality determination records on all of the above procedures to insure satisfactory data identification and retrieval.

Section 10 - Compliance With Notices To Proceed

All construction of the Pipeline System undertaken by Permittees shall comply in all respects with the provisions of Notice to Proceed that are issued by the Authorized Officer.

Section 16 – Laws and Regulations

A. Permittees, and each of them, shall comply) with all applicable Federal laws and regulations, existing or hereafter enacted or promulgated.

B. In any event, Permittees, and each of them, shall comply with: (1) all regulations hereafter promulgated to implement the Trans-Alaska Pipeline Authorization Act, and (2) all applicable regulations hereafter promulgated to implement Section 28 of the Mineral Leasing Act of 1920, as amended.

Stipulation 1.1.1.24 – Related Facilities

1.1.1.24. A. "Related Facilities" means those structures, devices, improvements, and sites, the substantially continuous use of which is necessary for the operation or maintenance of the Oil transportation pipeline, including:

- (1) line pipe and supporting structures;
- (2) pump stations, including associated buildings, heliports, structures, yards and fences;
- (3) valves and other control devices and structures housing them;
- (4) monitoring and communication devices, and structures housing them;
- (5) surge and storage tanks, and related containment structures;
- (6) bridges;
- (7) terminals, including associated buildings, heliports, structures, yards, docks, and fences;
- (8) a gas fuel line and electrical power lines necessary to serve the Pipeline;
- (9) retaining walls, berms, dikes, ditches, cuts and fills, including hydraulic control structures;
- (10) storage buildings and structures, and areas for storage of supplies and equipment;
- (11) administrative buildings;
- (12) cathodic protection devices;
- (13) mechanical refrigeration equipment; and
- (14) such other facilities as the Authorized Officer shall determine to be Related Facilities.

B. "Related Facilities" not authorized by this Agreement include roads and airports. Authorizations for such Related Facilities shall be given by other instruments.

C. "Related Facilities" does not mean those structures, devices, improvements, sites, facilities or areas, the use of which is temporary in nature such as those used only for

construction purposes. Among such are: temporary camps; temporary landing strips; temporary bridges; temporary Access Roads; temporary communications sites; temporary storage sites; disposal sites; and construction use areas.

Stipulation 1.3 - Authorized Officer

1.3.1. For purposes of information and review, the Authorized Officer may call upon Permittees at any time to furnish any or all data related to construction, operation, maintenance and termination activities undertaken in connection with the Pipeline System.

1.3.2. The Authorized Officer may require Permittees to make such modification of the Pipeline System, without liability or expense to the United States, as he deems necessary to: protect or maintain stability of geologic materials; protect or maintain integrity of the Pipeline System; prevent serious and irreparable harm to the environment (including but not limited to fish or wildlife populations, or their habitats); or remove hazards to public health and safety.

Stipulation 1.7 – Notices to Proceed

1.7.1. Permission to construct.

1.7.1.1. Permittees shall not initiate any construction of the Pipeline System without prior written permission of the Authorized Officer. Such permission shall be given solely by means of a written Notice to Proceed issued by the Authorized Officer. Each Notice to Proceed shall authorize construction only as therein expressly stated and only for the particular Construction Segment therein described.

1.7.1.2. The Authorized Officer shall issue a Notice to Proceed only when in his judgment the construction (including design) and operation proposals are in conformity with the provisions of these Stipulations.

1.7.1.3. By written notice, the Authorized Officer may revoke in whole or in part any Notice to Proceed which has been issued when in his judgment unforeseen conditions later arising require alterations in the Notice to Proceed in order to: protect or maintain stability of geologic materials; protect or maintain integrity of the Pipeline System; prevent serious and irreparable harm to the environment (including but not limited to fish or wildlife populations, or their habitats); or remove hazards to public health and safety.

1.7.1.4. Prior to submission of any Preliminary Designs or applications for any Notice to Proceed, Permittees and the Authorized Officer shall agree to a schedule for the time, scope and quantity of such submissions and applications. The purpose of such schedule is to assure that Permittees' submissions and applications shall be reasonable in scope, and filed in a reasonable time frame, insofar as the workload thereby imposed on the Authorized Officer is concerned. Submittal and applications shall be filed in accordance with said schedule, and the Authorized Officer may refuse to consider any that are not so filed. The schedule may be reviewed and revised from time to time as may be agreed upon by Permittees and Authorized Officer.

1.7.2. Preliminary Design Submissions

1.7.2.1. Prior to applying for a Notice to Proceed for any Construction Segment, Permittees shall submit the Preliminary Design for that Segment to the Authorized

Officer for approval. Where appropriate, each submission shall include the criteria which justify the selection of the Construction Modes. The Authorized Officer shall expeditiously review each submission and shall do so within thirty (30) days from the date of his receipt of the submission. The Authorized Officer may request additional information if he deems it necessary.

1.7.2.2. In appropriate cases, the Authorized Officer may waive the requirement that a Preliminary Design be submitted. In this circumstance, Permittees may proceed to apply for a Notice to Proceed in accordance with Stipulation 1.7.4.

1.7.3. Summary Network Analysis Diagram

1.7.3.1. Prior to Final Design submissions, Permittees shall submit a summary network analysis diagram for the entire project to the Authorized Officer. The summary network analysis diagram shall be time-scaled and shall include all activities and contingencies which may reasonably be anticipated in connection with the project. The summary network analysis diagram shall include:

- (1) Data collection activities;
- (2) Submittal and approval activities;
- (3) Preconstruction, construction and post construction activities; and
- (4) Other pertinent data.

1.7.3.2. The summary network analysis diagram shall be updated at thirty (30) day intervals, as significant changes occur, or as otherwise approved in writing by the Authorized Officer.

1.7.4. Application for Notice to Proceed

1.7.4.1. Permittees may apply for a Notice to Proceed for only those Construction Segments for which the Preliminary Design has been approved in writing by the Authorized Officer or a waiver pursuant to Stipulation 1.7.2.2 has been issued in writing by the Authorized Officer.

1.7.4.2. Before applying for a Notice to Proceed for a Construction Segment, Permittees shall, in such manner as shall be acceptable to the Authorized Officer, by survey, locate and clearly mark on the ground the proposed centerline of the line pipe to be located in the Mapping Segment within which the Construction Segment is to be constructed and the location of all Related Facilities proposed to be constructed in the Mapping Segment.

1.7.4.3. Each application for a Notice to Proceed shall be supported by:

- (1) A Final Design.
- (2) All reports and results of environmental studies conducted or considered by Permittees.
- (3) All data necessary to demonstrate compliance with the terms and conditions of these Stipulations with respect to that particular Construction Segment.
- (4) A detailed network analysis diagram for the Construction Segment, including: Permittees' work schedules; consents, permits or authorizations required by State and Federal agencies and their interrelationships; design and review periods; data collection activities; and construction sequencing. The detailed network analysis diagram shall be updated as required to reflect current status of the project.

(5) A map or maps, prepared in such manner as shall be acceptable to the Authorized Officer, depicting the proposed location in the Mapping Segment within which the Construction Segment is to be constructed of: (1) the boundaries of all contiguous temporary use areas, and (2) all improvements, buried or aboveground, that are to be constructed within the Mapping Segment. The Authorized Officer shall not issue a Notice to Proceed with construction until he has approved all relevant locations on the ground and temporary boundary markers have been set by Permittees to the satisfaction of the Authorized Officer.

(6) Such other data as may be requested by the Authorized Officer either before submission of the application for a Notice to Proceed or at any time during the review period.

1.7.4.4. During review of an application for a Notice to Proceed, the relevant portion of the route of the Pipeline may be modified by the Authorized Officer, if, in his judgment, environmental conditions or new technological developments warrant the modifications. If, during construction, adverse physical conditions are encountered that were not known to exist, or that were known to exist but their significance was not fully appreciated when the Authorized Officer issued a Notice to Proceed for the portion of the Mapping Segment in which the physical conditions are encountered, the Authorized Officer may authorize deviations from the initially approved location of the Pipeline to another location along the same general route of the Pipeline at the point or points where the physical conditions are encountered, including adequate room for structurally sound transition. A deviation shall not be constructed without the prior written approval of the Authorized Officer and, if so approved, shall conform in all respects to the provisions of the approval.

1.7.4.5. The Authorized Officer shall review each application for a Notice to Proceed and all data submitted in connection therewith within ninety (90) days. Said ninety (90) day period shall begin from the later of the following dates:

(1) Date of receipt by the Authorized Officer of an application for a Notice to Proceed.

(2) Date of receipt by the Authorized Officer of the last submittal of additional data pursuant to this Stipulation.

1.7.4.6. If the Authorized Officer requires Permittees to submit additional data on one or more occasions, the review period shall begin from the date of receipt by the Authorized Officer of the last submittal

Stipulation 1.12 – Regulation of Public Access

1.12.1. During construction or termination activities, Permittees may regulate or prohibit public access to or upon any Access Road being used for such activity. At all other times, Permittees shall permit free and unrestricted public access to and upon Access Roads, except that with the written consent of the Authorized Officer, Permittees may regulate or prohibit public access and vehicular traffic on Access Roads as required to facilitate operations or to protect the public, wildlife and livestock from hazards associated with operation and maintenance of the Pipeline System. Permittees shall provide appropriate warnings, flagmen, barricades, and other safety measures when

Permittees are using Access Roads, or regulating or prohibiting public access to or upon Access Roads.

1.12.2. During construction of the Pipeline System, Permittees shall provide alternative routes for existing roads and trails as determined by the Authorized Officer whether or not these roads or trails are recorded.

1.12.3. Permittees shall make provisions for suitable permanent crossings for the public where the Right-of-Way or Access Roads cross existing roads, foot-trails, winter trails, or other rights-of-way.

1.12.4. After completion of construction of the Pipeline System, and with the concurrence of Permittee, the Authorized Officer may designate areas of the Right-of-Way to which the public shall have free and unrestricted access.

Stipulation 1.17 – Fire Prevention and Suppression

1.17.1 Permittees shall promptly notify the Authorized Officer and take all measures necessary or appropriate for the prevention and suppression of fires in accordance with 43 CFR 2801.1-5(d). Permittees shall comply with the instructions and directions of the Authorized Officer concerning the use, prevention and suppression of fires. Use of open fires in connection with construction of the Pipeline System is prohibited unless authorized in writing by the Authorized Officer.

Stipulation 1.18 – Surveillance and Maintenance

1.18.1 During the construction, operation, maintenance and termination of the Pipeline System, Permittees shall conduct a surveillance and maintenance program applicable to the subarctic and arctic environment. This program shall be designed to: (1) provide for public health and safety; (2) prevent damage to natural resources; (3) prevent erosion; and (4) maintain Pipeline System integrity.

1.18.2 Permittees shall have a communication system that ensures the transmission of information required for the safe operation of the Pipeline System.

1.18.3 Permittees shall maintain complete and up-to-date records on construction, operation, maintenance and termination activities performed in connection with the Pipeline System. Such records shall include surveillance data, leak and break records, necessary operation data, modification records and such other data as the Authorized Officer may require.

1.18.4 Permittees shall provide and maintain Access Roads and airstrips, the number and location of which shall be approved by the Authorized Officer, to ensure that Parties' maintenance crews and Federal and State representatives shall have continuing access to the Pipeline System.

Stipulation 1.20 – Health and Safety

1.20.1 Permittees shall take all measure necessary to protect the health and safety of all persons affected by their activities performed in connection with the construction, operation, maintenance or termination of the Pipeline System, and shall immediately

abate any health or safety hazards. Permittees shall immediately notify the Authorized Officer of all serious accidents which occur in connection with such activities.

Stipulation 1.21 – Conduct of Operations

1.21.1 Permittees shall perform all Pipeline System operations in a safe and workmanlike manner so as to ensure the safety and integrity of the Pipeline System, and shall at all times employ and maintain personnel and equipment sufficient for that purpose. Permittees shall immediately notify the Authorized Officer of any condition, problem, malfunction, or other occurrence which in any way threatens the integrity of the Pipeline System.

Stipulation 2.1 – Environmental Briefing

2.1.1 Prior to and during construction of the Pipeline System, Permittees shall provide for environmental and other pertinent briefings for construction and other personnel by such Federal employees as may be designated by the Authorized Officer. Permittees shall arrange the time, place and attendance for such briefings upon request by the Authorized Officer. Permittees shall bear all costs of such briefings other than salary, per diem, subsistence, and travel costs of Federal employees. In addition, Permittees shall separately arrange with the State of Alaska for such similar briefings as the State may desire.

Stipulation 2.2 – Pollution Control

2.2.1. General

2.2.1.1. Permittees shall conduct all activities associated with the Pipeline System in a manner that will avoid or minimize degradation of air, land and water quality. In the construction, operation, maintenance and termination of the Pipeline System, Permittees shall perform their activities in accordance with applicable air and water quality standards, related facility siting standards, and related plans of implementation, including but not limited to standards adopted pursuant to the Clean Air Act, as amended, 42 U.S.C. § 1857 *et seq.*, and the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1321 *et seq.*

2.2.2. Water and Land Pollution

2.2.2.1. Permittees shall comply with applicable "Water Quality Standards" of the State of Alaska as approved by the Environmental Protection Agency.

2.2.2.2. Mobile ground equipment shall not be operated in lakes, streams or rivers unless such operation is approved in writing by the Authorized Officer.

2.2.3. Thermal Pollution

2.2.3.1 Permittees shall comply with the standards set for thermal pollution in the State of Alaska "Water Quality Standards," as approved by the Environmental Protection Agency.

2.2.4. Air Pollution and Ice Fog

2.2.4.1. Permittees shall utilize and operate all facilities and devices used in connection with the Pipeline System so as to avoid or minimize air pollution and ice fog. Facilities and devices which cannot be prevented from producing ice fog shall be located so as not to interfere with airfields, communities or roads.

2.2.4.2. Emissions from equipment, installations and burning materials shall meet applicable Federal and State air quality standards.

2.2.5. Pesticides, Herbicides and other Chemicals

2.2.5.1. Permittees shall use only non-persistent and immobile types of pesticides, herbicides and other chemicals. Each chemical to be used and its application constraint shall be approved in writing by the Authorized Officer prior to use.

2.2.6. Sanitation and Waste Disposal

2.2.6.1. "Waste" means all discarded matter, including but not limited to human waste, trash, garbage, refuse, oil drums, petroleum products, ashes and equipment.

2.2.6.2. All waste generated in construction, operation, maintenance and termination of the Pipeline System shall be removed or otherwise disposed of in a manner acceptable to the Authorized Officer. All applicable standards and guidelines of the Alaska State Department of Environmental Conservation, the United States Public Health Service, the Environmental Protection Agency, and other Federal and State agencies shall be adhered to by Permittees. All incinerators shall meet the requirements of applicable Federal and State laws and regulations and shall be used with maximum precautions to prevent forest and tundra fires. After incineration, material not consumed in the incinerator shall be disposed of in a manner approved in writing by the Authorized Officer. Portable or permanent waste disposal systems to be used shall be approved in writing by, the Authorized Officer.

Stipulation 2.3 – Buffer Strips

2.3.1. Public Interest Areas

2.3.1.1. No construction activity in connection with the Pipeline System shall be conducted within one-half (½) mile of any officially designated Federal, State or municipal park, wildlife refuge, research natural area, recreation area, recreation site, or any landmark, unless such activity is approved in writing by the Authorized Officer.

2.3.2. Vegetative Screen

2.3.2.1. Permittees shall not cut or remove any vegetative cover within a minimum five hundred (500) foot strip between State highways and material sites unless such cutting or removal is approved in writing by the Authorized Officer.

Stipulation 2.4 – Erosion Control

2.4.1. General

2.4.1.1. Permittees shall perform all Pipeline System construction, operation, maintenance and termination activities so as to avoid or minimize disturbance to vegetation.

2.4.1.2. The design of the Pipeline System shall provide for the construction of control facilities that will avoid or minimize erosion.

2.4.1.3. The erosion control facilities shall be constructed to avoid induced and accelerated erosion and to lessen the possibility of forming new drainage channels resulting from Pipeline System activities. The facilities shall be designed and operations conducted in such a way as to avoid or minimize disturbance to the thermal regime.

2.4.2. Stabilization

2.4.2.1. Surface materials taken from disturbed areas shall be stockpiled and utilized during restoration unless otherwise approved in writing by the Authorized Officer. Stabilization practices, as determined by the needs for specific sites, shall include but shall not be limited to seeding, planting, mulching, and the placement of mat binders, soil binders, rock or gravel blankets, or structures.

2.4.2.2. All disturbed areas shall be left in a stabilized condition satisfactory to the Authorized Officer. Such satisfaction shall be stated in writing by the Authorized Officer.

2.4.3. Crossing of Streams, Rivers or Flood Plains.

2.4.3.1. Permittees shall prevent or minimize erosion at stream and river crossings and those parts of the Pipeline System within flood plains, as defined in Stipulation 3.6.

2.4.3.2. Temporary access over stream banks shall be made through use of fill ramps rather than by cutting through stream banks, unless otherwise approved in writing by the Authorized Officer. Permittees shall remove such ramps upon termination of seasonal or final use. Ramp materials shall be disposed of in a manner approved in writing by the Authorized Officer.

2.4.4. Seeding and Planting.

2.4.4.1. Seeding and planting of disturbed areas shall be conducted as soon as practicable and, if necessary, shall be repeated until vegetation is successful, unless otherwise approved in writing by the Authorized Officer. All other restoration shall be completed as soon as possible.

2.4.5. Excavated Material

2.4.5.1. Excavated material in excess of that required to backfill around any structure, including the pipe, shall be disposed of in a manner approved in writing by the Authorized Officer.

