United States General Accounting Office

GAO

Report to Congressional Requesters

August 1995

TRANS-ALASKA PIPELINE

Actions to Improve Safety Are Under Way

GAO/RCED-95-162

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-261176

August 1, 1995

The Honorable Don Young
Chairman, Committee on Resources
House of Representatives

The Honorable John D. Dingell
House of Representatives

This report is in response to a February 23, 1994, request from Representative Dingell, former Chairman of the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce. Subsequent to this request, Representative Young, Chairman of the House Resources Committee, assumed oversight jurisdiction for the Trans-Alaska Pipeline System (TAPS). On March 28, 1995, Chairman Young joined in this request. The report provides information on the progress made in correcting deficiencies in the operations, maintenance, and oversight of the Trans-Alaska Pipeline System.

As agreed with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days from the date of this letter. At that time, we will send copies to the Joint Pipeline Office and its members made up of representatives from federal agencies and the State of Alaska; the Secretaries of the Interior and Transportation; the Administrator, Environmental Protection Agency; the Director, Bureau of Land Management; the President, Alyeska Pipeline Service Company; the Chairman, TAPS Owners Committee; and the Director, Office of Management and Budget. We will also make copies available to others on request.

Please call me at (202) 512-7756 if you or your staff have any questions. Major contributors to this report are listed in appendix IV.

James Duffus III
Director, Natural Resources
Management Issues

Executive Summary

Purpose

The Trans-Alaska Pipeline System (TAPS), operated by the Alyeska Pipeline Service Company (Alyeska), transports nearly 20 percent of the nation's domestically produced oil and has operated for nearly 20 years without a major oil spill. However, throughout the pipeline's years of construction and operation, problems with the condition of the pipeline, the quality assurance program of its operator, and the effectiveness of the government's monitoring efforts have been reported. These problems have resulted in continued oversight by the Congress. For example, hearings held by the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, in July 1993 raised concerns about the ability of the pipeline to continue to operate safely and of its federal and state regulators to ensure that it does. A study commissioned by the Department of the Interior's Bureau of Land Management (the Bureau) in August 1993 to assess Alyeska's management and operation of the pipeline identified 22 categories of substantial—and potentially threatening—deficiencies. Other audits of the pipeline in recent years have identified additional deficiencies. In total, more than 4,900 deficiencies have been identified.

Representative John D. Dingell and the Chairman, House Committee on Resources, asked GAO to (1) assess Alyeska's progress in correcting these deficiencies; (2) specifically, determine whether the corrective actions planned for three areas of deficiencies—electrical systems, quality, and preventive maintenance—will address the deficiencies; (3) determine whether regulators are taking action to improve regulatory oversight of the pipeline; and (4) identify the root causes of the deficiencies.

Background

The 800-mile pipeline travels over federal, state, and private lands. Alyeska operates the pipeline for seven owner companies. Six federal agencies—principally the Bureau—and six state agencies—principally the Alaska Department of Natural Resources—provide oversight. In 1990, the Bureau and the Alaska Department of Natural Resources created the Joint Pipeline Office (the Office) to better coordinate federal and state regulatory efforts. The Office's budget is funded primarily by the Bureau and the Alaska Department of Natural Resources. However, Alyeska is required to reimburse the Bureau for all reasonable costs related to overseeing the pipeline and, by agreement, began in 1990 to reimburse the state for part of its costs. Staff are provided by the Bureau, other federal agencies, and several state agencies. Alyeska's budget is funded by the seven oil companies that own the pipeline.

In addition to the Bureau-commissioned study that identified 22 categories of deficiencies (these were subdivided into 208 specific deficiencies requiring corrective action), TAPS' owners hired an independent consulting firm in September 1993 to provide a comprehensive, independent assessment of the pipeline's operations. The firm identified an additional 4,200 deficiencies. Other audits undertaken in recent years have identified as many as 500 additional deficiencies. Alyeska has set up a system to track the correction of all 4,920 deficiencies. Less than 2 percent of the deficiencies dealt with structures, systems, and components that prevent or mitigate the consequences of an accident or natural event that could cause significant harm to the public or to the environment.

Results in Brief

Alyeska has made progress in resolving the deficiencies, but it is taking longer than originally planned. In February 1995, Alyeska estimated that it would be able to correct 85 to 90 percent of the deficiencies by December 1995 and nearly all of the rest by the end of 1996. By the end of April 1995, Alyeska had corrected about 62 percent of the 4,920 identified deficiencies.

For the three categories of deficiencies that GAO focused on—electrical integrity, quality, and preventive maintenance—Alyeska has taken substantive actions that, if carried through to completion, appear to be adequate to correct the problems. Alyeska has corrected most electrical problems, focused management attention on the quality program and revised the quality program's organization and procedures, and is overhauling its maintenance program.