Stipulation 2.5 – Fish and Wildlife Protection

2.5.1. Passage of Fish

2.5.1.1. Permittees shall provide for uninterrupted movement and safe passage of fish. Any artificial structure or any stream channel change that would cause a blockage to fish shall be provided with a fish passage structure or facility that meets all Federal and State requirements. The proposed design shall be submitted to the Authorized Officer in accordance with Stipulation 1.7.

2.5.1.2. Pump intakes shall be screened to prevent harm to fish.

2.5.1.3. Abandoned water diversion structures shall be plugged and stabilized to prevent trapping or stranding of fish.

2.5.1.4. If material sites are approved adjacent to or in certain lakes, rivers, or streams, the Authorized Officer may require Permittees to construct levees, berms or other suitable means to protect fish and fish passage and to prevent siltation of streams or lakes.

2.5.2. Fish Spawning Beds

2.5.2.1. "Fish Spawning Beds" means the areas where anadromous and resident fish deposit their eggs.

2.5.2.2. Permittees shall avoid channel changes in Fish Spawning Beds designated by the Authorized Officer; however, where channel changes cannot be avoided in such beds, new channels shall be constructed according to written standards supplied by the Authorized Officer.

2.5.2.3. Fish Spawning Beds shall be protected from sediment where soil material is expected to be suspended in water as a result of construction activities. Settling basins shall be constructed to intercept silt before it reaches streams or likes.

2.5.2.4. Permittees shall comply with any special requirements made by the Authorized Officer for a stream system in order to protect Fish Spawning Beds. Permittees shall repair all damage to Fish Spawning Beds caused by construction, operation, maintenance or termination of the Pipeline System.

2.5.3. Zones of Restricted Activities

2.5.3.1. Permittees' activities in connection with the Pipeline System in key fish and wildlife areas may be restricted by the Authorized Officer during periods of fish and wildlife breeding, nesting, spawning, lambing or calving activity and during major migrations of fish and wildlife. The Authorized Officer shall give Permittees written notice of such restrictive action. From time to time, the Authorized Officer shall furnish Permittees a list of areas where such actions may be required, together with anticipated dates of restriction.

2.5.4. Big Game Movements

2.5.4.1. Permittees shall construct and maintain the Pipeline, both buried and above ground sections, so as to assure free passage and movement of big game animals.

Stipulation 2.6 – Material Sites

2.6.1. Purchase of Materials

2.6.1.1. If Permittees require materials from the public lands, Permittees shall make application to purchase such materials in accordance with 43 CFR, Part 3610. Permittees shall submit a Mining plan in accordance with 43 CFR, Part 23. No materials may be removed by Permittees without the written approval of the Authorized Officer.

2.6.1.2. Insofar as possible, use of existing materials sites will be authorized in preference to new sites.

2.6.1.3. Gravel and other construction materials shall not be taken from stream beds, river beds, lake shores or other outlets of lakes, unless the taking is approved in writing by the Authorized Officer.

2.6.2. Layout of Materials Sites

2.6.2.1. Materials site boundaries shall be shaped in such a manner as to blend with surrounding natural land patterns. Regardless of the layout of materials sites, primary emphasis shall be placed on prevention of soil erosion and damage to Vegetation.

Stipulation 2.7 - Clearing

2.7.1. Boundaries

2.7.1.1. Permittees shall identify approved clearing boundaries on the ground for each Construction Segment prior to beginning clearing operations. All timber and other vegetative material outside clearing boundaries and all blazed, painted or posted trees which are on or mark clearing boundaries are reserved from cutting and removal with the exception of danger trees or snags designated as such by the Authorized Officer.

2.7.2. Timber

2.7.2.1. Prior to initiating clearing operations, Permittees shall notify the Authorized Officer of the amount of merchantable timber, if any, which will be cut, removed or

destroyed in the construction and maintenance of the Pipeline System, and shall pay the United States in advance of such construction or maintenance activity, such sum of money as the Authorized Officer determines to be the full stumpage value of the timber to be cut, removed or destroyed.

2.7.2.2. All trees, snags, and other woody material cut in connection with clearing operations shall be cut so that the resulting stumps shall not be higher than six (6) inches measured from the ground on the uphill side.

2.7.2.3. All trees, snags and other woody material cut in connection with clearing operations shall be felled into the area within the clearing boundaries and away from water courses.

2.7.2.4. Hand clearing shall be used in areas where the Authorized Officer determines that use of heavy equipment would be detrimental to existing conditions.

2.7.2.5. All debris (resulting from clearing operations and construction that may block stream flow, delay fish passage, contribute to flood damage, or result in stream bed scour or erosion) shall be removed.

2.7.2.6. Logs shall not be skidded or yarded across any stream without the written approval of the Authorized Officer.

2.7.2.7. No log landing shall be located within three-hundred (300) feet of any water course.

2.7.2.8. All slash shall be disposed of in construction pads or Access Roads unless otherwise directed in writing by the Authorized Officer.

Stipulation 2.8 – Disturbance of Natural Water

2.8.1. All activities of Permittees in connection with the Pipeline System that may create new lakes, drain existing lakes, significantly divert natural drainage, permanently alter stream hydraulics, or disturb significant areas of stream beds are prohibited unless such activities along with necessary mitigation measures are approved in writing by the Authorized Officer.

Stipulation 2.9 – Off Right-of-Way Traffic

2.9.1. Permittees shall not operate mobile ground equipment off the Right-of-Way, Access Roads, State highways, or authorized areas, unless approved in writing by the Authorized Officer or when necessary to prevent harm to any Person.

Stipulation 2.12 - Restoration

2.12.1. Areas disturbed by Permittees shall be restored by Permittees to the satisfaction of the Authorized Officer as stated in writing.

2.12.2. All cut and fill slopes shall be left in a stable condition.

2.12.3. Materials from Access Roads, haul ramps, berms, dikes, and other earthen structures shall be disposed of as directed in writing by the Authorized Officer.

2.12.4. Vegetation, overburden and other materials removed during clearing operations shall be disposed of by Permittees in a manner approved in writing by the Authorized Officer.

2.12.5. Upon completion of restoration, Permittees shall immediately remove all equipment and supplies from the site.

Stipulation 2.14 – Contingency Plans

2.14.1 It is the policy of the Department of the Interior that there should be no discharge of Oil or other pollutant into or upon lands or waters. Permittees must therefore recognize their prime responsibility for the protection of the public and environment from the effects of spillage.

2.14.2 Permittees shall submit their contingency plans to the Authorized Officer at least one hundred and eighty (180) days prior to scheduled start-up. The plans shall conform to the Stipulation and the National Oil Hazardous Substances Pollution Contingency Plan, 36 F.R. 16215, August 20, 1971, and shall: (1) include provisions for Oil Spill Control; (2) specify that the action agencies responsible for contingency plans in Alaska shall be among the first to be notified in the event of any Pipeline System failure resulting in an Oil spill; (3) provide for immediate corrective action including Oil Spill Control and restoration of affected resource; (4) provide that the Authorized Officer shall approve any materials or devices used for Oil Spill Control and shall approve any disposal sites or techniques selected to handle oily matter; and (5) include separate and specific techniques and schedules for cleanup of Oil spills on land, lakes, rivers and streams, sea, and estuaries.

Stipulation 3.2 – Pipeline System Standards

3.2.1. General Standards

3.2.1.1. All design, material and construction, operation, maintenance and termination practices employed in the Pipeline System shall be in accordance with safe and proven engineering practice and shall meet or exceed the following standards:

(1) U.S.A. Standard Code for Pressure Piping, ANSI B 31.4, "Liquid Petroleum Transportation Piping System."

(2) Department of Transportation Regulations, 49 CFR, Part 195, "Transportation of Liquids by Pipeline."

(3) ASME Gas Piping Standard Committee, 15 Dec. 1970: "Guide for Gas Transmission and Distribution Piping System."

(4) Department of Transportation Regulations, 49 CFR, Part 192, "Transportation of Natural and Other Gas by Pipelines: Minimum Federal Safety Standards."

3.2.1.2. Requirements in addition to those set forth in the above minimum standards may be imposed by the Authorized Officer as necessary to reflect the impact of subarctic and arctic environments. If any standard contains a provision which is inconsistent with a provision in another standard, the more stringent shall apply.

3.2.2. Special Standards

3.2.2.1. The design shall also provide for remotely controlled shutoff valves at each pump station; remotely controlled mainline block valves (intended to control spills); and additional valves located with the best judgment regarding wildlife habitat, fish habitat, and potentially hazardous areas.

3.2.2.2. All practicable means shall be utilized to minimize injury to the ground organic layer.

3.2.2.3. Radiographic inspection of all main line girth welds and pressure testing of the Pipeline shall be conducted by Permittees prior to placing the system in operation.

3.2.2.4. Permittees shall provide for continuous inspection of Pipeline System construction to ensure compliance with the design specifications and these Stipulations.

3.2.2.5. Welder qualification tests shall be by destructive means, except that operators of automatic welding equipment for girth welding of tank seams shall be tested by radiography in accordance with ASME Boiler and Pressure Vessel Code, Section 9, Subsection Q-21 (b).

3.2.2.6. Lightning protection shall conform to the requirements of ANSI C5.1-1969, "Lightning Protection Code-1968.17

3.2.3. Standards for Access Roads

3.2.3.1. Design, materials and construction practices employed for Access Roads shall be in accordance with safe and proven engineering practice and in accordance with the principles of construction for secondary roads for the subarctic and arctic environments.

3.2.3.2. Permittees shall submit a layout of each proposed Access Road for approval by the Authorized Officer in accordance with Stipulation 1.7.

3.2.3.3. Access Roads shall be constructed to widths suitable for safe operation of equipment at the travel speeds proposed by Permittees.

3.2.3.4. The maximum allowable grade shall be 12 percent unless otherwise approved in writing by the Authorized Officer.

Stipulation 3.6 – Stream and Flood Plain Crossings and Erosion

3.6.1. General

3.6.1.1. For each region through which the Pipeline passes, the Pipeline shall be designed to withstand or accommodate the effects (including runoff, stream and flood plain erosion, meander cutoffs, lateral migration, ice-jams, and icings) of those meteorologic, hydrologic (including surface and subsurface) and hydraulic conditions considered reasonably possible for the region. The following standards shall apply to such Pipeline design:

3.6.1.1.1. For stream crossings and portions of the Pipeline within the flood plain.

3.6.1.1.1.1. The Pipeline shall cross streams underground unless a different means of crossing is approved in writing by the Authorized Officer.

3.6.1.1.1.2. The design flood shall be based on the concept of the "Standard Project Flood" as defined in Corps of Engineers Bulletin 52-8, Part 1.

3.6.1.1.1.3. The depth of channel scour shall be established by appropriate field investigations and theoretical calculations using those combinations of water velocity and depth that yield the maximum value. At the point of maximum scour, the cover over the pipe shall be at least twenty (20)

3.6.1.1.1.4. For overhead crossings comparable analysis shall be made to ensure that support strictures are adequately protected from the effects of scour, channel migration, undercutting, ice forces and degradation of permafrost.

3.6.1.1.1.5. In flood plains, appropriate construction procedures shall be used wherever there is potential channelization along the pipe.

3.6.1.1.1.6. The pipe trench excavation shall stop an adequate distance from the water crossing to leave a protective plug (unexcavated material) at each bank. These plugs shall be left in place until the stream bed excavation is complete and the pipe laying operation is begun. The plugs shall not be completely removed until absolutely necessary. The trench shall be backfilled with stable material as soon as the pipe is laid.

3.6.1.2. Culverts and Bridges.

3.6.1.2.1. Culverts and bridges necessary for maintenance of the Pipeline shall be designed to accommodate a fifty (50) -year flood in accordance with criteria established by the American Association of State Highway Officials and the Federal Highway Administration and endorsed by the State of Alaska Department of Highways.

3.6.2. Erosion

3.6.2.1. Where necessary because of outfall erosion, stilling basins shall be constructed at the outflow end of culverts. To prevent erosion the pool sides shall be stabilized by appropriate methods; eg., by the use of riprap.

3.6.2.2. Slopes of cuts through stream banks shall be designed and constructed to minimize erosion and prevent slides.

3.6.2.3. Erosion control procedures shall accommodate and be based on the runoff produced by the maximum rainfall rate and snow melt rate combination reasonably characteristic of the region. The procedures shall also accommodate effects that result from thawing produced by flowing or pond water on permafrost terrain.

Stipulation 3.9 – Construction and Operation

3.9.1. All construction, operation, maintenance, and termination activities in connection with the Pipeline System shall be conducted so as to avoid or minimize thermal and other environmental changes and to provide maximum protection to fish and wildlife and their habitat, and people. All working platforms, pads, fills and other surface modifications shall be planned and executed in such a way that any resulting degradation of permafrost will not jeopardize the Pipeline foundations.

3.9.2. Acceptable plans, procedures and quality controls that ensure compliance with Stipulation 3.9.1 shall be submitted in accordance with Stipulation 1.7.

Stipulation 3.10 – Pipeline Corrosion

3.10.1. Permittees shall provide detailed plans for corrosion resistant design and methods for early detection of corrosion. These shall include: (1) pipe material and welding techniques to be used and information on their particular suitability for the environment involved; (2) details on the external pipe protection to be provided (coating, wrapping, etc.), including information on variation of the coating process to cope with variations in environmental factors along the Pipeline route; (3) plans for cathodic protection including details of impressed ground sources and controls to ensure continuous maintenance of adequate protection over the entire surface of the pipe; (4) details of plans for monitoring cathodic protection current including spacing of current monitors; (5) provision for periodic intensive surveys of trouble spots, regular preventive maintenance surveys and special provisions for abnormal potential patterns resulting from the crossing of the Pipeline by other pipelines or cables; and (6) information on precautions to be taken to

prevent internal corrosion of the Pipeline. Permittees shall also provide for periodic internal pitting surveys by electromagnetic or other means.

Appendix B - Bibliography of JPO Reports Generated by Construction Oversight

Assessments:

JPO-98-A-009, *Review of Audit, Surveillance, and Employee Concern Findings Relevant to Change Management*, dated September 1, 1998

JPO-00-A-002, *TAPS Shutdown, Valve Replacement, Maintenance, and Pipeline Restart*, dated February 1, 2000

Subsidiary Engineering Reports:

- JPO-99-E-025, *Operational Compliance for Pipeline Shutdown*, dated September, 2000

Subsidiary Surveillances:

- JPO-99-S-093, *Installation of North and South Split Tees (Project F064)*, dated August 2, 1999
- JPO-99-S-097, *Installation of Stopples and Replacement of Remote Gate Valve (RGV)-60, (Project F064)*, dated September 17, 1999
- JPO-99-S-098 *Consideration of proposed modifications to restore access*, dated September 22, 1999
- JPO-99-S-102, *Sept 11/12 Pipeline Shutdown Activities; Mainline Valve Leak-through Testing*, dated September 12, 1999
- JPO-99-S-127, *Pipeline Shutdown Activities: Mainline Valve numbers 17 through 21 Leak-through Testing*, dated November 13, 1999
- JPO-99-S-107 *Pipeline Shutdown Activities: Mainline Valve #'s 31- 40 Leak-through Testing*, dated September 11/12, 1999
- JPO-99-S-116, *Sept 11/12 Pipeline Shutdown Activities; Mainline Valve Leak-through Testing*, dated September, 1999
- JPO-99-S-128 *PS-04 Gas Building Valve # 146 Replacement*, dated September 11/12, 1999

JPO-00-A-004, *1999 Flood Damage Repair Project (F075)*, dated June, 2000

Subsidiary Surveillances:

- JPO-99-S-055REV, *Revetment project at MP 218.5 on the Koyukuk River*, dated March 17, 1999
- JPO-99-S-121REV, *Revetment project at MP 218.5 on the Koyukuk River*, dated 3/24/99
- JPO-99-S-122REV, *Revetment project at MP 218.5 on the Koyukuk River*, dated April 26, 1999
- JPO-99-S-123REV, *Revetment project at MP 218.5 on the Koyukuk River*, dated April 24, 1999
- JPO-99-S-014, *Construction of Dietrich River Diversion Project and Shoreline Protection for RGV-34*, dated April 22, 1999
- JPO-99-S-010, *Revetment project at PLMP 218.5 on the Middle Fork Koyukuk River*, dated April 28, 1999

- JPO-99-S-013, *Revetment construction to protect RGV 34 at PLMP 185.8 on the Dietrich River, dated April 28, 1999*
- JPO-99-S-012, *Future bank stabilization and erosion control project between PLMP 186 and 187 on Dietrich River, dated April 28, 1999*
- JPO-00-S-020, *Middle Fork Koyukuk River, PLMP 218.5, Assess revegetation efforts and stipulation compliance, dated September 9, 1999*
- JPO-00-S-014, *Site surveillance of existing post-project F075 compliance, dated June 22, 1999*
- JPO-00-S-013, *Agency Compliance inspection at the Koyukuk River revetment near MP 218.5, dated August 12, 1999*
- JPO-00-S-022, *Project F075: Work on Dietrich River Bank Revetment - Flood plain damage repair, dated October 18, 1999*

JPO-00-A-006, *Assessment of Alyeska Pipeline Service Company's Supplier Evaluation Processes for Compliance to Grant and Lease Requirements, dated September, 2000*

Subsidiary Surveillances:

- JPO-00-S-016, *Review of VECO, dated February, 2000*
- JPO-00-S-023, *Review of non-QSL suppliers procurement practices, dated March, 2000*
- JPO-00-S-024, *Review of Potential Suppliers previously not on the QSL, dated April, 2000*

Engineering Reports:

JPO-00-E-001, *AAI 1955, dated January 3, 2000*

JPO-00-E-002, *TAPS Remote Gate Valve Control System Improvement Project, dated January, 2000*

Subsidiary Surveillances:

- JPO-99-S-099, *Project B023, RGV Upgrade, dated August 24, 1999*
- JPO-99-S-100, *Project B023, RGV Upgrade, dated August 24, 1999*
- JPO-99-S-119, *Functional Checkout of RGV-91, dated October 13, 1999*
- JPO-99-S-125, *B023 RGV 80 Upgrade Project demobilization, dated October 29, 1999*

JPO-00-E-007, *Pump Station Crude Oil Piping Corrosion Monitoring and Control Programs, dated February 10, 1999*

JPO-00-E-009, *Tazlina River Crossing Erosion Repairs (Z065), dated April 12, 2000*

Subsidiary Surveillances:

- JPO-99-S-026, *Tazlina River Revetment project Z065, dated April 12, 1999*

JPO-00-E-014, *Review of F068, Fuel Gas Line Remediation Project, dated May 31, 2000*

Subsidiary Surveillances:

- JPO-98-GS-011, *Review of the Fuel Gas Line PS01 to MP18, dated June 5, 1998*

- JPO-98-GS-012, *Review of the Fuel Gas Line MP 20 to MP 127.0, dated June 15, 1998*

JPO-00-E-015, *Trans-Alaska Pipeline System Comprehensive Corrosion Program, dated July 3, 2000*

JPO-00-E-016, *Linewide-Wide 48-inch Buried Check Valve Investigations (Projects F086/F022) and Repairs, and Mainline Block and Bypass Valve Maintenance (Projects F087/F002), dated July 5, 2000*

JPO-00-E-020, *Tazlina and Gulkana Pipeline River Bridge Crossings, dated June 15, 2000*

Subsidiary Surveillances:

- JPO-99-S-118, *Worker Safety and Maintenance, Alyeska Project F066, 1999 Pipeline Bridge Inspections, Tazlina and Gulkana River Crossing, dated 9/24/99*
- JPO-99-S-126, *Comprehensive Monitoring Program, Construction, Pipeline Bridge Inspections, dated 9/24/99*

Surveillances:

JPO-99-S-003, *Mainline Pipe Corrosion investigation at Phelan Creek under Project X019, dated February 27, 1999*

JPO-99-S-004, *Mainline Pipe Corrosion investigation at Phelan Creek under Project X019, dated February 27, 1999*

JPO-99-S-005, *Mainline Pipe Corrosion investigation at Phelan Creek under Project X019, dated February 27, 1999*

JPO-99-S-027, *Mainline Pipe Corrosion investigation at MLR2 under Project X019B, dated May 12, 1999*

JPO-99-S-028, *Mainline Pipe Corrosion investigation at MLR2 under Project X019B, dated May 12, 1999*

JPO-99-S-129, *Operational Compliance; Pipeline Shutdown, Restart, and Normal Operations, dated November 13, 1999*

JPO-99-S-145, *Y2K Readiness, dated December 16, 1999*

JPO-00-S-002, *Oversight of Pipeline Operation during Y2K transition, dated December 31, 1999*

JPO-00-S-003, *Corrosion Monitoring of Mainline Remote Gate Valve # 44 (RGV-44) 6-inch Bypass Piping, using the Project X029 Package, dated August 14, 1999*

JPO-00-S-005, *Corrosion Monitoring of Pump Station (PS-04) Crude Piping (S005 – Deadleg Suction line to Unit # 4) under Project X029, dated July 24, 1999*

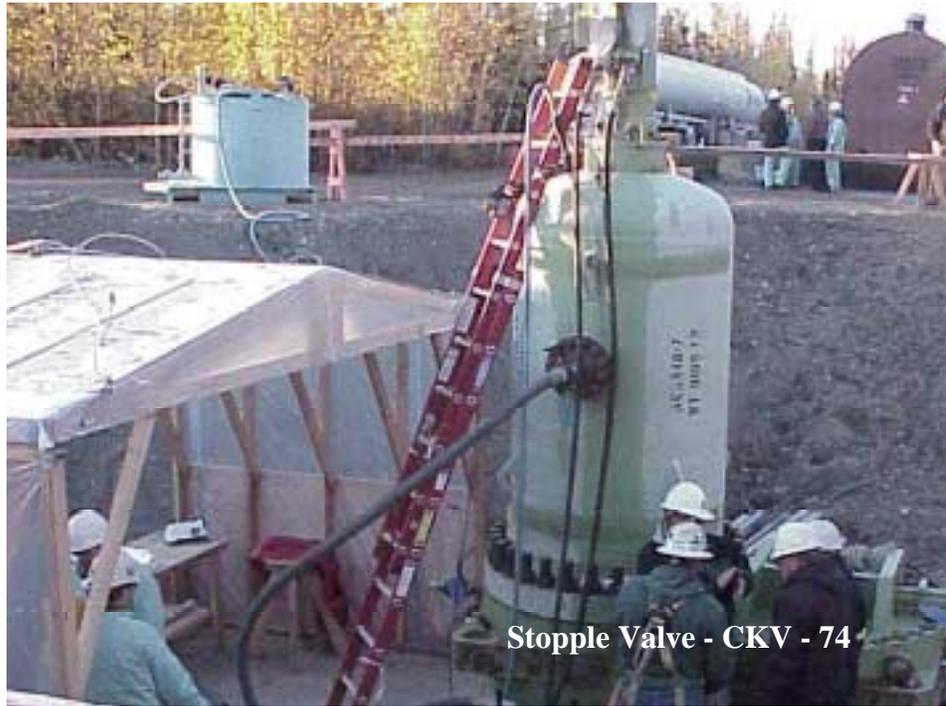
JPO-00-S-034, *Verification of Construction Project V309, dated June 22, 2000*

Reports:

The JPO Analysis and Review of "Itemized Punch List of Non-compliances" Associated with Project #B176, North Pole Metering Station, dated October, 2000

Appendix C - Construction Photos

An Example of a Valve Replacement - Check Valve 74







CKV-74 and Section of Pipe Removed



Crane Lifts Valve Away from Site

*Corrosion Investigation/Repair
- Project #X019*



Buried Mainline Pipe is Excavated



**Special Burial Pipe , Refrigeration pipe,
Fiber Glass Reinforced Plastic heating
that has cracked,**



Sigma Coated Pipe,



Structural Full Encirclement Sleeve installed



Insulation



Restoration of site

Buried Check Valve Investigations



JOINT PIPELINE OFFICE

Comprehensive Monitoring Program Report

TAPS Maintenance Program 1999/2000

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Executive Summary

Joint Pipeline Office Comprehensive Monitoring Program - Maintenance

Purpose

The Joint Pipeline Office (JPO) 1999/2000 Maintenance Comprehensive Monitoring Program (CMP) was developed to provide oversight of the Trans-Alaska Pipeline System (TAPS), focusing on the maintenance requirements and strategies necessary to ensure long term operational safety and reliability of TAPS systems and equipment. This program was designed to measure compliance to requirements for maintenance of TAPS, as well as to evaluate the pipeline system's integrity to determine long term viability and "useful life". JPO considers the useful life of TAPS to be directly related to system condition monitoring and resulting maintenance activities.

Scope/Methodology

The 1999/2000 JPO CMP programs have attempted to establish a "systems based" approach to TAPS oversight. As such, the JPO maintenance oversight efforts have been designed to address the maintenance needs of particular TAPS systems, how those systems are monitored, and how the results of monitoring are transitioned into maintenance work activities.

The 1999/2000 Maintenance CMP work is broken into three major elements: (1) TAPS Monitoring and Maintenance Program Reviews; (2) TAPS Maintenance Baseline Assessments; and (3) 1997/1999 Maintenance CMP Issues. A summary discussion of each of these elements follows:

TAPS Monitoring and Maintenance Program Review

This element provides for (1) review of the various TAPS monitoring and surveillance program(s); (2) analysis of any emerging issues, concerns, and associated corrective actions; (3) assessment of the process by which issues, concerns and recommendations are tracked through to closure (either justification for no work required or development of a work activity such as baseline maintenance or project development); and (4) JPO field monitoring to track identified issues, concerns or corrective actions.

TAPS Maintenance Baseline Assessments

This element provides a comprehensive evaluation of (1) the maintenance program for TAPS; (2) the integrity of critical TAPS systems; and (3) the useful life of TAPS. To accomplish this, the JPO is in the process of conducting (1) an Asset Maintenance

Management (AMM) assessment; and (2) Reliability-Centered Maintenance (RCM) analyses of critical TAPS systems. The AMM assessment is to provide a relative measure of the current approach to TAPS maintenance. The RCM analyses are to facilitate identification of the critical system(s) current functional state and the maintenance requirements necessary to ensure long term (30 year) operational safety and reliability. This work element is of particular importance today as TAPS is a declining asset and the expert workforce is aging.

JPO 1997/1999 Maintenance CMP Issues

This element provides for tracking resolution of the following issues identified in the 1997/1999 Maintenance CMP review.

1. TAPS Electrical Systems
2. Preventive Maintenance
3. Slope Stability
4. Erosion Control
5. Valve Maintenance
6. Work Pad Maintenance
7. Material Sites
8. Change Management (AAI 1955)

Results/Conclusions

TAPS Monitoring and Maintenance

The subject of maintenance and the definition of what might be considered “successful” or “adequate” for a particular piece of equipment, or its parent system, is subjective and thereby open to interpretation. However, over the period of this review, JPO has accumulated data which evidences some inadequacies in maintenance management and opportunities for Alyeska Pipeline Service Company (APSC) to improve its maintenance practices on TAPS. The following provides a summary conclusion regarding APSC management of TAPS maintenance:

APSC Corrective Action Process: The corrective action process at APSC whereby the results of systems monitoring efforts transition into maintenance work activities (or documented justification for no work required) is inconsistent, ill defined, and in some cases absent. A clearly defined and integrated corrective action process, which considers all the maintenance needs of TAPS in a comprehensive manner, in order to make work funding and scheduling decisions, is not apparent within the APSC maintenance management process. This was concluded from not only JPO oversight efforts, but APSC audits as well.

TAPS Maintenance Baseline Assessments

The work associated with this element, over the period covered by this report, has primarily involved (1) researching industry maintenance management strategies; (2) planning and scoping the integration of JPO agency participation; (3) briefing APSC on the intent of this effort and expectations for APSC participation; and (4) procurement of consulting maintenance management experts. Implementation of this work element commenced in November 2000. Initial work has consisted of criticality analyses of TAPS systems, and training of JPO and APSC personnel to the RCM process.

JPO has emphasized to APSC, as well as the owner companies, the need for this effort to meet the TAPS maintenance and right-of-way requirements discussed in section 4.0 *Requirements* of this report. APSC has recognized the benefits of this effort and formally agreed to support its implementation through the signing of a *Memorandum of Agreement* (MOA), dated January 9, 2001. A copy of this MOA is provided as attachment (1) to this report.

APSC has conducted their own Asset Maintenance Management (AMM) assessments, one for the Pipeline Business Unit (PBU) and one for the Valdez Business Unit (VBU). APSC procured a team of maintenance management consultants, headed by BP Amoco, to conduct these assessments, and has shared the associated philosophy, methodology, scope, and results with the JPO. APSC has begun implementation of the results of these assessments and has maintained an open relationship with JPO throughout these efforts.

Grant/Lease and Regulatory Compliance

JPO has implemented a systems based oversight structure which provides for evaluation of compliance to Grant/Lease and regulatory requirements as they pertain to the systems which comprise TAPS. The non-compliances and potential non-compliances identified through this CMP effort are entered into the JPO CMP database to facilitate tracking their resolution and development of a history of deficiencies identified on TAPS. It should be noted that many of the cited non-compliances have been corrected, yet they are still listed here in order to provide completeness in describing JPO maintenance oversight results for 1999/2000. The current status for each will be maintained in the CMP database. The Grant/Lease and regulatory non-compliances and potential non-compliances identified through this CMP effort are listed below. For each cited non-compliance, the affected TAPS system is identified, along with the applicable section of this report which provides the results discussion.

Principle 3 ‘Permittees Management of Pipeline System Maintenance’:

System: Linewide (programmatic)
(sections 5.1.1, 5.1.2.3, 5.1.4, 5.1.5, 5.1.8, and 5.4)

Stipulation 1.17 *Fire Prevention and Suppression:*

Systems: VMT Fire Suppression System (section 5.4)

- Stipulation 1.18** ***Surveillance and Maintenance:***
Systems: Aboveground Mainline Pipe (section 5.1.4)
Belowground Mainline Pipe (section 5.1.5)
Pipeline River and Stream Crossings (section 5.1.2.3)
Pipeline Bridges (section 5.1.8)
VMT Fire Suppression System (section 5.4)
- Stipulation 1.20** ***Health and Safety:***
Systems: VMT Operations Control Center (OCC) (section 5.4)
VMT Tanker Vapor Control System (TVCS) (section 5.4)
VMT Fire Suppression System (section 5.4)
- Stipulation 1.21** ***Conduct of Operations:***
Systems: Linewide - Cold Restart (Section 5.4)
VMT OCC (section 5.4)
VMT TVCS (section 5.4)
VMT Fire Suppression System (section 5.4)
- Stipulation 2.2** ***Pollution Control:***
Systems: VMT TVCS (section 5.4)
- Stipulation 2.5** ***Fish and Wildlife Protection:***
Systems: Pipeline River and Stream Crossings (sections 5.1.2.3 and 5.4)
- Stipulation 2.6** ***Material Sites:***
Systems: Material Sites (section 5.3.7)
- Stipulation 2.8** ***Disturbance of Natural Water:***
Systems: Pipeline River and Stream Crossings (section 5.4)
- Stipulation 2.14** ***Contingency Plans:***
Systems: Pipeline Bridges (section 5.4)
- Stipulation 3.2** ***Pipeline System Standards:***
Systems: Belowground Mainline Pipe (section 5.1.5)
- Additionally, USDOT/OPS identified regulatory non-compliances to the following:
Systems: Pressure Control Systems
Mainline Valve Maintenance
External Corrosion Control
Internal Corrosion
General Safety requirements
Pipeline Repairs
- Stipulation 3.3** ***Construction Mode Requirements:***
Systems: Belowground Mainline Pipe (section 5.1.5)

Stipulation 3.5

Systems:

Slope Stability:

Aboveground Mainline Pipe (sections 5.1.4 and 5.4)

Stipulation 3.9

Systems:

Construction and Operation:

Aboveground Mainline Pipe (sections 5.1.4 and 5.4)

Pipeline River and Stream Crossings (section 5.4)

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Joint Pipeline Office

Comprehensive Monitoring Program - Maintenance

1.0 Introduction and Purpose

The Joint Pipeline Office (JPO) 1999/2000 Maintenance CMP program was developed to provide oversight of the Trans-Alaska Pipeline System (TAPS) focusing on the maintenance requirements and strategies necessary to ensure operational safety and reliability of TAPS systems and equipment. The requirements basis for maintenance of the TAPS is principally taken from the following four documents: (1) *Public law 93-153*, dated November 16, 1973, which amends section 28 of the Mineral Leasing Act of 1920; (2) *The Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline*, dated January 23, 1974 (hereinafter referred to as the “Grant”); (3) *The Alaska State Lease of Right-of-Way*, dated May 3, 1974 (hereinafter referred to as the “Lease” and (4) 49 CFR Part 195. These documents broadly define the maintenance requirements for TAPS. Public Law 95-153 further states the requirements for renewal of any Federal *Grant of Right-of-Way*, and includes the requirement for consideration of the “useful life” of the system prior to renewal. The Federal *Agreement and Grant of Right-of-Way* for TAPS expires in January 2004 unless renewed. The Alaska State *Lease of Right-of-Way* for TAPS expires in May 2004 unless renewed.

The JPO considers the “useful life” of TAPS to be directly related to system condition monitoring and maintenance activities. As such, the JPO 1999/2000 Maintenance CMP program has been designed to (1) comprehensively evaluate the Alyeska Pipeline Service Company (APSC) monitoring and maintenance strategies and program structure; (2) identify the maintenance requirements of critical TAPS systems necessary to maintain system safety and reliability; (3) measure the degree of compliance to the Grant/Lease and regulatory requirements for maintenance of TAPS; (4) monitor resolution of the 1997/1999 Maintenance CMP issues; and (5) provide quantitative information regarding the state of the APSC maintenance program.

2.0 Methodology/Scope

The 1999/2000 JPO CMP programs have attempted to establish a “systems based” approach to TAPS oversight. As such, the JPO maintenance oversight efforts have been designed to address the maintenance needs of particular TAPS systems, how those systems are monitored, and how the results of monitoring are transitioned into maintenance work activities. For implementation of this systems based approach, JPO has developed a set of matrices, which identify the relationships between (1) JPO Agency Work Programs; (2) the Grant/Lease and Regulatory Requirements for TAPS; and (3) the systems that comprise TAPS. JPO work planning and documentation of work efforts are comprehensively implemented through a computer based application of this matrix model.

The 1999/2000 Maintenance CMP work is divided into three major elements: (1) TAPS Monitoring and Maintenance Program Reviews; (2) TAPS Maintenance Baseline Assessments; and (3) 1997/1999 Maintenance CMP Issues. A discussion of each of these elements follows:

2.1 TAPS MONITORING AND MAINTENANCE PROGRAM REVIEW

This element provides for (1) review of the various TAPS monitoring and surveillance program(s); (2) analysis of any emerging issues, concerns, and associated corrective actions; (3) assessment of the process by which issues, concerns and recommendations are tracked through to closure (either justification for no work required or development of a work activity such as baseline maintenance or project development); and (4) JPO field monitoring to track identified issues, concerns or corrective actions.

An explanation of the relationship between the 1999/2000 Maintenance and Construction CMP reports must be made here. Construction projects typically result from recommendations made by the APSC surveillance, monitoring, and maintenance organizations; projects being the avenue of corrective action. To avoid duplication, references to the 1999/2000 Construction CMP will be found throughout this report.

2.2 TAPS MAINTENANCE BASELINE ASSESSMENTS

This element provides an assessment of the APSC maintenance program by comparing it to industry standards for maintenance management. The maintenance management standard is comprised of programmatic elements considered by various industries to best provide for equipment safety and reliability. This assessment, termed the Asset Maintenance Management (AMM) assessment, is intended to measure the APSC maintenance program against these elements and identify any relative strengths or weaknesses. This will then provide a basis for JPO declarations regarding APSC maintenance capabilities as well as specifics for continuous improvement. This work element also includes application of Reliability Centered Maintenance (RCM) analyses of critical TAPS systems to identify specific maintenance requirements necessary to ensure operational safety and reliability. The AMM assessment and the RCM analyses are discussed further in this report under section 3.0 *Background*.

The JPO currently has two BLM contracts to support this work element. The first is with *Aladon Ltd.*, a company with internationally recognized expertise in Maintenance Management and RCM analyses, to provide strategic planning support to JPO throughout this effort; the second is with *Spearhead System Consultants Ltd.*, a full-service, strategic consulting practice which specializes in AMM methods and techniques. Spearhead is to provide expert maintenance consultants to facilitate and support the AMM assessment and the RCM analyses. JPO began implementation of this work element in November 2000.

2.3 JPO 1997/1999 MAINTENANCE CMP ISSUES

This element provides for tracking resolution of the following issues identified in the 1997/1999 Maintenance CMP review.

1. TAPS Electrical Systems
2. Preventive Maintenance
3. Slope Stability
4. Erosion Control
5. Valve Maintenance
6. Work Pad Maintenance
7. Material Sites
8. Change Management (AAI 1955)

3.0 Background

3.1 JPO POSITION ON TAPS MAINTENANCE AND USEFUL LIFE

To evaluate the TAPS maintenance, system integrity, and useful life requirements in a comprehensive manner, the JPO is in the process of conducting: (1) an Asset Maintenance Management (AMM) Assessment; and (2) Reliability Centered Maintenance analyses of critical TAPS systems. The AMM assessment is to provide a relative measure of the current APSC approach to TAPS maintenance. The RCM analyses are to facilitate identification of the critical system(s) current functional state and the maintenance requirements necessary to ensure long term (30 year) operational safety and reliability.

The combined objective of the TAPS AMM Assessment and RCM analyses is to provide a structured, maintenance-based methodology, to evaluate the maintenance strategies and resulting useful life capacity of the TAPS. This is of particular importance today as TAPS is a declining asset and the APSC expert workforce is aging. This objective is in alignment with the requirements listed in section 4.0 *Requirements*, below.

The following sections provide a discussion of the AMM assessment and the RCM analyses.

3.1.1 Asset Maintenance Management (AMM) Assessment

Over the time period of this CMP effort, APSC managed the TAPS according to an asset management model. The TAPS consists of several assets, each managed separately, but under two business units, (1) Pipeline Business Unit (PBU) and (2) Valdez Business Unit (VBU). This management structure makes the overall TAPS maintenance management strategy unclear.

Principle 3 of the Agreement and Grant of Right-of-Way, requires APSC to manage and maintain

the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology.

In order to provide a "state of the art" maintenance management baseline from which to evaluate APSC maintenance management practices, the AMM assessment shall measure against a de-facto standard termed "World Class." There are variations on the definition of "World Class" maintenance management, depending upon the industry considered, however, there are relatively consistent programmatic elements and associated measurement criteria. For the purposes of this assessment, JPO considers the following programmatic elements to be necessary to the "state of the art" maintenance management of TAPS:

- Management Leadership
- Maintenance, Engineering & Operations Organizational Structures
- Roles and Responsibilities
- Documentation Management
- Maintenance Planning
- Logistical Support
- Resource Management
- Computerized Maintenance Management System
- Maintenance Management Metrics
- Materials Management Metrics
- Root Cause Failure Analysis Process
- Maintenance Budgets

3.1.2 Reliability Centered Maintenance (RCM) Analyses

Reliability centered maintenance is a highly prescriptive process used to identify the maintenance needs of a physical asset to ensure operational safety and functional reliability. The RCM analysis involves the asset operators, maintainers, and responsible engineering resources in a comprehensive and interactive manner. The RCM methodology JPO advocates complies with the only existing internationally recognized RCM standard, and is designed to quantifiably answer the following seven questions relevant to an operating asset:

1. What are the functions and associated desired standards of performance of the asset in its present operating context (functions)?
2. In what ways can it fail to fulfill its functions (functional failures)?
3. What causes each functional failure (failure modes)?
4. What happens when each failure occurs (failure effects)?
5. In what way does each failure matter (failure consequences)?
6. What should be done to predict or prevent each failure (proactive tasks and task intervals)?
7. What should be done if a suitable proactive task cannot be found (default actions)?

The application of this RCM methodology on critical TAPS systems will provide the following information:

- The current functional state of the system.
- Adequacy of the current system monitoring methods to assure identification of potential functional failures (inclusive of hidden failure modes).
- The effectiveness of current maintenance activities to ensure functional reliability of the system (i.e. corrective actions taken to address functional failure potentials).
- Suitability of the systems current operating context to that of the original design/design basis.

3.2 APSC COMMITMENTS

In January of 1999, JPO began discussions with APSC regarding the AMM assessment and RCM analyses discussed above; APSC verbally emphasized their concurrence to the benefits of these evaluations and agreed to cooperate and assist where possible. In January of 2001, APSC formally agreed in a written *Memorandum of Agreement (MOA)*, signed January 9, 2001, to support the implementation of the AMM and RCM analyses. Attachment (1) provides a copy of this MOA.

To date, APSC has conducted their own AMM assessments, one for the Pipeline Business Unit (PBU) and one for the Valdez Business Unit (VBU). APSC procured a team of maintenance management consultants, headed by BP Amoco, to conduct these assessments, and has shared the associated philosophy, methodology, scope, and results with the JPO. APSC has begun implementation of the results of these assessments and has maintained an open relationship with JPO throughout these efforts.

3.3 JPO 1997/1999 MAINTENANCE CMP

The JPO Comprehensive Monitoring Program has been consolidated from 12 oversight categories to four oversight programs: Construction/Termination, Operations, Maintenance, and Culture. The previous JPO Maintenance CMP report published in April 1999, titled *An Evaluation of Selected Portions of the TAPS Maintenance Program January 1997–April 1999*, concluded the following:

- Five of the stipulations evaluated contained some aspects of noncompliance. The areas of noncompliance included slope stability, failure to update records for system changes and civil maintenance, inconsistency between existing conditions and design requirements, and vegetation damage at material sites. APSC committed to address each issue.
- Two slopes at Squirrel Creek were not in compliance with design basis requirements

and Stipulation 3.5 *Slope Stability* of the Grant and Lease. Instrumentation data showed the Squirrel Creek slopes were thawed, resulting in a degradation of permafrost and a finding of noncompliance with Stipulation 3.9 *Construction and Operation*. The degree of integrity of the Squirrel Creek slopes under design contingency earthquake conditions was in question and being reviewed by JPO and APSC. If it could not be demonstrated that these slopes were safe, civil improvements must be completed. APSC scheduled a risk assessment for 1999 to evaluate the Squirrel Creek slopes. APSC completed the Pump Station 11 slope risk assessment on December 4, 1999, which JPO reviewed. APSC concluded in their Pump Station 11 risk assessment that the probability of a crude oil leak or spill was very remote. Appropriate mitigation actions will follow the review of the risk assessments.

- The Alaska Department of Labor electrical inspector found six National Electrical Code (NEC) violations on TAPS that were within the scope of the CMP. APSC corrected the violations and JPO verified the corrections. APSC now requires third party inspection of electrical installations and modifications. If consistently followed, this requirement should prevent future noncompliance with the National Electrical Code.
- APSC was meeting their commitments for the mainline valve testing and repair program. Planning, preparation, and execution of mainline valve repair projects achieved a high standard of performance. Maintenance goals included 1) testing of 44 mainline valves for internal leak-through in 1998, and testing of the remaining mainline valves by the year 2000, 2) repairing Check Valve 122, and 3) replacing Remote Gate Valve 80. The last two items were completed in 1998. JPO will follow all Valve Program commitments through to completion.
- APSC did not coordinate well with JPO regulatory agencies during the planning, scheduling, and design of a number of maintenance projects along the TAPS right-of-way. This, coupled with APSC's lack of internal coordination, resulted in delays in the permitting and execution of some projects. To correct this problem, APSC is clarifying roles and responsibilities and providing additional training to their asset managers.
- APSC maintenance records only partially documented some workpad and above ground maintenance repairs. This hindered the trending of damage caused by flood, erosion and thawing. JPO considered this to be an instance of noncompliance with Grant and Lease Stipulation 1.18 *Surveillance and Maintenance*. Although APSC disagreed with this noncompliance determination, they are working to improve tracking of civil maintenance repairs.
- New projects were commissioned and turned over to pipeline operators without the

necessary preventive maintenance procedures being established. Other electrical system modifications lacked updated drawings. APSC changed procedures to ensure timely completion of preventive maintenance procedures and project records.

These 1997/1999 Maintenance CMP issues have been integrated into the JPO 1999/2000 oversight efforts; the results of which are presented in section 5.0 *Results*, below.

4.0 Requirements

The following provides a summary of the requirements to which JPO has operated with regard to the maintenance and useful life of TAPS:

4.1 PUBLIC LAW

Public Law 93-153, dated November 16, 1973, was an act to amend section 28 of the Mineral Leasing Act of 1920, and to authorize the trans-Alaska oil pipeline and provide other Federal rights-of-way requirements. Title I of this act includes amendments to Section 28 of the Mineral Leasing Act of 1920. Title I requires the following regarding right-of-ways through any Federal lands:

Regulatory Authority

(f) Rights-of-way or permits granted or renewed pursuant to this section shall be subject to regulations promulgated in accord with these provisions of this section and shall be subject to such terms and conditions as the Secretary or agency head may prescribe regarding extent, duration, survey, location, construction, operation, maintenance, use, and termination.

Technical and Financial Capability

(j) The Secretary or agency head shall grant or renew a right-of-way or permit under this section only when he is satisfied that the application has the technical and financial capability to construct, operate, maintain, and terminate the project for which the right-of-way or permit is requested in accordance with the requirements of this section.

Duration of Grant

(n) Each right-of-way or permit granted or renewed pursuant to this section shall be limited to a reasonable term in light of all circumstances concerning the project, but in no event more than thirty years. In determining the duration of a right-of-way the Secretary or agency head shall, among other things, take into consideration the cost of the facility, its useful life, and any public purpose it serves. The secretary or agency head shall renew any right-of-way, in accordance with the provisions of this section, so long as the project is in commercial operation and is operated and maintained in accordance with all of the

provisions of this section.

Title II of this amendment is the "Trans-Alaska Pipeline Authorization Act." Title II, in part, requires the following:

Sec. 203. (b) The Congress hereby authorizes and directs the Secretary of the Interior and other appropriate Federal officers and agencies to issue and take all necessary action to administer and enforce rights-of-way, permits, leases, and other authorizations that are necessary for or related to the construction, operation, and maintenance of the trans-Alaska oil pipeline system, including roads and airstrips, as that system is generally described in the Final Environmental Impact Statement issued by the Department of the Interior on March 20, 1972.

4.2 AGREEMENT AND GRANT OF RIGHT-OF-WAY FOR TRANS-ALASKA PIPELINE

The following requirements of the Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline are the primary maintenance requirements under review:

Principle 3: Permittees shall manage, supervise and implement the construction, operation, maintenance and termination of the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology. In the exercise of these functions, Permittees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance and termination of the Pipeline System as are provided for in this Agreement and other applicable authorizations. The parties intend that this Agreement shall not in any way derogate from, or be construed as being inconsistent with, the provisions of Section 203 (d) of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 585 (1973), relating the National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. 4321 *et seq.*

Stipulation 1.18 *Surveillance and Maintenance*: During the construction, operation, maintenance and termination of the Pipeline System, Permittees shall conduct a surveillance and maintenance program applicable to the subarctic and arctic environment. This program shall be designed to: (1) provide for public health and safety; (2) prevent damage to natural resources; (3) prevent erosion; and (4) maintain Pipeline System integrity.

Stipulation 1.18.3: Permittees shall maintain complete and up-to-date records on construction, operation, maintenance and termination activities performed in connection with the Pipeline System. Such records shall include surveillance data, leak and break records, necessary operational data, modification records and such other data as the Authorized Officer may require.

Additionally, this report is a summarization of several reports produced throughout years 1999

and 2000. Each report provides the applicable Grant/Lease principles, sections, or stipulation reviewed for compliance. The following provides a list of those Grant/Lease requirements for which maintenance surveillances were conducted in 1999 and 2000:

1. Principle (3)
2. Section 9 Construction Plans and Quality Assurance Program
3. Section 10 Compliance With Notices To Proceed
4. General Stipulation 1.7 Notice to Proceed
5. General Stipulation 1.8 Changes in Conditions
6. General Stipulation 1.12 Regulation of Public Access
7. General Stipulation 1.17 Fire Prevention and Suppression
8. General Stipulation 1.18 Surveillance and Maintenance
9. General Stipulation 1.20 Health and Safety
10. General Stipulation 1.21 Conduct of Operations
11. Environmental Stipulation 2.1 Environmental Briefing
12. Environmental Stipulation 2.2 Pollution Control
13. Environmental Stipulation 2.3 Buffer Strips
14. Environmental Stipulation 2.4 Erosion Control
15. Environmental Stipulation 2.5 Fish and Wildlife Protection
16. Environmental Stipulation 2.6 Materials Sites
17. Environmental Stipulation 2.7 Clearing
18. Environmental Stipulation 2.8 Disturbance of Natural Water
19. Environmental Stipulation 2.9 Off Right of Way Traffic
20. Environmental Stipulation 2.11 Use of Explosives
21. Environmental Stipulation 2.12 Restoration
22. Environmental Stipulation 2.13 Reporting of Oil Discharges
23. Environmental Stipulation 2.14 Contingency Plans
24. Technical Stipulation 3.2 Pipeline System Standards
25. Technical Stipulation 3.3 Construction Mode Requirements
26. Technical Stipulation 3.5 Slope Stability
27. Technical Stipulation 3.6 Stream and Flood Plain Crossings and Erosion
28. Technical Stipulation 3.9 Construction and Operation
29. Technical Stipulation 3.10 Pipeline Corrosion

4.3 USDOT/OPS REGULATORY REQUIREMENT

Currently, the primary regulatory basis for achieving safety goals in the pipeline industry is the set of regulations embodied in Title 49 of the Code of Federal Regulations Parts 190-199. The federal pipeline safety regulations assure safety in design, construction, inspection, testing, operation, and maintenance of natural gas and hazardous liquid pipeline facilities

5.0 Results

The following sections summarize the results of the JPO 1999/2000 Maintenance CMP efforts. These results represent a consolidation of JPO assessment reports and engineering reports. Much of the field work associated with these reports is documented in JPO surveillance reports.

5.1 TAPS MONITORING AND MAINTENANCE PROGRAM REVIEWS

5.1.1 TAPS Monitoring and Corrective Action Process

Purpose and Scope:

The Joint Pipeline Office expressed concern about APSC's apparent inability to achieve compliance with the Grant and Lease requirements for timely and effective corrective action. APSC responded to this concern by initiating the *Special Review of the Corrective Action Process, SR#00-03*.

The scope of the Special Review conducted by APSC included the identification and evaluation of sixty corrective action sources and processes currently utilized inclusive of:

1. Identification of the corrective action processes utilized within TAPS;
2. Identification of any corrective action sources not covered by existing processes;
3. Evaluation of methods to identify and implement initial fixes;
4. Evaluation of methods to ensure prevention of recurrence;
5. Evaluation of management oversight and intervention methods; and
6. Root Cause Analysis and Recommended Actions to dramatically improve the corrective action processes.

APSC Findings:

Finding No. 1: A formal company-wide Corrective Action Program has not been adequately defined, developed or implemented to include the various sources of issues and potential corrective actions (High Risk). Specifically, two major grant and lease compliance programs lack an adequate corrective action process to assure that known deficiencies are captured and resolved in a timely and effective manner. These specific programs, listed below, need immediate management intervention to provide on-going assurance that compliance requirements are being maintained:

- Systems Integrity Annual Monitoring Program Reports (MP-166). Although annual reports are generated, there is no assurance that engineering recommendations are funded or acted upon by Individual Assets; and
- Civil Surveillance Program Notable Conditions (MS-31). The methods utilized to identify, prioritize and resolve identified conditions vary by Asset, with no assurance

that notable conditions are consistently tracked, funded or acted upon in a timely manner by Individual Assets.

Finding No. 2: No formal strategy and long range plan has been developed to support implementation of Corrective Action IT Tools. This has resulted in ineffective and inefficient methods of corrective action assignment, workload management, status reporting, trending & analysis, lessons learned, and overall "Change Management" (High Risk).

Finding No. 3: Ayeska management has not immediately implemented methods that support an action based culture (Medium Risk).

Grant/Lease Compliance:

JPO interprets the findings presented above to be inconsistent with the intent of Principle 3 'Permittees Management of Pipeline System Maintenance'; and a non-compliance to Stipulation 1.18 *Surveillance and Maintenance*.

There are a number of Grant/Lease stipulations relating to systems monitored by the APSC *Systems Integrity Monitoring Program Procedures* (MP-166) and *Surveillance Monitoring* (MS-31) programs. These include: Stipulation 3.4 *Earthquake and Fault Displacements*; Stipulation 3.5 *Slope Stability*; Stipulation 3.6 *Stream and Flood Plain Crossings and Erosion*; Stipulation 3.7 *Sea Waves*; and Stipulation 3.8 *Glacier Surges*. The findings issued as a result of this special review indicate the potential for non-compliances to these stipulations as well.