Although the Office's actions are not complete, GAO believes that the Office is making a concerted effort to improve its oversight. In addition, in July 1993 the Director of the Bureau affirmed both its authority as the lead agency within the Office and its responsibility for providing comprehensive oversight. Subsequently, the Office increased its staff and reorganized to strengthen its focus on monitoring Alyeska.

According to the Bureau's study and a study commissioned by the Office, the operating philosophies of both Alyeska and the Office—to react to problems rather than conduct active, quality-based programs aimed at prevention and early detection—were the underlying causes of the deficiencies identified. Alyeska and the Office are now refocusing their efforts on preventing problems and improving quality. However, because much work remains to be accomplished, the full effectiveness of Alyeska's

and the Office's actions cannot be assessed in the short term. Alyeska has the primary responsibility for ensuring that the pipeline operates in a safe, environmentally responsible manner. The key to its success depends on how well it can create and sustain a commitment to quality throughout its organization. The Office's success depends on having adequate staffing and funds over the long term. The Office's funding is provided largely by Alyeska, which will be under continuing pressure to reduce its costs as the flow of oil through the pipeline decreases. In addition, the Office will also be under pressure to reduce its government staffing levels. Either or both situations could adversely affect the Office's ability to maintain adequate oversight.

Principal Findings

Alyeska Makes Progress, but Correcting Deficiencies Is Slower Than Planned

By the end of April 1995, Alyeska had corrected about 62 percent (3,030) of the 4,920 deficiencies identified. Among the 208 items from the Bureau's study, Alyeska had corrected 95 (46 percent). While Alyeska has made progress in correcting the deficiencies, its progress has been slower than planned. Alyeska initially anticipated having about 3,000 deficiencies and had planned to close them all by December 1994. As of February 1995, Alyeska estimated closing 85 percent of the deficiencies by the end of 1995 and nearly all of the rest by the end of 1996. Alyeska said that progress has been slower than anticipated because (1) more deficiencies were identified than anticipated—4,920 rather than 3,000; (2) the amount of additional training required to implement some of the corrective actions was greater than anticipated; and (3) the estimated completion date of December 1994 was too optimistic.

Progress in Specific Areas Has Been Substantial

From the 22 broad categories of deficiencies identified in the Bureau's study, GAO focused on electrical integrity, quality, and maintenance. The study reported that deficiencies in the electrical hardware—power cables and grounding, among other things—posed the greatest threats of any hardware deficiencies to the health and safety of the public and the environment. In response, by December 1994 Alyeska had completed an inspection of the pipeline that identified about 49,000 electrical deficiencies. By the end of April 1995, it had fixed nearly all of them. In addition, it has initiated 20 studies of broad-based electrical problems. The Bureau's study also reported that Alyeska's quality program was

dysfunctional. In response, in May 1994 Alyeska set as a key company expectation the development of an effective quality program; revised its quality procedures, which the Office conditionally approved in May 1995; and began developing a system to identify and ensure compliance with all regulations. In addition, Alyeska is undergoing a series of revisions in the organizational structure of its quality program; the first revision occurred in early 1994, and the most recent is scheduled for July 1995. The study further reported that Alyeska's maintenance program did not provide a basis for learning from past performance in order to prevent problems from recurring. Alyeska is developing a maintenance management system, which it plans to complete in November 1995, to gather, track, and provide a basis for analyzing maintenance histories to improve the efficiency and effectiveness of its maintenance program.

The Office Has Acted to Improve Its Oversight

The July 1993 hearings and the Bureau's study highlighted the need to improve the Office's monitoring of the pipeline. In response, the Director of the Bureau asserted at the hearings that the Bureau would invoke its authority as the lead agency in the Office to oversee the pipeline. In April 1994, the Office selected an independent consulting firm to assess its monitoring and inspection program. In June 1994, the consultant recommended that the Office reorganize to improve its oversight and change its philosophy to be an active regulator using an effective quality program to monitor the full range of Alyeska's activities. By April 1995, the Office had expanded its staff and completed its reorganization.

Alyeska and the Office Are Taking Steps to Correct Causes of Problems

The studies conducted for the Bureau and the Office have pointed to a common underlying cause for the problems identified—Alyeska and the Office both operated on the philosophy of reacting to problems rather than providing effective quality programs to minimize the chances that problems would occur. The Bureau's study considered Alyeska's management philosophy as one of the most significant problems identified, and the Office's study found that the Office needed to substantially transform its oversight philosophy.

Alyeska and the Office have taken steps to change their management approach. In May 1994, Alyeska established a company policy that set objectives for a more open and quality-oriented organization. It subsequently developed tools for achieving those objectives. These tools include management training to encourage teamwork, a program for responding to employees' concerns, an improved quality program, and

requirements for a new maintenance program. For its part, the Office now speaks of itself as a regulator and has changed its operating philosophy to focus on prevention, increased its staff, and reorganized to implement the new monitoring program.

Alyeska has the primary responsibility for ensuring that the pipeline operates in a safe, environmentally responsible manner. The success of its efforts will depend on its ability to establish a new philosophy throughout the entire organization and its ability to complete and fully implement its plans and actions, such as those to improve its quality and maintenance programs and its program for responding to employees' concerns. The Office's effectiveness depends not only on the actions under way to improve its oversight, but also on its ability to continue these actions in the future. Its progress, however, could be affected over the long term because (1) the Office's funding comes largely from Alyeska and Alyeska will be under continuing pressure to reduce its costs as the oil flow through the pipeline decreases and (2) staffing comes from the Bureau and other federal and state agencies and staff levels throughout the government are being reduced.

Recommendations

GAO is making no recommendations.

Agency Comments

GAO provided copies of a draft of this report to Alyeska and the Joint Pipeline Office and met with the President of Alyeska, officials from the TAPS owner companies, and officials of the Office, including the Bureau's Authorized Officer and Alaska's State Pipeline Coordinator. These officials agreed with GAO's assessment of their efforts to correct audit deficiencies and improve regulatory oversight. The President of Alyeska commented that the draft report was an objective, professional assessment of the work by TAPS' owners, Alyeska, and the Office to respond to various audit findings. Alyeska's written comments are presented in appendix III. Officials of the Office stated that the draft was fair and impartial and captured both the successes achieved and the challenges remaining for both Alyeska and the Office. Also, in view of the work remaining and the concern for continued secure funding, the officials of the Office believe that periodic, comprehensive oversight from an independent source is critical to ensure that the Office and Alyeska continue their improvement efforts.

Contents

Abbreviations

ACT	Audit Compliance Tracking
ADL	Arthur D. Little, Inc.
ADNR	Alaska Department of Natural Resources
AIMS	Alyeska Integrity Management System
AKOSH	Alaska Occupational Safety and Health
ANSC	AKOSH/NEC Safety Compliance Program
ARCS	Alyeska Regulatory Compliance System
BLM	Bureau of Land Management
CAP	Corrective Action Plan
CMP	Comprehensive Monitoring Program
DOI	Department of the Interior
DOT	Department of Transportation
EPA	Environmental Protection Agency
GAO	U.S. General Accounting Office
IMMS	Integrated Maintenance Management System
JPO	Joint Pipeline Office
NEC	National Electrical Code
PDC	Power Distribution Center
PS	pump station
QTC	Quality Technology Company
SCADA	Supervisory Control and Data Acquisition
TAPS	Trans-Alaska Pipeline System
VMT	Valdez Marine Terminal

Introduction

The Trans-Alaska Pipeline System (TAPS) is the primary transportation link for 20 percent of the nation's domestically produced oil. For nearly 20 years, TAPS, which was built between 1974 and 1977 to meet specific environmental and technical requirements for arctic conditions, has transported more that 10 billion barrels of crude oil without a major spill.

Because of its importance to ensuring the continuity of the domestic oil supply, TAPS and the federal and state agencies responsible for monitoring it have received attention from the Congress throughout the pipeline's years of construction and operation. While the pipeline was under construction, we reviewed the status of pipeline construction and the effectiveness of federal and state monitoring efforts.[1] These and subsequent reports,[2] as well as congressional hearings, publicized recurring problems with the condition of the pipeline, the quality assurance program of its operator, and the effectiveness of government monitoring efforts. More recently, congressional hearings in 1993 highlighted numerous potential deviations from federal and state standards. A 1993 study of TAPS, commissioned by the Department of the Interior's Bureau of Land Management (BLM), concluded that the pipeline had deficiencies that, if left uncorrected, could pose serious safety risks for workers and potentially cause a pipeline failure. These findings, together with those from other reviews of TAPS, have focused even more attention on the pipeline's condition.

TAPS' Operations

TAPS carries almost 1.6 million barrels of oil per day, down from 2 million barrels a day in 1990, across some of the most rugged terrain in the world. The 48-inch diameter pipeline transports oil 800 miles from Prudhoe Bay, north of the Arctic Circle, to the ice-free port of Valdez on Prince William Sound. The pipeline crosses 3 mountain ranges, more than 800 rivers and streams, 3 known seismic faults, and hundreds of miles of permafrost (permanently frozen soil).