Conclusions:

APSC's Special Review concludes that although most of the systems of the TAPS are monitored, the data accumulated as a result of those efforts is not managed effectively. This is a significant deficiency. The state and federal agencies responsible for oversight of the pipeline require assurance that the TAPS has been, and will continue to be, adequately maintained.

APSC is to be commended for the performance of the special review and the honest self-assessments issued as a result. The deficiencies identified in the corrective action process, however, must be resolved before APSC's surveillance and maintenance program can meet the compliance standard.

5.1.2 River and Flood Plains Monitoring and Maintenance

JPO 1999/2000 oversight of the River and Flood Plains Monitoring and Maintenance consisted of the following three efforts: (1) a construction project which performed repairs on the flood damaged Dietrich, Koyukuk, and Sagavanirktok rivers; (2) a construction project which conducted repairs on the Tazlina River pipeline crossing; and (3) evaluation of compliance with fish passage requirements for culverts and low water crossings. The following provides a

summary of these efforts:

5.1.2.1 Assessment Report JPO-00-A-004, 1999 Flood Damage Repair Project (F075)

JPO involvement in this project was a multi-agency effort which included: (1) review of the design set forth in the Notice to Proceed (NTP) construction packages; (2) surveillance monitoring of the project implementation; and (3) review of closeout and re-vegetation issues. Findings issued as a result of JPO oversight on this project can be found in the 1999/2000 Construction CMP report.

River and Flood Plain monitoring is part of the APSC Systems Integrity Monitoring Program (MP-166) and has been a significant element of JPO oversight for years. JPO reviews the annual MP-166 reports and tracks resolution of the recommendations. Through this oversight effort, JPO has identified a disconnect between the Systems Integrity recommendations for maintenance repairs and corrective action resolution (funded construction projects). This observation is one of many that led to the request for an APSC corrective action audit (see section 5.1.1 *TAPS Monitoring and Corrective Action Process*).

5.1.2.2 Engineering Report JPO-00-E-009, Tazlina River Crossing Erosion Repairs (Z065)

Oversight of this project was also a multi-agency effort including: (1) review of the design set forth in the Notice to Proceed (NTP) construction packages; (2) surveillance monitoring of the project implementation; and 3) review of closeout. This project was selected for inclusion in the 1999/2000 Construction CMP and greater detail can be found there.

5.1.2.3 Assessment Report JPO-00-A-001, Alyeska Pipeline Service Company Compliance With Fish Passage and Related Environmental, Surveillance, Maintenance and Quality Program Requirements

Purpose and Scope:

In 1999, the Alaska Department of Fish and Game (ADF&G) conducted surveillances at various locations along TAPS. The purpose of these surveillances was to evaluate APSC compliance with fish passage requirements for culverts and low water crossings. Due to unsatisfactory conditions documented during the surveillances, JPO/ADF&G expanded the scope of its oversight to assess compliance with Grant/Lease stipulation 1.18 *Surveillance and Maintenance* and Grant/Lease sections 9B/16B *Construction Plans and Quality Assurance Program*. The intent of the expanded oversight was to: (1) determine the root cause of unsatisfactory compliance with fish passage requirements documented by JPO/ADF&G at low water crossings and culverts; and (2) evaluate the effectiveness of the APSC environmental, surveillance, maintenance, and quality programs in detecting, correcting and preventing fish passage concerns.

Grant/Lease Compliance:

Finding 1. APSC was not in compliance with ADF&G and Grant/Lease requirements regarding fish passage as specified in Alaska Statute (AS) 16 and stipulation 2.5.1.1 during JPO surveillances in 1999. With one exception at Grey Stream, APSC has corrected all instances of noncompliance identified by JPO surveillances in 1999. Grey Stream is scheduled for remedial action between May 15 and July 15, 2000 in response to a JPO Order. See Section 5.4 for current status of JPO Orders.

Current Status: Finding 1. On July 26, 2000 JPO and ADF&G approved and accepted the remedial actions taken by APSC at Grey Stream.

Finding 2. APSC is not in compliance with sections 9B/16B of the Grant/Lease and stipulations 1.18.1 and 1.18.3. The APSC *Quality Assurance Program* required by the Grant/Lease was not adequately implemented so that full compliance with Grant/Lease environmental stipulation 2.5.1.1 was assured. The APSC surveillance and maintenance program required by stipulation 1.18.1 of the Grant/Lease did not identify or prevent damage to natural resources. APSC did not maintain complete and up-to-date records on operations and maintenance activities, including surveillance and maintenance data on TAPS drainage structures, as required by stipulation 1.18.3.

Current Status: Finding 2. On March 27, 2000, APSC issued a Corrective Action Request (CAR) to address the lack of processes and documentation to demonstrate compliance with the Grant/Lease. The CAR specifies the following actions: (1) clarify criteria for surveillance maintenance, and repair of drainage structures by reviewing and revising the Surveillance Manual (MS-31) and the Maintenance and Repair Manual (MR-48); (2) initiate an annual preventive maintenance (PM) schedule for drainage structures in each Asset area; (3) Field Environmental Generalists (FEG) initiate a training program for Maintenance Coordinators (MC) and key baseline personnel on drainage structure surveillance, maintenance, and repair from a fish passage perspective; and (4) the Environmental Protection Manual (EN-43) be revised to improve the Environmental Surveillance program and to be consistent with the methodology used in the Quality Program Manual (QA-36).

Conclusions:

Twenty percent of the culverts (two) and sixty five percent of the low water crossings (seventeen) sampled by ADF&G in 1999 were not in compliance with fish passage requirements contained in Fish Habitat Permits and Grant/Lease stipulation 2.5.1.1. Noncompliance with fish passage requirements and lack of implementation of internal Alyeska requirements results in noncompliance with Grant/Lease sections 9B/16B and stipulations 1.18.1 and 1.18.3 for these TAPS systems (low water crossings and culverts). These sections and stipulations require quality assurance, surveillance and maintenance programs designed to assure compliance with environmental stipulations and to prevent damage to natural resources. Complete and up-to-date surveillance and maintenance records are also required, and were found to be absent. Noncompliance with fish passage requirements results from the lack of effective implementation of APSC internal requirements contained in the Environmental, Surveillance, and Maintenance

programs.

The findings of the assessment will not be fully closed until the JPO completes a full review of the program changes made by APSC. This review is currently under-way.

5.1.3 Fuel Gas Line (FGL) Stability Monitoring and Maintenance

The issuance of 1998 JPO findings and a DOT/OPS Notice of Probable Violation (NOPV) on the FGL led APSC to develop a five year corrective action plan for depth of ground cover over pipe, exposed pipe, and other compliance issues. JPO oversight of these issues consists of tracking the progress of the corrective action plan through monitoring of the associated yearly projects. The first phase of the plan was concluded with Project No. F068 – Fuel Gas Line Remediation Project; this project was selected for inclusion in the 1999/2000 Construction CMP and additional information can be found there.

The next phase of the Fuel Gas Line Remediation effort is currently being conducted as Project No. F960, which is being monitored as a part of JPO’s continuing oversight plan.

The USDOT/OPS has issued a Notice of Probable Violation, Proposed Civil Penalty and Compliance Order, CPF No. 59502, since the fuel gas line became exposed at MP 13.02 and 16.57 and was washed out and lying in water at MP 78.6, 86, 84 Mile hill, and 120 APS. The Compliance Order requires APSC to take all practicable steps to protect their fuel gas line and associated appurtenances in those areas from future detrimental movement and external forces.

USDOT/OPS is also taking enforcement action relating to lateral vaults on the FGL at MP 18, 47 and 70 that are filled with frozen water. The vaults must be designed to minimize the entrance of water and the valve must be readily accessible during an emergency.

5.1.4 Mainline Above Ground Monitoring and Maintenance

JPO efforts on Mainline Above Ground Monitoring and Maintenance are documented in JPO Engineering Report No. 00-E-022, titled *Evaluation of 1998 and 1999 MP-166 Above Ground Monitoring Reports and Status of Compliance with Stipulation 3.5, Slope Stability*, dated June 30, 2000. A summary of these efforts is provided below:

Purpose and Scope:

The purpose of this review is to evaluate the TAPS Aboveground System for Compliance with Grant and Lease Stipulations 1.18 *Surveillance and Maintenance*, 3.5 *Slope Stability*, and 3.9 *Construction and Operation*. The scope is to evaluate APSC’s 1998 and 1999 MP-166 Reports on Aboveground Monitoring, including a review of the status of slope stability.

Grant/Lease Compliance:

Stipulation 3.5 Slope Stability; and Stipulation 3.9 Construction and Operations:

JPO reviews have identified slopes along the TAPS Right-of-Way which are not in compliance with the referenced stipulations. The slopes, as well as the Vertical Support Members (VSMs), at Squirrel Creek, MP 717, are not in compliance with the TAPS design basis. The Lost Creek slope, MP 392, has significant geotechnical concerns and movement of the VSMs.

Principle (3) 'Permittees Management of Pipeline System Maintenance'; and Stipulation 1.18 Surveillance and Maintenance:

JPO review of APSC's above ground monitoring program identified the following deficiencies: (1) there is no programmatic method which provides for documented resolution of recommendations made by the APSC Systems Integrity group and (2) there is no programmatic method which provides for documented resolution of recommendations made by expert consultants. JPO interprets this as a failure of the APSC corrective action process (see section 5.1.1) and a non-compliance to the referenced stipulations.

In addition to the JPO Engineering Report 00-E-002, USDOT/OPS conducted safety inspections to determine if geotechnical features pose a threat to safety. Safety issues identified include: (1) MP 170, South Chandalar Hill monitoring rods are not being monitored; (2) MP 392.5, south side of Lost Creek slope appears to be moving and possibly impacting VSM's; (3) MLR-2 segment has moved upward a maximum of 6" in the last year; (4) VSM's at MP 608 are experiencing lateral pushing from frost heaving; and (5) the anchor at Klutina Hill is tilting.

49 CFR, Part 195. 254, 422 and 424, Design and Maintenance:

USDOT regulations require the pipeline operating pressure to be reduced by 50% of MOP, whenever the pipe is moved. USDOT/OPS has issued a NOPV in the past (CPF 53507-W, 195.424) relating to pipe line movement. At Squirrel Creek, APSC has moved its above ground piping without reducing the operating pressure. APSC is presently seeking a waiver from the DOT regulation.

Conclusions:

Published scientific evidence¹ is available to suggest that warming climatic trends are likely to expand the active zone throughout regions of Alaska's permafrost; this could affect pipeline

¹ Weller, G., and Patricia A. Anderson, "Implications of Global Change in Alaska and the Bering Sea Region - Proceedings of a Workshop University of Alaska Fairbanks June 1997", *The Center for Global Change and Arctic System Research University of Alaska Fairbanks, April 1998.*

foundations and more than 25,000 VSMs currently subject to movement². Further, 84% of all heat pipes along TAPS have some degree of blockage, potentially causing diminished heat transfer performance. The combination of warming permafrost and reduced heat pipe performance can result in frost heaving. Frost heaving presents a potential threat to VSM supports as it can cause “jacking” of the member up and out of the ground, thereby reducing VSM embedment, resulting in further jacking and reduced load bearing potential. This is a complex subject, with both natural and man made factors (heat pipe effectiveness) playing a role in changing permafrost conditions along sections of the above ground pipe. Continued ground thawing will only exacerbate the problem. A comprehensive long-term corrective action plan is necessary.

APSC has responded to these issues with (1) a request for a design basis waiver for the slopes at Squirrel Creek (currently under review by JPO); and (2) several integrated projects designed to determine the performance characteristics of heat pipes (Project F170), make aboveground pipe repairs at Squirrel Creek (Project F171), and revise the aboveground surveillance, monitoring and maintenance program linewide (Project F172). Implementation of improvements to the surveillance, monitoring, and maintenance of the aboveground system is expected as a result of these project efforts

5.1.5 Mainline Below Ground Monitoring and Maintenance

The JPO 1999/2000 efforts on mainline below ground monitoring and maintenance involve depth of cover requirements at various below ground pipe locations. These efforts are documented in (1) JPO Engineering Report No. JPO-99-E-026, titled *Buried Pipeline Bend Design and Use of Overfills at Horizontal Bends and Overbends in Lieu of Deep Burial*, dated October 7, 1999; (2) JPO Letter No. 99-095-JH, dated December 17, 1999; (3) APSC Letter No. 00-15426, dated February 11, 2000; and (4) APSC Letter No. 00-16072, dated August 1, 2000. The following provides a summary status of this oversight effort:

Background:

Grant/Lease Stipulations 3.2 *Pipeline System Standards* and 3.3 *Construction Mode Requirements* address the requirements for depth of cover over the buried mainline pipe. During a JPO engineering review of the original design basis depth of cover requirements, compliance concerns were identified for the following pipe configurations: (1) horizontal bends; (2) overbends; and (3) sidebends. The concerns were: (1) can APSC evidence knowledge of the location of these critical below ground pipe configurations; and (2) can APSC evidence knowledge that the depth of cover at these locations meets the minimum requirements. These concerns were transmitted to APSC via the above listed correspondence and the APSC response

² Vertical Support Members comprise the support structures for the above ground pipe as well as house the heat pipe systems used to maintain permafrost conditions. VSMs are spaced at 60 foot intervals along the above ground pipeline. TAPS is comprised of approximately 78,000 VSMs and 61,000 heat pipes.

acknowledged gaps in their monitoring of these sites.

Grant/Lease Compliance:

If follow-up surveys determine that the depth of cover requirements at any of these locations are not being met, there will be determinations of non-compliance with Stipulations 3.2 *Pipeline System Standards*, 3.3 *Construction Mode Requirements*, 1.18 *Surveillance and Maintenance*, as well as Principle (3) '*Permittees Management of Pipeline System Maintenance*'.

USDOT/OPS Regulatory Compliance:

DOT has issued a NOPV under 49 CFR §195.401 to APSC relating to operating their pipeline at MP 652 at a level that could adversely affect the safe operation of its pipeline system and not correcting it within a reasonable time. APSC is contesting this violation and a court hearing has been set for January 9, 2001.

Conclusions:

APSC has committed to the following actions in order to resolve JPO's concerns:

- Revise *System Integrity Monitoring Program Procedures Manual*, MP-166, to ensure review of these bend sites after curvature pig runs.
- Revise *Monitoring and Surveillance Manual*, MS-31, to include a list of critical overfills and sidefills to be monitored (note: the 1985 listing of these sites was originally in MS-31 as Appendix D, but was dropped during later manual revisions).
- Install signs to protect critical fill areas.
- Conduct surveys of the bend locations to determine actual fill thickness. Sites with insufficient fill will be forwarded to APSC Operations for repair.

This issue provides evidence of gaps in the APSC monitoring program, which is a significant element of an effective corrective action process (see section 5.1.1 *TAPS Monitoring and Corrective Action Process* for discussion of deficiencies in APSC's corrective action processes). JPO will continue its oversight of this issue through to resolution.

5.1.6 TAPS Corrosion Monitoring and Control History

JPO Engineering Report No. 00-E-021, titled *TAPS Corrosion History*, dated June 22, 2000, provides a complete history of TAPS corrosion and corrosion monitoring efforts. The following provides a summary of the more significant historical events:

- 1969 – TAPS owners establish a Corrosion Advisory Committee, which recommends that thin film epoxy coatings be utilized, supplemented by a cathodic protection (CP) system.
- 1972 – The epoxy coating, Scotchkote 202, is found to crack when bent under cold conditions.
- 1974 – The Scotchkote 202 coating is discovered to experience disbondment problems
- 1975 – APSC submits the TAPS Corrosion Control Plan to the government for approval and the DOT and DOI respond with the following concerns:
 - Problems with Scotchkote 202 coating cracking and to what extent the belowground pipe would be tape wrapped.
 - Method for locating disbonded coating.
 - Long term performance of thermally insulated pipe.
 - Stress corrosion and hydrogen cracking.
 - Frequency of pig runs.
 - Effects of telluric currents.
 - Methods for pipe to soil monitoring.

The government insists that APSC tape wrap the entire belowground pipe and develop a basis for corrosion pig run frequency.

- 1977 – TAPS becomes operational.
- 1979 – TAPS Super Pig becomes lodged in the pipeline at Check Valve 29.
- 1984 – DOT warns APSC that insufficient action regarding low CP readings is being taken and APSC contracts with Pipetronix to develop an enhanced magnetic flux pig.
- 1987 – the first run of the Pipetronix pig takes place.
- 1989 – APSC identifies over 1000 anomaly locations.
- 1991 – APSC replaces 8.5 miles of corroded pipe in the Atigun River floodplain and installs approximately 70 full encirclement repair sleeves.
- 1992 – State of Alaska signs an Alternative Dispute Resolution Agreement (Cooperative Agreement) with APSC intended to develop programs for enhanced detection, mitigation, repair, and prevention of corrosion.
- 1994 – APSC introduces the CP Coupon and proposes the use of this technology as a stand-alone CP Monitoring Method.
- 1998 – JPO approves the use of the CP Coupon as the “best available” technology and APSC provides a schedule for the development of a Corrosion Control Management Plan and Continued Development Plan.
- 1999 – APSC submits the Corrosion Control Management Plan consisting of:
 - Data Management Component
 - CP Component
 - CP Monitoring component (Includes Coupons, Close Interval Survey, and Conventional Test Stations)
 - Pipeline Integrity Component (Uses pig data to find and repair corrosion defects)
 - Enhance Integrated Monitoring Component: Used to make decisions regarding the need for enhancements to the CP system and pipe refurbishment (Combines Corrosion Pigs, CP Data, Mitigation History, Corrosion Activity Model into a Decision Tree).