[1]Trans-Alaska Oil Pipeline—Progress of Construction Through November 1975 (GAO/RED-76-69, Feb. 17, 1976) and Trans-Alaska Oil Pipeline—Information on Construction, Technical, and Environmental Matters Through Spring 1977 (GAO/EMD-77-44, Aug. 23, 1977).

[2]Trans-Alaska Oil Pipeline Operations: More Federal Monitoring Needed (GAO/EMD-81-11, Jan. 6, 1981) and Trans-Alaska Pipeline: Regulators Have Not Ensured That Government Requirements Are Being Met (GAO/RCED-91-89, July 19, 1991).

The Alyeska Pipeline Service Company (Alyeska) operates the pipeline for the seven companies that own it[3] and is responsible for meeting the various regulatory requirements for TAPS. The owner companies fund Alyeska's budget, which they approve, and Alyeska has its own permanent staff, although a significant number of its upper-level managers are on loan for limited time periods from the owner companies.

Many State and Federal Agencies Share Regulatory Responsibility

The laws, requirements, and regulations intended to ensure TAPS' operational safety, oil spill response, and environmental protection call for monitoring and enforcement by a number of federal and state agencies. The federal government has administrative responsibility for 401 miles of the pipeline's right-of-way, while the state administers 353 miles, including the Valdez terminal, where oil is loaded on tanker ships for transport to refineries. Specific operating requirements are contained in federal grant and state right-of-way lease agreements and in additional federal and state regulations and laws. Of the remaining 46 miles of pipeline, 26 miles are administered jointly by federal and state authorities, and 20 miles are owned by private landholders.

Six federal and six state agencies have significant jurisdiction over some aspect of the pipeline's operation or the land on which it is located (see table 1.1 for a list of agencies and the nature of their jurisdiction). The five with primary authority are the Department of the Interior's Bureau of Land Management, which is charged with enforcing the federal right-of-way agreement on federal lands; the Alaska Department of Natural Resources (ADNR), which enforces the state's right-of-way agreement on state-owned lands and the federal agreement on certain state-owned lands; the Department of Transportation's Office of Pipeline Safety, which is responsible for overseeing the operational safety of the entire pipeline under the Hazardous Liquid Pipeline Safety Act; and the Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation, which are responsible for enforcing environmental regulations along the pipeline and at the terminal. EPA is also the federal On-Scene Coordinator for responding to on-shore oil spills. Interior's responsibilities and authorities are the most comprehensive and broadest in scope of any of TAPS' regulators—covering operational safety and environmental protection issues.

[3]The seven owner companies are Amerada Hess Pipeline Corporation; ARCO Transportation Alaska, Inc.; BP Pipelines (Alaska), Inc.; Exxon Pipeline Company; Mobil Alaska Pipeline Company; Phillips Alaska Pipeline Corporation; and Unocal Pipe Line Company.

Table 1.1: Federal and State Agencies With Significant Jurisdiction Over TAPS

Agency	Nature of jurisdiction
Federal	
Bureau of Land Management, Department of the Interior (DOI)	By delegation of the Secretary of the Interior, BLM's Alaska Office has primary authority for administration of the right-of-way agreement on federal lands.
Office of Pipeline Safety, Department of Transportation (DOT)	Monitors pipeline operations for compliance with federal safety standards and for assurance that remedial actions for spills and accidents are adequate for the pipeline system.
Environmental Protection Agency	Responsible for ensuring that the pipeline system complies with several environmental laws, including the Clean Air Act and Clean Water Act.
Fish and Wildlife Service, DOI	Responsible for national wildlife refuges; provides expertise to BLM on matters affecting fish and wildlife conservation and habitats.
Coast Guard, DOT	Responsible for issuing permits for bridges over navigable waterways and for various activities of the oil tankers at Valdez terminal.
Army Corps of Engineers	Responsible for issuing permits for wetlands, construction in navigable waters, and coordination with Army installations through which the pipeline passes.
State of Alaska	
Department of Natural Resources	Primarily responsible for administering the right-of-way agreements on state lands.
Department of Fish and Game	Responsible for protecting fish and game on state lands.
Department of Environmental Conservation	With EPA, responsible for ensuring compliance with applicable environmental laws; also responsible for reviewing pipeline contingency plans.
Department of Transportation and Public Facilities	Responsible for issuing permits for construction on state operated airports and highway rights of way; also responsible for issuing permits for vehicles operating on the northern portion of haul road.
Department of Labor	Responsible for compliance with various building codes and for worker safety for the pipeline system.
Office of Management and Budget, Division of Governmental Coordination	Responsible for coordination of federal and state authorizations inside the Coastal Zone.