- 2000 – APSC submits finalized Corrosion Control Management Plan procedures with a Transition Plan for the remaining Cooperative Program CP projects. JPO decides to use this plan as the basis of compliance with 49 CFR Part 195 and Stipulation 3.10 *Pipeline Corrosion*.

5.1.7 TAPS Corrosion Monitoring and Maintenance

JPO efforts with regard to TAPS Corrosion Monitoring and Maintenance are documented in Engineering Report JPO-00-E-028, titled *TAPS Corrosion Monitoring and Control*. The following provides a summary of these efforts:

Purpose and Scope:

This effort reviewed APSC surveillance and maintenance programs as they relate to the following Grant/Lease Stipulations:

- 3.10 Pipeline Corrosion
- 3.2 Pipeline System Standards
- 1.21 Conduct of Operations
- 1.18 Surveillance and Maintenance

Through this effort, JPO assessed the adequacy of TAPS corrosion monitoring and control programs as outlined in APSC Manual MP 166 *System Integrity Monitoring Program Procedures, Section 3 Corrosion Monitoring*. Selected surveillance, monitoring and inspection data were collected and reviewed for program compliance, deficiency identification, and corrective action implementation. These program results were then assessed for compliance to the requirements of the above listed stipulations.

The TAPS systems reviewed were: (1) TAPS mainline Pipe, (2) major crude oil tanks; and (3) related facility crude oil piping.

Conclusions:

Review of TAPS corrosion control and monitoring programs for TAPS crude oil piping revealed that corrosion to the mainline and related facilities is of significant concern to the long-term viability of TAPS operations. In response to this concern, APSC has instituted rigorous corrosion control and monitoring programs which have been effective in identifying where corrosion threatens the integrity of the TAPS mainline pipe and related facilities, and has implemented timely corrective action. Consequently, JPO/USDOT/OPS has concluded that at this time, APSC is in compliance with the above listed stipulations and regulatory requirements.

However, corrosion continues to present a significant maintenance challenge for APSC, and this

review identified some specific concerns which JPO will continue to monitor; these are as follows:

Mainline Pipe:

- Ability to monitor mainline girth welds and mechanical damage defects.
- Corrosion of mainline pipe. Pipeline derates have averaged 1.75 per year and the installation of repair sleeves have averaged 1.75 per year since 1996.
- Corrosion of 6-inch by-pass piping on mainline valves. At least four bypass lines have been replaced since 1996, due to corrosion.

Pump Stations and Related Facilities:

- Internal corrosion of TAPS facilities crude oil piping. Corrosion to piping systems continues to progress with corrosion rates dependant on crude oil flow and corrosion inhibitor effectiveness.

APSC has acknowledged the need for improvement, and has taken the following actions:

- **Girth Weld Inspections:** APSC has developed new criteria for the inspection of mainline welds, which focus on deep corrosion adjacent to the girth welds. The new criteria identified nine new locations which are being investigated in 2000 under APSC project F900.
- **Mechanical Damage:** APSC is in the process of performing a causal factor analysis to determine why the corrosion pig did not accurately characterize recently discovered mechanical damage at MP 710.76.
- **Mainline Pipe Corrosion Monitoring and Control:** APSC has implemented the Corrosion Control Management Plan (CCMP). The CCMP is intended to provide a redundant, five-part program of corrosion protection. JPO/USDOT has reviewed and concurred with the CCMP and its implementing procedures. The CCMP is designed to evaluate cathodic protection (CP) monitoring data and corrosion growth activity and history. It is also intended to manage data and the implementation of corrective actions. Additionally, the State/Owner Company Cooperative Corrosion Program will install over 20 new impressed current CP systems. These systems are anticipated to cover up to 280 miles of belowground pipe.
- **Mainline Valve 6-inch Bypass Piping:** APSC is in the process of excavating and installing vaults around all buried check valves. Upon completion of the vault installations, these valves will be accessible for both visual and instrumented inspections. APSC Systems Integrity Group has recommended the facility asset managers design an

improved monitoring and corrective action process to better control corrosion of mainline valve bypass lines.

- Pump Station and Valdez Marine Terminal (VMT) Facility Piping: APSC continues to aggressively evaluate corrosion inhibitor effectiveness at pump stations and the VMT. In the 1999 TAPS Corrosion Control Summary Report, APSC Systems Integrity Group recommended the Facility Asset Managers design an improved monitoring and corrective action process to better control corrosion of facility piping systems.

5.1.8 TAPS Pipeline Bridge Inspection and Repair

JPO efforts on TAPS pipeline bridge inspection and repair are documented in the JPO Engineering Report No. 00-E-020, titled *Tazlina and Gulkana Pipeline River Bridge Crossings*, dated June 15, 2000. A brief summary of this effort is provided below.

Purpose and Scope:

The APSC pipeline bridge inspection program requires a five-year inspection for structural integrity on all pipeline bridges. The JPO 1999/2000 oversight of TAPS bridge inspections included an assessment of the adequacy of pipeline bridge maintenance in general, and the inspection of the Tazlina and Gulkana River pipeline bridges, in particular. The project specific to these two pipeline bridges was selected for inclusion in the JPO Construction CMP and additional information can be found there.

Grant/Lease Compliance:

Principle (3) ‘Permittees Management of Pipeline System Maintenance’; and Stipulation 1.18 Surveillance and Maintenance:

This review effort determined that APSC could not demonstrate that the pipeline bridge inspection program adequately ensured that identified maintenance deficiencies were corrected.

Conclusions:

Review of the pipeline inspection program revealed that inspections were, for the most part, conducted at the specified intervals and identified deficiencies were documented. The evidence of action taken to correct the deficiencies, however, was insufficient, which represents a failure of the corrective action process (see section 5.1.1). APSC has committed to develop a new procedure to cover this programmatic gap to reside in the APSC Manual MP 166, *System Integrity Monitoring Program Procedures*.

5.1.9 VMT Tanker Vapor Control System (TVCS) Management Review

Background:

The Valdez Marine Terminal (VMT) TVCS was designed to collect crude oil vapors from loading tankers and transport them to pressurizing compressors, to be used for either balancing the crude storage tanks, or as a fuel source for the power plant. Since these vapors are potentially volatile, the system must also prevent combustion. The TVCS was designed to accomplish this by preventing the accumulation of oxygen, and preventing the introduction of an ignition source. In the event these preventive measures fail, and combustion does occur, the TVCS is further designed to sense the event and respond through isolation and suppression.

The installation and implementation of this complex system was plagued with problems and malfunctions and became the object of intense public scrutiny. In April of 1999, JPO, the United States Coast Guard (USCG), and the Regional Citizens Advisory Council (RCAC) became concerned about the integrity of the system and initiated discussions with APSC which resulted in a management review of the TVCS. The JPO, USCG, and RCAC all participated in this management review.

Conclusion:

The TVCS management review was comprised of a gap analysis for five main areas of concern:

- Management Controls
- Operating Controls
- Training
- Procedures
- Hardware

JPO personnel monitored all elements of the management review and have tracked the associated progress and commitments.

The most in-depth element of this review was the Reliability Centered Maintenance (RCM) analyses of the TVCS hardware. RCM, as was explained in section 3.1.2, is a highly prescriptive process for identifying the maintenance needs of equipment to ensure operational safety and functional reliability. Due to the complexity of the TVCS system, RCM analyses were conducted on the following sub-systems: (1) the Servomex oxygen analyzers; (2) the Fenwal detection, isolation, and suppression system; (3) the vapor arm to berth isolation valve; and (4) the TVCS controls.

The RCM analyses resulted in 456 action items. A number of these action items were recommendations for compulsory redesign; so designated because of the safety or environmental consequences of functional failure. JPO gave notice to APSC, via Letter No. 99-033-LB, that completion of all compulsory redesign recommendations identified in the RCM analyses must be completed for Berths 4 and 5. JPO also requested via Letter No. 99-087-JH, the disposition of all

non-compulsory recommendations resulting from the RCM analyses.

APSC has developed a database which details each action item, the category (compulsory or non-compulsory), due date, and responsible individual. Tracking the resolution of these action items is a part of the JPO continuing work plan. See section 5.4 *JPO Orders* for further discussion of the JPO notice regarding the TVCS.

5.2 TAPS MAINTENANCE BASELINE ASSESSMENT

The work associated with this element, over the period covered by this report, has primarily involved (1) researching industry maintenance management strategies; (2) planning and scoping the integration of JPO agency participation; (3) briefing APSC on the intent of this effort and expectations for APSC participation; and (4) procurement of consulting maintenance management experts. Implementation of this work element commenced in November 2000. Initial work has consisted of criticality analyses of TAPS systems, and training of APSC and JPO personnel to the RCM process.

JPO has emphasized to APSC, as well as the owner companies, the need for this effort to meet the TAPS maintenance and right-of-way requirements discussed in section 4.0 *Requirements* above. APSC has recognized the benefits of this effort and formally agreed to support its implementation through the signing of a *Memorandum of Agreement (MOA)*, dated January 9, 2001. Attachment (1) provides a copy of this MOA.

APSC has conducted their own Asset Maintenance Management (AMM) assessments, one for the Pipeline Business Unit (PBU) and one for the Valdez Business Unit (VBU). APSC procured a team of maintenance management consultants, headed by BP Amoco, to conduct these assessments, and has shared the associated philosophy, methodology, scope, and results with the JPO. APSC has begun implementation of the results of these assessments and has maintained an open relationship with JPO throughout these efforts.

The philosophical approach to maintenance management adopted for these assessments, as described to JPO, is very similar to that of the “World Class” maintenance management approach discussed in section 3.0 *Background*. The JPO AMM assessment will include a detailed review of these APSC maintenance management assessments to establish a unified understanding of what is considered “state of the art” maintenance management, as required by Principle 3 of the Grant and Lease (see section 4.0 *Requirements*).

5.3 JPO 1997/1999 MAINTENANCE CMP ISSUES

The following provides the results of JPO follow-up efforts on issues identified in the 1997/1999 Maintenance CMP. Follow-up results for many of these issues were captured in preceding sections of this report, and in those cases, the reader is referred to the applicable section:

5.3.1 TAPS Electrical Systems

JPO efforts on 1998 issues regarding TAPS Electrical Systems is documented fully in the JPO Engineering Report JPO-00-E-006, titled *TAPS National Electrical Code Compliance*, dated February 3, 2000. The following provides a summary of this effort:

This work effort was scheduled because of APSC's poor past performance and allegations from concerned employees. An Assessment was conducted in 1998 which consisted of 11 surveillances and resulted in five findings and six notices of violation. Follow-up surveillances were conducted in 1999 to ascertain the degree of APSC's improvement.

Grant/Lease Compliance:

Compliance to the following Grant/Lease requirements were evaluated through this monitoring effort:

- Section 9 *Construction Plans and Quality Assurance*
 - 9.C (3) - Quality control, planning and inspection
 - 9.C (4) - Materials and services based upon quality control
- 1.18 *Surveillance and Maintenance*
- 1.20 *Health and Safety*
- 1.21 *Conduct of Operations*

This review found APSC to be in compliance with the National Electrical Code (NEC). This indicates an overall improvement in NEC compliance on TAPS. Employees were found to have the proper Certificates of Fitness. No findings related to NEC code compliance were identified and the State Electrical Inspector wrote fewer Notices of Violation.

Conclusions: The JPO performed surveillances and an assessment in 1998 due to poor past performance and concerned employee allegations of violations of codes and procedures. The allegations were found to be unfounded with one exception: Pump Station 7 personnel working on the fire systems were found not to have the appropriate permits issued by the State Fire Marshal. APSC was notified of five findings and six notices of violation. The response to the findings was deemed appropriate and the six code violations were corrected. APSC's performance in 1999 did not result in any findings or observations.

The 1999 surveillances were conducted to verify that the corrections taken in 1998 continue to be effective. Results of these surveillances indicate that APSC's electrical code compliance has indeed improved and personnel have obtained the appropriate fire permits.

5.3.2 TAPS Preventive Maintenance

JPO has completed its review of the 1997/1999 Maintenance CMP issue regarding APSC management of TAPS preventive maintenance (PM). A specific PM concern regarded newly completed projects being commissioned and turned over to APSC operations, without providing the necessary PM procedures for newly installed equipment. JPO conducted follow-up surveillances designed to measure APSC management of this project turnover element. Specifically, the preventive maintenance procedures for the TAPS Digital Strong Motion Accelerograph (DSMA) and the VMT Backpressure Control System were reviewed. It was found that the required PM tasks were being completed and tracked through the APSC maintenance management software, Passport.

A review of open Priority 4 PM tasks³ was also conducted as part of the JPO continued evaluation of the APSC overall equipment maintenance strategy. A total of 563 open work orders were identified; which is an improvement over the 831 open and overdue work orders found in the 1998 JPO assessment, JPO-98-A-013. While the number of open priority 4 work orders has declined since the 1998 assessment, JPO will continue to monitor open work orders until the backlog is further reduced.

Priority 3 PM tasks were also reviewed. It was found that 156 supplemental work orders were written to complete PM tasks which were not completed at the originally scheduled maintenance interval. The importance of these delayed PM tasks could not be determined from the Passport information provided to JPO by APSC. Many were designated as a priority 3, which would appear to indicate concern by the writer. JPO requested, via Letter No. 00-054-JH, that APSC review all open supplemental work orders written to correct deficiencies found on Priority 3 PM tasks.

5.3.3 Slope Stability

See section 5.1.4 *Mainline Above Ground Monitoring and Maintenance*, above for details regarding this 1997/1999 Maintenance CMP follow-up effort.

5.3.4 Erosion Control

See section 5.1.2 *River and Flood Plains Monitoring and Maintenance*, above for details regarding this 1997/1999 Maintenance CMP follow-up effort.

³ Priority 4 PM tasks were defined in the APSC Maintenance System Manual, MP-167, rev 2, as medium priority work with a required completion date of fourteen to ninety days from the date they are created. Priority 3 PM tasks were defined as high priority work, or prescriptive regulatory maintenance work, with a required completion date of fourteen to ninety days from the date they are created.

5.3.5 Valve Maintenance

The APSC TAPS Valve Program has dealt with multiple issues, including (1) testing mainline valves for sealing performance; (2) excavating, investigating and vaulting below ground check valves; and (3) development of the TAPS Valve Maintenance Management Plan. The following provides a summary of the status of these issues:

Mainline Valve Testing

APSC and JPO/USDOT entered into a Memorandum of Agreement (MOA) in 1997, which addressed the testing of 177 mainline valves by the year 2000. As a result of this program, all operating mainline valves have been tested. Testing results have so far necessitated the repair or replacement of three valves: Remote Gate Valves (RGV)'s 60 and 80, and Check Valve 122. The results of year 2000 testing have yet to be submitted to JPO for review.

Prior to year 2000 testing, APSC reported that five valves had a degree of measured leak through, although the rates were below the values that APSC had proposed as indicating that repair or replacement was warranted. Test data on a number of other valves also showed leak through, however, APSC noted that a temperature drop of oil in the pipeline during the test can cause a pressure drop that mimics leak through. Because of this, APSC argued that if the leak rate is small enough (equivalent hole size of less than 0.05 inches) and there are no other indicators of leak through, the test results are more likely due to a temperature drop than an actual leak in the valve. Hence, APSC reports these valves as having sealed, even though the data reports show leak through.

APSC has developed in-service performance criteria for valve leak through as part of their quality program. Nevertheless, JPO has informed APSC that deferral of repair of a valve with leak through will require approval from the Federal Authorized Officer, the Alaska State Pipeline Coordinator, and the US DOT/OPS. Decisions to defer repair of the valves will be based on an analysis of the particular valve and the impact of the leak through on spill scenarios, maintenance requirements and DOT requirements. All requests to defer repair and supporting documentation are due to the JPO by January 2, 2001.

Below Ground Check Valve Investigations

APSC has committed to excavate, inspect and perform necessary repairs on buried mainline check valves. APSC Corrective Action Request 95-002 and Government Letter No. 97-12193 set the rate of investigation at five valves per year through 2002. Currently, 24 valves have been excavated, with 16 remaining. As requested by JPO, all valves will be vaulted to facilitate future inspection, maintenance and monitoring.

JPO Engineering Report No. JPO-00-E-016 was generated as part of the Construction CMP and additional information is presented there. There were problems identified with the planning and management of the work done in 1999. The investigations revealed numerous seeps and weeps

at many valves as well as uncovering various mechanical issues, and additional undocumented modifications of the type noted on other valves. The mechanical issues and undocumented modifications are resolved prior to reburial, but weeps and seeps remain a concern.

TAPS Valve Maintenance Management Plan

APSC has substantially completed the TAPS Valve Maintenance Management Plan (TVMMP). The TVMMP has been submitted to the JPO and review is ongoing. The TVMMP is perhaps one of the most comprehensive, multi-disciplinary, multi-system plans APSC has developed. It will track performance, maintenance, configuration and history for mainline valves, pump station valves and VMT valves. The plan represents a significant effort to provide configuration management tools to assure valve performance. APSC is to provide JPO with an annual report summarizing the status of the valve program. This annual reporting requirement will help insure that the plan is followed.

USDOT/OPS Regulatory Compliance

USDOT is taking enforcement action relating to the issue of APSC not investigating the internal corrosive effects of the hazardous liquids on 6" by-pass valve piping in accordance with 49 CFR §195.418.

5.3.6 Work Pad Maintenance

JPO concerns regarding work pad maintenance pertain to the APSC corrective action process, which led to the JPO request for APSC to perform the Special Review of the Corrective Action Process, SR#00-03. See section 5.1.1 *TAPS Monitoring and Corrective Action Process*, for a discussion of this 1997/1999 Maintenance CMP follow-up effort.

Also, the above section 5.1.2.3 Assessment Report JPO-00-A-001, *Alyeska Pipeline Service Company Compliance With Fish Passage and Related Environmental, Surveillance, Maintenance and Quality Program Requirements*, provides discussion of this follow-up review effort.

5.3.7 Material Sites

JPO efforts on TAPS Material Sites is documented fully in the JPO Assessment Report JPO-00-A-003, titled *Assessment of OMS Sites (Operations Material Sites)*, dated May, 2000. The following provides a summary of this review effort:

Purpose and Scope:

The purpose of this assessment was to determine if APSC was in compliance with Federal Grant

of Right of Way and State Lease Stipulation 2.6 *Material Sites*, the provisions of the Federal and State material sale contracts, and the Mining and Reclamation Plans for each site. BLM Manual, Section 3600, Instruction Memorandum No. 99-021 requires annual inspections of mineral material sites on federal land. JPO policy requires annual inspection of the sites on state land as well. There are 73 active material sites used by APSC along the TAPS Corridor, 40 sites on federal land and 33 sites on state land. This assessment is based on the results of the surveillances conducted by various JPO staff members between June 21 and September 25, 1999.

Grant/Lease Compliance:

Stipulation 2.6 *Material Sites*:

JPO Finding No. 00-A-003-F/01: Three sites were in non-compliance with Grant/Lease Stipulation 2.6.1.1. Material was taken from three sites without current material sale contracts. These actions constitute a non-compliance with Grant/Lease Stipulation 2.6.1.1. because APSC did not have written approval from the Authorized Officer or the Pipeline Coordinator to remove the material at the time it was taken.

APSC reported these situations to JPO before they were discovered by JPO's review of APSC's 1999 Year End Report for TAPS OMS Sites. JPO assessed triple charges in each case as called for in the federal and state material sale contracts. APSC has paid the charges assessed on these sites. This finding is now closed.

JPO Finding No. 98-A-016-F/1: This finding was generated as a result of a 1998 assessment and remains open. It discussed six sites (three gravel and three riprap) which were not in compliance with the mining and reclamation sites because each had side slopes steeper than the maximum measurement listed in the mining plan.

The 1999 field inspections revealed the slopes of the three gravel sites listed in this finding had been repaired. APSC had suggested posting warning signs at the three rip rap sites to warn the public of the danger of the steep slopes as well as revising the mining plans. Two of the rip rap sites had warning signs posted on the pit floors during the 1999 field inspections and the last site was posted with warning signs in December, 1999.

APSC submitted the proposed revisions to the mining and reclamation plans in APSC Letter 00-15549. JPO found the language unacceptable and by JPO Letter NO. 00-026-JH instructed APSC to provide more clarity and detail to the mining plans.

APSC revised the three mining plans a second time and submitted them to JPO with APSC letter 00-15839 dated May 31, 2000. JPO approved the changes in the mining plans by JPO Letter No. 00-108-LM dated June 23, 2000 and requested APSC to make a determination of the appropriate side slopes for the three sites and submit them for JPO approval. This is the only outstanding issue remaining for *JPO Finding No. 98-A-016-F/01*.

Conclusion

The OMS sites used by APSC are clean and well maintained. There was no evidence of erosion in any of the sites inspected this summer. There has been minimal change in the quality of the mining sites between the 1997, 1998 and 1999 on-site inspections.

JPO will work with APSC to close out the sites that are no longer under contract to insure they have been reclaimed as stated in the reclamation portion of the mining plans.

5.3.8 Change Management (AAI 1955)

The results of this work element have been incorporated in the JPO 1999/2000 Construction CMP report. See the JPO 1999/2000 Construction CMP report for a detailed discussion of the status of this effort.

5.4 JPO ORDERS AND NOTICES 1999-2000

JPO's Comprehensive Monitoring Programs revealed numerous gaps in APSC's efficiency in completing work that JPO found was essential to maintaining pipeline integrity, protecting public safety and the environment. APSC had continually deferred work on several projects JPO felt needed immediate attention. Several key issues involved noncompliance with the Federal Grant and State Lease terms, such as slope stability at Squirrel Creek. JPO determined that work on several key items could no longer be continually postponed. This decision led to JPO's issuance of eight orders and three notices to APSC between August and December 1999.

These orders fall into two basic categories: (1) long standing issues where work schedules have continually slipped past specified completion dates; and (2) urgent situations that require immediate attention. Some long standing issues needing corrective action were reported in previous CMP reports, such as the cold restart of the pipeline, resolution of audit action items, and slope stability for above ground pipe. JPO used the order process to get APSC focused on resolving these items. The orders contain a wide range of issues and vary in significance. Some of the more urgent situations involved testing of the fire suppression system for the eighteen crude oil storage tanks at the Valdez Marine Terminal (VMT), and conclusion of the management review of the VMT Tanker Vapor Control System.

The following is a discussion of the orders and notices JPO issued in 1999. The table below specifies dates and status of the issues.

JPO ORDERS AND NOTICES

	ORDERS AND NOTICES BY STIPULATION 1.6 of the FEDERAL GRANT & STATE LEASE	RESULTS	STATUS
1	ORDER: Slope Stability	Complete	CLOSED

	Order issued 8/11/99. Corrective action plan for slope stability and aboveground pipeline maintenance on Squirrel Creek slopes (<i>Stipulations 3.5.1, 3.9.1</i>)		1/4/01
2	ORDER: Pungs Crossing Bridge Order issued 10/4/99. Replace the bridge at PLMP 289.5, Pungs Crossing, to provide safe access to the right-of-way and the pipeline for oil spill response. (<i>Stipulation 2.14.3</i>)	Complete Bridge replaced	CLOSED 10/24/00
3	ORDER: Grey Stream Fish Passage Order issued 10/29/99. Implement corrective action to allow for fish passage at Grey Stream (PLMP 790.9), so construction could be completed between May 15 and July 15, 2000. (<i>Stipulations 2.5.1.1, 2.8.1, 3.9.1; Lease Section 22</i>)	Complete	CLOSED 7/26/00
4	ORDER: Cold Restart Procedure for the Pipeline Order issued 11/5/99. JPO directed APSC to provide a final schedule for development and implementation of the cold restart procedure for TAPS, specifically completion of laboratory testing, development of the cold restart procedure, final hydraulic model updates and revision of the TAPS operating procedure manuals and design basis documents. (<i>Stipulation 1.21.1</i>)	In progress	OPEN
5	NOTICE: Audit Action Item Status Notice issued 10/25/99. JPO provided notice to APSC regarding closure of five audit action items remaining from the 1993 audit of TAPS: 1) AAI 1955 – Configuration management 2) AAI 2076 – Operation of RGV control system in Triconix mode 3) AAI 2113 – Completion of a qualification development program 4) AAI 50528 – Access road and workpad bridge design compliance 5) AAI 50552 – Install secondary containment in pump station tanks	In progress In progress Complete Complete Complete	OPEN OPEN CLOSED CLOSED CLOSED
6	ORDER: Non-Plenum Cables at OCC Order issued 10/15/99. JPO ordered APSC to replace all non-plenum rated cables located in the Operations Control Center at the Valdez Marine Terminal under floor plenum. (<i>Stipulations 1.20.1, 1.21.1</i>)	Complete Cables replaced	CLOSED 6/5/00
7	NOTICE: Tanker Vapor Control System Compulsory Redesign, Valdez Marine Terminal Notice issued 10/25/99. JPO directed APSC to complete all compulsory redesign conclusions and recommendations identified in the Reliability-Centered Maintenance reports for Berths 4 and 5 at the Valdez Marine Terminal, and to submit their plan and schedule for redesign completion for Berths 4 and 5 to JPO for review and approval. (<i>Stipulations 1.20.1, 1.21.1, 2.2.1.1</i>)	In progress (Compulsory)	OPEN
8	NOTICE: Tanker Vapor Control System Management Review Notice issued 11/23/99. JPO directed APSC to provide a detailed	Completed (Non-	CLOSED 1/26/01

	plan and schedule to conclude the management review of the non-compulsory items in the Valdez Marine Terminal tanker vapor control system, to include the requirements listed in JPO's report on the VMT TVCS Management Review of November 22, 1999. (Stipulations 1.20.1, 1.21.1, 2.2.1.1)	compulsory)	
9	ORDERS: Test the Valdez Marine Terminal Fire Suppression System 1) First Order: Issued 10/14/99. To ensure the functionality of the crude oil storage tank subsurface foam systems at the Valdez Marine Terminal, JPO ordered APSC to conduct a functional test of all subsurface foam systems by 12/31/99. (Grant Stipulations 1.17.1, 1.20.1, 1.21.1; Lease Stipulations 1.20.1, 1.21.1)	Complete	CLOSED March 2001
10	2) Second Order: Issued 11/8/99. JPO asked for more specifics: (1) APSC is to submit a plan for ensuring crude oil storage tank subsurface foam systems are operable; (2) to specify which subsurface fire systems are operational; (3) which tanks have blockages in their fire foam distribution systems; and (4) what fire prevention and response measures are in place as a result of the blockages	Complete	
11	3) Third Order: Issued 12/2/99. JPO ordered APSC to clean and inspect crude oil storage tanks and develop contingency measures at the Valdez Marine Terminal. This order amended, restored, and expanded the first order of 12/31/99.	Complete	

5.4.1 Valdez Marine Terminal

5.4.1.1 VMT Crude Oil Storage Tanks - Fire Suppression System

JPO issued three orders to APSC concerning the testing of the eighteen crude oil storage tank subsurface fire foam systems at the Valdez Marine Terminal.

First Order: Conduct Functional Test of Fire Suppression System:

On October 14, 1999, JPO/USDOT ordered APSC to conduct a functional test of all subsurface foam systems by December 31, 1999, to ensure the functionality of the crude oil storage tank subsurface foam systems at the Valdez Marine Terminal. The subsurface fire foam suppression systems are situated below the oil surface in the eighteen storage tanks at the Terminal. APSC conducted a test of the subsurface foam system for Tank 14 September 1999, which proved the tests could be completed without adverse consequence. The test involved flowing seawater (without foam) into each tank as if the system were activated to fight a fire. The objective of the test was to assure JPO that the subsurface foam system will operate as designed.

Although no foam was injected into the system, the test was conducted as close as possible to

normal operating conditions, and demonstrated that sea water could be pumped into Tank 14. JPO specified the remaining required tests had to be functionally equivalent to the test of Tank 14. JPO also specified that, in order to ensure the functionality of the fire suppression system at the Valdez Marine Terminal, APSC must complete preventive maintenance inspection and testing of fire suppression systems to the frequency requirements of the National Fire Protection Association (NFPA) 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. JPO ordered the requirements of NFPA 25, which are more stringent than State requirements. This will assure JPO the best possible maintenance standards are being met. JPO requested APSC to provide the NFPA 25 agreement by January 31, 2000. APSC timely submitted the final NFPA 25 maintenance frequencies to JPO and satisfied this portion of the order.

Second Order: Operability of Fire Foam Systems and Response Measures:

Since the functionality of the fire suppression systems remained indeterminate into November 1999, JPO issued another order November 8, 1999, upon learning portions of the subsurface fire foam distribution system in Tank 9 were found to be blocked during tank cleaning. JPO specified that, since the tests in the first order of October 1999 may not conclusively prove that the fire foam systems were fully operational, the first order would be held in abeyance (temporarily suspended) until further notice. However, JPO specified the NFPA requirements would remain in force. In the second order, JPO directed APSC to specify 1) which tanks may have blockages in their fire foam distribution systems, 2) what interim fire prevention and response measures are in place as a result of the blockages, and 3) submit a plan for rapidly ensuring the crude oil storage tank subsurface foam systems are operable.

Third Order: (1) Tank Cleaning, Inspection, and Testing, (2) Interim Measures, (3) Disposition of Sediment and Sludge, and (4) Preventive Maintenance:

(1) Tank Cleaning, Inspection, and Testing: JPO issued a third order to APSC to restore and expand the first two orders and cancel the November 8, 1999 amendment. In addition to the items required in the first two orders, JPO directed APSC to immediately clean and inspect crude oil storage tanks and develop emergency fire contingency measures at the Valdez Marine Terminal. JPO directed APSC to demonstrate subsurface fire foam systems were operational and effective on four tanks by April 30, 2000. APSC was also directed to develop and submit to JPO (1) a methodology and schedule for initial testing and annual re-testing of fire foam systems on all tanks with subsurface fire foam systems; and (2) a methodology for accurately determining sludge levels and quantities in oil storage tanks.

Schedule For Testing and Annual Re-Testing of Fire Foam Systems on the Tanks.

APSC developed a schedule for annual testing of the fire foam systems. A preventive maintenance task was created for all eighteen storage tanks, specifying that each tank will be flushed on an annual basis by flowing crude oil through the fire foam system. APSC submitted the first emergency fire contingency plan to JPO December 12, 1999, which JPO felt needed major modification. APSC submitted a second plan for emergency contingency fire suppression in July 2000, which JPO accepted. The plan is now in place, and requires a methodology to

continually test the system on an annual basis.

Determining Sludge Levels in Crude Oil Storage Tanks. APSC developed a methodology for accurately determining sludge levels and quantities in crude oil storage tanks. Combining infrared images of the outside of the tanks with manual depth gauging along the exterior tank walls and at the center of the tank was successful in determining sludge levels. In March 2000 APSC began conducting measurement and profiling of tanks by performing infrared radiation and tape gauging of each crude oil tank to determine levels of accumulation. APSC determined nearly all eighteen crude oil storage tanks had varying amounts of sludge covering the fire-fighting subsurface foam dispersing pipes used for fire suppression. The sludge prevented the fire suppression system from effectively functioning. The tanks contained more sediment than was first anticipated. The first schedule APSC had provided JPO included steps to reduce the sludge levels and evaluate the foam dispersing piping system. APSC began tank flushing procedures, beginning with Tank 6 in February 2000 and found fluidization seemed to work. Sediment processing from the tanks was completed and results were verified by entry into the tanks.

Spider and Crossover Piping. APSC worked on a fire system hydraulic model to ensure the foam suppression spider systems were not blocked, and did viscosity tests for waxy oil to ensure foam could pass through the mixture. APSC determined the most effective method to test whether the subsurface foam fire suppression system is functional, was to use a system of spider piping and crossover piping to keep the pipes flushed out and prevent plugging. The use of crossover piping proved to be successful in this endeavor. The subsurface foam spider piping inside of the crude tanks has ten six inch spider branches extending radially from the center hub. Foam solution flows into the center hub via a foam line and discharges through the spider branches. The new cross over piping connects a line to the main foam line, allowing crude oil to be diverted to the foam spider piping. The crossover piping makes it possible for the subsurface foam suppression system to work effectively by periodically flushing the foam spider piping to prevent blockage.

APSC completed the crossover piping modifications for all crude oil storage tanks by the end of 2000. APSC also initiated preventive maintenance to annually flush the tanks to assure functionality of the tank fire suppression system. In a December 28, 2000 letter to JPO, APSC stated the fire suppression systems in the Valdez Marine Terminal crude oil tanks were now determinate and fully functional. JPO conducted surveillances to verify system functionality and has closed the order.

(2) Interim Measures:

Access For Emergency and Fire-Fighting Vehicles to Tank Farms. JPO directed APSC to keep all roads open for emergency and fire-fighting vehicles to ensure year round access to the East and West tank farms. Some roads were not accessible in the winter. APSC removed snow from all tank farm access roads during the winter of 1999-2000 and retained an avalanche consultant. JPO expects APSC to have more than one access road to the tank farm be accessible at all times during the winter months for emergency access and evacuation.

Over-the-top suppression. JPO directed APSC to provide a final written plan, including a schedule for implementing interim prevention and response measures including procedural changes and over-the-top supplemental fire foam system able to reach all tanks. After considering the advice of RCAC consultants, the Fire Marshall and subject matter experts, JPO concurred with APSC that the over-the-top application may not be feasible for the unique layout of the tank farms at the Valdez Marine Terminal. JPO expects APSC to continue to explore practical alternatives to provide over the top protection for the tanks that cannot be reached with the equipment presently on site. JPO will continue to work with APSC on this matter.

Contingency Plan For Evacuation of the West Tank Farm. JPO ordered APSC to submit an emergency fire contingency plan, including an evacuation plan for the prevention, detection, and prompt abatement of a fire at the Valdez Marine Terminal. The evacuation plan was to include the West Tank Farm and all other Terminal locations not currently covered. In July 2000, JPO received and accepted a satisfactory contingency and evacuation plan (EC-71-VT).

(3) Disposition of Sediment and Sludge: JPO ordered APSC to provide written plans for the management and disposition of sediment in the storage tanks. APSC was directed to consider all environmentally acceptable options during the planning process, including incineration, reprocessing, refining, shipment to appropriate disposal sites, and intermingling with crude oil loaded on tankers. Once sludge levels were determined, APSC had to decide what to do with the tank sediment. The most feasible solution was to reprocess the sediment by mixing it with diesel to turn it back into liquid form. This way, it could intermingle with crude oil for loading on tankers for refining. This mixture was then transferred from one tank to another for storage until shipment. In the future, APSC plans to provide JPO an annual “contour map” of each tank that will indicate sediment accumulation depth levels. This decision turned out to be a successful solution to the sediment disposal problem.

(4) Preventive Maintenance: The final National Fire Protection Association (NFPA) 25 maintenance frequencies submitted to JPO January 31, 2000, satisfies the requirements of this item. JPO had ordered APSC to complete inspection and testing of the fire suppression systems to the frequency requirements of the National Fire Protection Association (NFPA) 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. JPO ordered the requirements of NFPA 25, which are more stringent than State requirements that changed NFPA 25 preventive maintenance frequencies to an annual basis. JPO and APSC resolved this issue through coordination. JPO ordered APSC to prove the operational integrity of the subsurface foam fire suppression system of all tanks on an annual basis.