In 1990, BLM and ADNR established the Joint Pipeline Office (JPO) to better coordinate federal and state regulatory efforts. This office has since become the focal point for overseeing TAPS. Begun with a small staff from the two agencies, JPO had grown to an authorized staff of 84 in April 1995 with staff assigned or on loan from 8 of the 12 agencies with significant oversight responsibility for TAPS.[4] BLM and ADNR are jointly responsible for JPO's operations. However, in July 1993, the then-director of BLM testified, in response to whistleblowers' complaints and other investigations that reported lax regulation practices for pipeline workers' health and safety, that "Whenever and wherever needed, BLM, as lead agency, will assume the responsibility of ensuring that the mandate of the JPO is carried out fully." Subsequently, the Executive Council was formed and it has taken the lead

[4]The four agencies with no representatives at JPO are the Coast Guard, the Fish and Wildlife Service, the Army Corps of Engineers, and the Alaska Department of Transportation and Public Facilities.

in providing focused policy guidance to JPO.[5] JPO is organized into two branches, Operations and Administration; the Operations Branch is responsible for ensuring that TAPS is operated in compliance with requirements.

Studies Have Identified Pervasive, Persistent Problems With TAPS' Operations and Oversight

Since about 1990, TAPS' operations have been the subject of many separate audits and studies. Most have focused on a single facility or one operational segment, but several have taken a more systemwide approach. The range of problems they identified was broad. Some deficiencies were considered serious in that they have potential for causing severe safety and environmental impacts. Other deficiencies were of a less serious nature: For example, the studies

- criticized Alyeska for being reactive and not focused on building in quality;
- identified systemic hardware problems that raise questions about the integrity of the TAPS electrical system; and
- identified hundreds of specific items, such as not having developed procedures for the qualification of inspection personnel.

Quality Technology Company Study Highlighted Broad, Systemwide Deficiencies

In response to concerns raised by whistleblowers, safety issues identified by congressional staff, and concerns for how JPO was regulating TAPS, the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, held hearings in July 1993. The hearings highlighted a number of potential problems with TAPS. At these hearings, the Director of BLM acknowledged the problems and told the Subcommittee that BLM, which has primary authority for administering the right-of-way agreement on federal lands, was going to take charge and make sure that the problems were corrected. Subsequently, BLM began a program designed to identify and resolve such problems. As part of the effort, BLM in August 1993 contracted with Quality Technology Company (QTC), an independent consulting firm, to investigate the physical condition of TAPS and the management of operations provided by Alyeska and its contractors. QTC conducted a 6-week on-site review that included visits to the Valdez terminal and three of the pipeline's pump stations.

QTC's final report, issued in November 1993, was highly critical of Alyeska's management of the pipeline and pointed out that some glaring deficiencies were present in Alyeska's management and the condition of TAPS'

[5]The Executive Council consists of representatives from each of the federal and state agencies listed in table 1.1 except for the Fish and Wildlife Service.

equipment. QTC identified 22 broadly scoped deficiencies, which were further grouped into three classes according to their potential threat to the safe operation of the pipeline or to the safety of the public and the environment:

- Six deficiencies were considered most threatening because of their potential for causing severe impacts, including death or an oil spill. These deficiencies included a lack of management focus on anticipating and correcting potential problems, a "dysfunctional" quality management program, and massive electrical code violations.
- Nine deficiencies presented moderate threats because of their potential for causing impacts, including severe injury or an oil spill. Examples included the lack of accurate drawings describing the pipeline's safety system and an inadequate safety inspection program at the Valdez terminal.
- Seven deficiencies fell in the lowest class of threats because their potential impacts were limited to such effects as loss of work time due to injuries or loss of oil. An example was the lack of a maintenance program that develops trends for predicting untimely equipment failures.

Many Other Owner- and Regulator-Sponsored Studies Found Specific Deficiencies at Certain Locations

While the QTC study addressed conditions on a broad, systemwide basis, many other studies have addressed narrower aspects of TAPS' operations, such as corrosion of pipeline welds, leak detection, or solid waste management. Since 1990, Alyeska and its regulators have conducted or contracted for more than 40 such studies. Together, they have identified about 500 action items.

On September 9, 1993, the TAPS owners contracted with Arthur D. Little, Inc. (ADL), an independent consulting firm, to provide a comprehensive independent assessment of TAPS' operations. Unlike the studies described so far, this one involved a detailed, facility-by-facility review of the entire pipeline and its attendant systems. The assessments were conducted by teams led by ADL personnel and composed of experts from five of the companies that own TAPS and from ADL. The assessments focused on compliance with the requirements and management systems relating to operational integrity. The result of the 9-month review was a list of more than 4,200 site-specific deficiencies, issued in two reports (December 1993 and July 1994). The following are examples of the kinds of deficiencies the study identified:

- At pump station 4, the fire alarm system was not in full working order. It did not provide an immediate sitewide alarm that was audible/visible in all areas of the pump station.
- At the main equipment maintenance facility in Fairbanks, Alyeska and contractor employees working with hazardous materials lacked specific hazard training, and the chemical inventory lists were out of date.
- Alyeska's quality assurance and inspection process did not have a management system defining responsibilities sufficiently to avoid duplication or omission of critical tasks.

Studies Also Showed Problems With Federal and State Regulatory Efforts

In 1991, we reported that federal and state monitoring agencies had not effectively overseen TAPS' operations. BLM officials told us at that time that JPO was not a regulator. Instead, the agencies relied on Alyeska to police itself. We noted that, for example, the regulators did not systematically or independently assess Alyeska's corrosion or leak detection systems, nor did they require that Alyeska demonstrate that it could respond adequately to a large-scale pipeline oil spill. We concluded that absent effective monitoring, the regulators could not ensure the safe operation of TAPS. We also reported that regulatory efforts had been hampered by a lack of coordination between the various agencies. We concluded that the recent establishment of JPO was a positive step but that its success was potentially hindered unless leadership, firm commitments from all regulatory agencies, and secure funding sources were in place.

In 1994, a study by Booz-Allen & Hamilton, an independent consulting firm, concluded that weaknesses in regulatory activity were still present. The study found that JPO was not effectively addressing the prevention of pipeline hazards. More effective oversight, the study concluded, could have precluded many of the problems that QTC had found in its review of Alyeska's operations. Specifically, the study recommended that JPO increase its monitoring of Alyeska's quality, operations, and maintenance programs—areas of concern that we had reported on since 1976.

While Correcting Deficiencies, Alyeska Conducted Normal Operations and Maintenance During 1994

Alyeska was confronted with the tasks of continuing to operate and maintain the pipeline, while at the same time correcting thousands of deficiencies identified in audits conducted for it, its owners, and various government agencies. During 1994, Alyeska continued to transport almost 1.6 million barrels of oil per day through the pipeline, conduct normal maintenance, and carry out numerous projects to upgrade the pipeline system. Alyeska estimates that in 1994, it spent about $81 million on upgrades in three broad areas. About $23.7 million was devoted to programs aimed at ensuring that Alyeska's operations did not adversely affect the environment through spills or air emissions. About $34.6 million was devoted to improving the protection of the pipeline's integrity through enhanced corrosion prevention and detection. About $20.2 million was devoted to improving Alyeska's ability to respond to emergencies related to tanker transport.

During 1994, Alyeska also reorganized the company from a centralized, functionally structured organization to an organization in which more of the responsibilities are now decentralized to "business units." The purpose of the reorganization was to provide the business units with increased control over the resources they need to operate and to provide greater accountability for operations. The four business units are the Northern Business Unit, comprising pump stations 1 through 4; the Southern Business Unit, comprising pump stations 5 through 12; the Valdez Terminal Business Unit; and the Ship Escort Vessel System Response Business Unit.

Objectives, Scope, and Methodology

On February 23, 1994, the former Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, asked us to review Alyeska's progress in addressing problems that QTC had identified with TAPS. On March 28, 1995, the current Chairman, House Committee on Resources, which now has oversight jurisdiction for TAPS, became a joint requester to this review. Specifically, we

- assessed Alyeska's progress in resolving deficiencies identified by the QTC study;
- determined whether Alyeska's planned actions for three areas of deficiency—electrical integrity, quality, and maintenance—will address these deficiencies;
- determined whether regulators are taking action to improve regulatory oversight of the pipeline; and
- identified the root causes of the deficiencies.

To address the first objective, we reviewed Alyeska's periodic reports, through the end of April 1995, on the status of actions taken to correct the QTC-identified deficiencies. Because Alyeska and its regulators incorporated the results of a number of other reviews besides QTC's into the data base of action items, we expanded our review to report Alyeska's progress in correcting deficiencies identified by these studies as well. To assess the reliability of Alyeska's reports, we (1) reviewed the procedures that Alyeska's quality assurance staff uses to monitor corrective actions and the documents certifying completion of various steps in the process, (2) reviewed JPO's procedures for verifying corrective actions and the documents certifying completion of various steps in the process, (3) accompanied JPO inspectors on field visits to observe inspections as they were being made, and (4) performed on-site reviews of a number of the reported corrections. However, because the number of action items was so extensive and because many of the actions taken were still under way, we did not systematically verify the accuracy of Alyeska's entire list of corrections. Chapter 2 contains our findings on Alyeska's progress in resolving identified deficiencies.