APSC has committed to do annual preventive maintenance tasks to ensure the tank fire suppression system remains functional. The company also developed three procedures to flush the subsurface foam system and form a system capable of monitoring and clearing the foam distribution spider piping in the crude oil storage tanks. APSC demonstrated that crude oil flush was able to clear any build-up that formed in the piping and clear a large area in the tank bottom at the outlet of each spider pipe.

APSC has completed, documented, and inspected all work required by JPO's three 1999 orders for tank fire suppression at the Valdez Marine Terminal. JPO verified the work satisfied all order requirements and closed the orders in February 2001.

5.4.1.2 VMT Tanker Vapor Control System

JPO issued two notices to APSC concerning the VMT Tanker Vapor Control System. The first notice was issued October 25, 1999. It stated in order to ensure continued safe and environmentally sound operation of the tanker vapor control system, APSC must complete all the compulsory redesign conclusions and recommendations identified in APSC's Reliability Centered Maintenance (RCM) process for Berths 4 and 5 at the Valdez Marine Terminal.

In June 2000, JPO requested an update on APSC's progress of updating the maintenance strategy for the tanker vapor control system, specifically records management, training and development, regulatory compliance tools, project management, document and drawing control, change management, procurement and maintenance.

JPO issued a second notice regarding the tanker vapor control system November 23, 1999, stating JPO had received APSC's *Valdez Marine Terminal Tanker Vapor Control System Management Review* of October 7, 1999. JPO determined the review was deficient and did not contain several items JPO had previously specified were required. JPO directed APSC to provide detailed plans and schedules to conclude the review, along with a description and schedule of the planned action to be taken with regard to each of the TVCS RCM non-compulsory maintenance recommendations. On February 4, 2000, APSC responded with plans for completing the implementation of the findings and recommendations of the TVCS management review. This included a schedule for RCM non-compulsory recommendations contained within the TVCS data base. This information satisfied the JPO requirement for a description and schedule for completion of the RCM non-compulsory recommendations. JPO closed the November 23, 1999 notice January 26, 2001.

JPO currently estimates 82% of the work is complete for the order on the compulsory items. APSC estimates another six to eight months to complete the rest of the project. During the last quarter of 2000, APSC halted work on this project to commit resources to the Berth 4 renovation at the Valdez Marine Terminal. Berth 4 was temporarily removed from operation for repair and maintenance work. APSC sent JPO a Tanker Vapor Control System Management Review Implementation Plan which is currently under JPO review. The report provided the progress to date on APSC's completion of the action items associated with the tanker vapor control system. Since early 2000, APSC has provided JPO with quarterly progress reports of the completed work.

5.4.1.3 VMT Operations Control Center (OCC) Non-Plenum Cables

JPO issued an order on October 15, 1999 directing APSC to replace all non-plenum (ventilation air duct) rated cables in the Operations Control Center at the Valdez Marine Terminal by

February 28, 2000. This was to ensure APSC compliance with National Fire Protection Association standards and the National Electric Code. APSC had planned and funded the work since 1994, but postponed it. Once the project began, APSC expanded the scope of work to include identifying additional cables needing replacement, identifying and marking all cables for future reference, and updating all drawings. JPO approved APSC's request for an extension to complete work by May 1, 2000, since a significant amount of work had been completed. JPO surveillance has verified that all work required by the order was finished, and the order was closed.

Regulatory Compliance

The USDOT conducted a safety review of the Operations Control Center (OCC) at the Valdez Terminal to determine the adequacy of the Supervisory Control and Data Acquisition (SCADA) system. As a result, DOT plans to issue a "Letter of Concern" relating to peak load data processing, emergency call handling, supervisor intervention and data point auditing.

5.4.2 Pipeline System

5.4.2.1 Slope Stability

On August 11, 1999, JPO ordered APSC to provide a corrective action plan for repair and maintenance to bring the above ground pipeline support system on Squirrel Creek's north and south slopes into compliance with Federal Grant and State Lease Stipulations 3.5.1 and 3.9.1. Soil movement and melting permafrost had affected the position of some vertical support members on the slopes. JPO directed APSC to provide a corrective action plan which would be either a request for a design basis waiver with a thorough justification or a plan for repairs for compliance with Grant and Lease Stipulation 3.5, and design basis requirements regarding the dynamic displacement calculation for the south slope of Squirrel Creek. JPO also directed APSC to provide a summary of the specific repairs to be included in the corrective action plan.

APSC completed project F-171, replacing numerous vertical support members (VSM) on the north side of Squirrel Creek. Due to permafrost thaw over the years, these new VSM's were placed at a lower depth of fifty feet for stabilization. VSM repair on the north side now allows the pipe to function fully as designed, and APSC has committed to properly maintaining the VSM's in the future. JPO reviewed and approved APSC's design basis variance request for Squirrel Creek, which closes APSC's noncompliance with Grant and Lease Stipulations 3.5.1 and 3.9.1 and JPO's August 11, 1999 order. JPO approved the design basis variance request for Squirrel Creek provided APSC implements monitoring, surveillance, and maintenance to prevent mass movement of slopes and to protect the aboveground pipe against mass movement. JPO approved the request in recognition of APSC's corrective action plan, completed risk assessment, project F-171 VSM repairs at Squirrel Creek, repair of field instrumentation, re-evaluation of potential for soil liquefaction, and APSC's long term commitment to continued surveillance, monitoring, and maintenance of the aboveground system and slope stability.

5.4.2.2 Pungs Crossing Bridge

On October 4, 1999, JPO directed APSC to replace the bridge at PLMP 289.5 to provide access to the right-of-way and pipeline by October 31, 1999. Pungs Crossing bridge was declared unusable in 1998, and became a block point on the right-of-way for oil spill response. JPO's concern was that the continued existence of this block point could impact a timely response to an oil spill in the area. The approved *Pipeline Oil Discharge Prevention and Contingency Plan* requires that APSC be able to efficiently reconnoiter the pipeline and have reasonable access for response actions. The continued existence of this block point would have impacted a timely response to a spill in the area. Rather than allow the bridge to remain a block point into the year 2000, JPO directed APSC to fix the bridge by October 31, 1999.

APSC temporarily reinforced the bridge until weather and ground conditions allowed for the bridge to be completely replaced in 2000. The Pungs Crossing bridge was replaced earlier in 2000 and is now safe for pipeline surveillance vehicles. A September 2000 JPO surveillance verified that all requirements of the order had been satisfied and closed the order.

5.4.2.3 Grey Stream

APSC was ordered to implement corrective action to allow for fish passage at Grey Stream (PLMP 790.9), so construction could be completed between May 15 and July 15, 2000. JPO directed APSC to (1) Develop a draft conceptual design for JPO review and meet with JPO representatives in pre-application meeting; (2) finalize the design and submit permit applications, including a notice to proceed application and an issued for construction package to appropriate agencies; (3) complete all construction, including necessary re-vegetation between May 15 and July 15, 2000; and (4) continue to monitor the stability and effectiveness of a new channel and other remedial efforts in accordance with a project monitoring plan to be submitted for JPO review and approval along with permit applications.

APSC submitted an application for the Corps of Engineer permit, along with a coastal project questionnaire on February 23, 2000. APSC likewise submitted a land use permit application and an Alaska Title 16 statutes fish habitat permit for rerouting and restoration to JPO Alaska Department of Natural Resources February 17, 2000. APSC completed the corrective actions, and JPO considered the order satisfied and closed the order. APSC completed the corrective actions and JPO considered the order satisfied and closed the order.

5.4.2.4 Cold Restart

On November 5, 1999, JPO ordered APSC to provide a final schedule for the development and implementation of the cold restart procedure for the pipeline. The schedule was to include dates for completion of laboratory testing, development of the cold restart procedure, final hydraulic model updates, and revision of TAPS operation procedure manuals and design basis documents.

In December 1999, APSC submitted a schedule to JPO for the development and implementation of the cold restart procedure for TAPS to be completed early in 2000. JPO approved the schedule. In June of 2000, APSC informed JPO the schedule would be delayed until November 30, 2000 because of complications in development and implementation. JPO approved the extension due to the difficulties APSC has had developing a method for cold restart, specifically with the gelling of crude oil at cold temperatures. APSC committed to provide JPO (1) a draft interim cold restart procedure by October 31, 2000; and (2) an updated project schedule for the permanent cold restart procedure by November 30, 2000. The final interim procedure is planned to be in place by winter 2001.

5.4.2.5 Audit Action Items

In 1993, the TAPS Owner companies promised the U.S. Congress that they would correct audit action items (AAI) and prevent their recurrence. Congress tasked the U.S. Department of the Interior to verify the AAI's were successfully closed. The Department has performed this task using a process where JPO reviews and approves APSC's corrective action plans for the most critical AAI's and verifies implementation.

JPO issued a notice to APSC to resolve some of the long standing issues that were originally identified as audit action items (AAI) from the TAPS audits of the 1990's. Several audit items had slipped beyond scheduled closure deadlines. JPO specified resolution of five remaining audit items:

- 1) AAI 1955 – Change Management. AAI 1955 was scheduled for closure by the end of 1999, but APSC was unable to complete the requirements within that time. JPO and APSC are discussing an agreement on the closure requirements and a target closure date. JPO continues to work with APSC to resolve the change management issues. The issue of change management is discussed in-depth in JPO's CMP Construction report. This AAI remains open.
- 2) AAI 2076 - Operation of Remote Gate Valve Control System in Triconix Mode. This project cannot be completed until a communication link with sufficient bandwidth is established between the pump stations and the remote gate valves along the pipeline. Availability of the bandwidth is dependent on Alascom to complete digitization of the current microwave system, or the availability of a fiber optics system that meets the necessary communication reliability criteria. Alascom is scheduled to complete digitization of the microwave system by the end of 2001. JPO will continue to track this AAI, which remains open.
- 3) AAI 2113 – Completion of a Qualification Development Program. APSC completed the corrective action for this AAI, which JPO closed April 4, 2000.
- 4) AAI 50528 - Access Road and Workpad Bridge Design Compliance. JPO reviewed and approved the closure package APSC submitted. JPO checked fourteen bridges to verify they met APSC operational requirements and closed this AAI December 21, 2000.

5) AAI 50552 - Install Secondary Containment in Pump Station Tanks. APSC completed the corrective action for this AAI, which JPO closed March 17, 2000.

6.0 Conclusions

This report has attempted to provide a summary of JPO oversight efforts related to monitoring and maintenance of the TAPS over the 1999/2000 timeframe. Numerous oversight issues have been presented; some have been resolved, others remain as continuing oversight efforts. JPO oversight of the TAPS is an ongoing and highly dynamic effort. As such, tracking, trending, and reporting on the multitude of oversight issues is a necessary function of the JPO. To accomplish this function, JPO has initiated a systems based monitoring approach and implemented a CMP database system which provides for capturing the various JPO oversight efforts in a comprehensive and quantitative manner. The oversight issues presented in this report and the associated on-going efforts to address resolution of deficiencies are tracked through the use of this database system. As such, the conclusions presented below will continue to be evaluated through ongoing JPO oversight efforts, with the current status of each continually updated in the CMP database.

The following provides the overall conclusions drawn from the JPO 1999/2000 Maintenance CMP efforts:

6.1 TAPS MONITORING AND MAINTENANCE

Per the requirements listed in section 4.0 *Requirements* above, the JPO is tasked with determining the adequacy of the maintenance practices implemented on the TAPS. This requires JPO to establish programmatic criteria by which APSC will be measured to determine whether or not the TAPS is being adequately maintained (this criterion is still under development and is related to the efforts described in the above section 3.1 *JPO Position on TAPS Maintenance and Useful Life*). The approach JPO is taking regarding maintenance of TAPS is based upon 3 main elements: (1) The monitoring of TAPS system performance to defined functional parameters; (2) Corrective action implementation when system performance degrades to outside the functional parameters; and (3) Defined maintenance management systems which link monitoring results with effective corrective action.

JPO has initiated oversight in accord with the 3 elements listed above and has accumulated data which evidences some inadequacies in maintenance management and opportunities for APSC to improve its maintenance practices on TAPS. TAPS maintenance and the management thereof is particularly critical today as TAPS is a declining asset and the APSC workforce is aging. The following provides a summary conclusion regarding APSC management of TAPS maintenance:

APSC Corrective Action Process: The corrective action process at APSC, whereby the results of systems monitoring efforts transition into maintenance work activities (or documented

justification for no work required) is inconsistent, ill defined, and in some cases absent. A clearly defined and integrated corrective action process, which considers all the maintenance needs of TAPS in a comprehensive manner, in order to make work funding and scheduling decisions, is not apparent within the APSC maintenance management process⁴. This was concluded from not only JPO oversight efforts, but APSC audits as well (reference section 5.1.1 *TAPS Monitoring and Corrective Action Process*).

The continued monitoring of this APSC management deficiency is integral to JPO's work plan. Specifically, the details associated with this issue are to be incorporated into the TAPS Maintenance Baseline Assessments as described in section 2.2 above.

6.2 GRANT/LEASE AND REGULATORY COMPLIANCE

As described in section 2.0 *Methodology/Scope*, JPO has implemented a systems based oversight structure which provides for evaluation of compliance to Grant/Lease and regulatory requirements as they pertain to the systems which comprise TAPS. This report has described the Grant/Lease and regulatory non-compliances and potential non-compliances identified through this CMP effort in section 5.0 *Results*. These are entered into the JPO CMP database to facilitate tracking their resolution and development of a history of APSC's compliance with the requirements of the Grant/Lease.

In addition to this system based oversight, the USDOT conducted enhanced inspections on TAPS during Year 2000 using subject matter experts within the Office of Pipeline Safety (OPS). OPS conducted comprehensive compliance inspections in the areas of corrosion, mainline valves, oil spill response, SCADA, geotechnical, and overpressure protection.

The non-compliances and potential non-compliances identified through the JPO 1999/2000 Maintenance CMP efforts are listed below. It should be noted, however, that many of these have been corrected; yet they are still listed here in order to provide completeness in describing JPO maintenance oversight results for 1999/2000. For each Grant/Lease non-compliance cited, the non-compliant TAPS system is identified, along with the applicable section of this report which provides the results discussion.

Principle 3 'Permittees Management of Pipeline System Maintenance':

System: Linewide (programmatic)

JPO finds APSC's lack of a clearly defined corrective action process, which links TAPS systems

⁴ This comprehensive decision process is considered by JPO to be the equivalent to a "change management board" as described by the "Configuration Management" process. This is significant as AAI 1955 closure is dependent upon APSC implementation of a management philosophy which incorporates elements of the configuration management philosophy (reference JPO report 00-E-001, titled *AAI 1955*). See JPO 1999/2000 Construction CMP for a discussion of AAI 1955 and the status of closure.

monitoring results to TAPS systems maintenance activities, to be inconsistent with this principle. This is viewed as a deficiency in the *management* of the TAPS monitoring and maintenance programs (see sections 5.1.1, 5.1.2.3, 5.1.4, 5.1.5, 5.1.8, and 5.4 above).

Stipulation 1.17 ***Fire Prevention and Suppression:***

Systems: VMT Fire Suppression System (section 5.4)

Stipulation 1.18 ***Surveillance and Maintenance:***

Systems: Aboveground Mainline Pipe (section 5.1.4)
Belowground Mainline Pipe (section 5.1.5)
Pipeline River and Stream Crossings (section 5.1.2.3)
Pipeline Bridges (section 5.1.8)
VMT Fire Suppression System (section 5.4)

Stipulation 1.20 ***Health and Safety:***

Systems: VMT OCC (section 5.4)
VMT TVCS (section 5.4)
VMT Fire Suppression System (section 5.4)

Stipulation 1.21 ***Conduct of Operations:***

Systems: Linewide - Cold Restart (Section 5.4)
VMT OCC (section 5.4)
VMT TVCS (section 5.4)
VMT Fire Suppression System (section 5.4)

Stipulation 2.2 ***Pollution Control:***

Systems: VMT TVCS (section 5.4)

Stipulation 2.5 ***Fish and Wildlife Protection:***

Systems: Pipeline River and Stream Crossings (sections 5.1.2.3 and 5.4)

Stipulation 2.6 ***Material Sites:***

Systems: Material Sites (section 5.3.7)

Stipulation 2.8 ***Disturbance of Natural Water:***

Systems: Pipeline River and Stream Crossings (section 5.4)

Stipulation 2.14 ***Contingency Plans:***

Systems: Pipeline Bridges (section 5.4)

Stipulation 3.2 ***Pipeline System Standards:***

Systems: Belowground Mainline Pipe (section 5.1.5)

Additionally, USDOT/OPS identified the following regulatory non-compliances:

Systems: Pressure Control Systems
 49 CFR, Part 195.428 – Pressure Valve Procedures
 Mainline Valve Maintenance
 49 CFR, Part 195.420 – Mainline Valve maintenance
 External Corrosion Control
 49 CFR, Part 195.416 – Cathodic Protection adequacy
 Internal Corrosion
 49 CFR, Part 195.418 – Internal corrosion investigation
 General Safety requirements
 49 CFR, Part 195.401 – level of Safety
 49 CFR, Part 195.402 (c) (3) – normal operating procedures
 49 CFR, Part 195.402 (d) (1) – abnormal operating procedures
 Pipeline Repairs
 49 CFR, Part 195.422 – pressure increase during excavation

Stipulation 3.3 ***Construction Mode Requirements:***

Systems: Belowground Mainline Pipe (section 5.1.5)

Stipulation 3.5 ***Slope Stability:***

Systems: Aboveground Mainline Pipe (sections 5.1.4 and 5.4)

Stipulation 3.9 ***Construction and Operation:***

Systems: Aboveground Mainline Pipe (sections 5.1.4 and 5.4)
 Pipeline River and Stream Crossings (section 5.4)