To address the second objective, we interviewed regulators, Alyeska personnel, consultants, and QTC's lead auditor; reviewed Alyeska's documentation of actions completed, under way, and planned; and traveled to various sites along the pipeline to observe conditions for ourselves. We conducted on-site work at the Valdez terminal, two pump stations, and several field locations and observed from the air about 100 miles of the pipeline's 800-mile length. In addition, specifically in regard to the deficiency area of electrical integrity, a GAO electrical engineer accompanied us on a detailed tour of the Valdez terminal. We received briefings on the electrical problems at the terminal and on the steps being taken to correct them and reviewed selected electrical studies and discussed their methodologies and results with contractor and Alyeska staff. Chapter 3 contains our findings on Alyeska's actions in three areas of deficiency identified by the QTC study.

To address the third objective, we reviewed prior GAO reports, the 1994 Booz-Allen study of JPO, and actions JPO and its member agencies were taking in response. We met with JPO managers and staff and with representatives of consulting firms employed by JPO or its member agencies to supplement its oversight work. We reviewed examples of JPO's actions in overseeing the resolution of action items. We reviewed JPO's

plans, procedures, and other documents. Chapter 4 contains our findings on this objective.

To address the fourth objective, we reviewed past studies of TAPS to determine the root causes of problems that these studies had identified. We also interviewed regulators, Alyeska officials, and owner company officials to obtain their opinions about root causes. We then reviewed the actions that Alyeska and its regulators had taken or were taking to address root-cause issues. Our work included interviews with Alyeska and JPO managers as well as with field staff to determine whether corrective actions were being carried out. Chapter 5 contains our findings.

Besides our on-site field work at Valdez and along the pipeline, we conducted work at state and federal agencies in Anchorage and Alyeska's offices in Anchorage and Fairbanks. We conducted our field work between March 1994 and April 1995 in accordance with generally accepted government auditing standards.

Agency Comments

We provided copies of a draft of this report to Alyeska and JPO. We met with the President of Alyeska and officials of JPO, including BLM's Authorized Officer and Alaska's State Pipeline Coordinator. These officials agreed with GAO's assessment of their efforts to correct audit deficiencies and improve regulatory oversight. The President of Alyeska and the Chairman of the TAPS Owners Committee commented that the draft report was an objective, professional assessment of the work by the TAPS owners, Alyeska, and JPO to respond to various audit findings. The President added that while the draft report accurately described the organizational structure for Alyeska's quality program at the time of our work, Alyeska is in the process of making some additional organizational changes. We have revised our draft report to describe Alyeska's planned changes to its quality program. Alyeska also provided detailed comments to clarify the draft, and where appropriate, we made changes to the report. In addition, Alyeska provided written comments. (See app. III.)

The JPO officials stated that the draft was fair and impartial and accurately captured both the successes achieved and the challenges remaining for both Alyeska and JPO. They fully concurred that secure funding for JPO and Alyeska is vital to ensuring the continued safe operation of the pipeline. While they believe that Alyeska has made many positive changes thus far, they believe the work ahead in implementing the plans will be much more difficult. Consequently, they believe that periodic, comprehensive

oversight from an independent source is critical to ensure that JPO and Alyeska continue their improvement efforts. The officials also provided suggestions to clarify the draft report, and where appropriate, we incorporated their suggestions into the report.

Alyeska Has Made Progress in Resolving TAPS' Deficiencies, but Progress Is Slower Than Planned

Alyeska has made substantial progress toward resolving the deficiencies. However, during this period, Alyeska's target for correcting all of the deficiencies slipped from December 1994 to 1996; a small number of items will extend beyond 1996. The completion dates slipped for a variety of reasons, including a larger than expected number of deficiencies, the complexity of many of the corrections, and Alyeska's overly optimistic estimation of the time needed to make corrections. Alyeska is taking actions to ensure that the remaining deficiencies are corrected on a priority basis and that JPO can track progress.

Alyeska Established a Data Base to Monitor Progress on Resolution of 4,920 Audit Items

To determine what work needed to be done to correct the audit deficiencies, Alyeska reviewed the results of more than 40 audits and studies of the various TAPS components. It translated the deficiencies identified in these audits and studies into a total of 4,920 action items. Alyeska established a data base for tracking all of these items and a system for planning, conducting, and approving the work.

List of Action Items Grew Over Time

By April 1994, Alyeska had identified about 1,700 action items stemming from deficiencies identified in the various TAPS audits and studies. These action items came from three sources—the first phase of the ADL study, which had been completed in December 1993; the QTC audit; and previous audits done primarily for Alyeska or its regulators. For the action items identified by April 1994, the first-phase interim report from ADL produced the most items—1,128 (subsequently expanded to 1,132). Alyeska translated the 22 overall deficiencies identified in the QTC study into 187 (subsequently expanded to 208) action items, and the findings of the various other audits and studies identified about 380 items (subsequently expanded to about 500). The second phase of the ADL study, completed in July 1994, led to an additional 3,100 action items. With these and with additional findings from other audits, the action items reached a total of 4,920.

Alyeska and JPO Developed a System for Tracking and Resolving Deficiencies

In January 1994, to keep track of the action items, Alyeska and JPO developed the Audit Compliance Tracking (ACT) data base and procedure, which was essentially in place in March 1994. In developing this data base, Alyeska and JPO also agreed to a process for identifying and resolving the action items. This process can be summarized in three main steps: identifying and setting priorities for the action items, preparing and approving corrective action plans, and preparing, reviewing, and verifying

the closure packages for the work done to correct the deficiency. Reports generated from this data base provide JPO with updated information on Alyeska's progress in correcting the deficiencies, and JPO summarizes this information in its annual report to congressional oversight committees.

Identifying and Setting Priorities for Action Items

Under the process agreed to by Alyeska and JPO, Alyeska's Integrity and Compliance Division[6] was responsible for reviewing all internal and external audits and assessment reports to identify the action items, assigning the responsibility for the corrective action, and entering the action items into the data base. In doing so, the division also set priorities for the action items on the basis of the potential impact of items on the pipeline's integrity. The priority system contains four levels, as shown in table 2.1. Alyeska's quality assurance office and JPO reviewed and approved the priority level for each action item.

Table 2.1: Priority Levels for Action Items in the ACT Data Base

Priority level	Description	Examples
1	Structures, systems, and components which prevent or mitigate the consequences of an accident or natural event which could cause significant harm or damage	Mainline pipe, gate and check valves, selected bridges, and quality manual updates and operating procedures for level-1 components
2	Items that do not meet the definition of a level-1 item but are necessary for compliance with safety regulations and for reliably transporting oil	Power generation systems, fire detection and suppression systems, and preventive maintenance program
3	Structures, systems, and components that by themselves would have minimal impact on safety and oil transport but to which Alyeska elects to apply selected quality program elements	Steam distribution, container labeling, and security procedures
4	Structures, systems, and components not designated in any of the other levels and for which the application of normal industry practices result in acceptable quality	Personnel living quarters, automotive equipment, and housekeeping items

Preparing, Reviewing, and Approving Corrective Action Plans

The action item process called for the Alyeska unit responsible for each action item to prepare a corrective action plan (CAP) describing how a deficiency would be fixed if the item was a priority level-1 or –2 item or a priority level-3 or –4 item requiring 40 or more hours of labor. Before corrective action can begin on priority level-1 and –2 items, the CAPs go to Alyeska's quality assurance staff and JPO for review and approval. After November 1994, Alyeska and JPO agreed that level-3 and –4 CAPs do not need a review by JPO.

[6]Alyeska's plans called for dissolving the Integrity and Compliance Division during June 1995 and transferring its responsibilities to other parts of the organization.

Preparing, Reviewing, and Verifying Closure Packages

When the Alyeska unit responsible for the action item has corrected the deficiency, it prepares a closure package containing the applicable procedures and drawings documenting how the item was corrected. Each closure package is reviewed and verified by Alyeska, JPO, or both. Alyeska's quality assurance unit verifies closure packages for all priority level-1, –2, and –3 items, and Alyeska's contract compliance unit or the unit responsible for making the correction verifies the closure packages for level-4 items. JPO also verifies all level-1 closure packages and a minimum 20-percent sample of level-2 packages.

Alyeska Made Progress Completing Action Items

By the end of April 1995, Alyeska reported that it had completed work on 3,030 of the 4,920 action items—about 62 percent (see table 2.2). It had also developed a CAP for a number of other action items—primarily level-1 and –2 items—that had not yet been closed. In all, Alyeska had approved 2,242—about 97 percent—of the 2,320 CAPs delivered for review. JPO had approved 2,126 of those.[7]

Table 2.2: Status of Action Items as of the End of April 1995

Priority level	Total items in ACT data base	Items closed	
		Number	Percent
1	95	32	34
2	2,132	1,023	48
3	2,105	1,469	70
4	588	506	86
Total	**4,920**	**3,030**	**62**

As table 2.2 shows, Alyeska had closed a higher percentage of items at priority levels 3 and 4 than at priority levels 1 and 2. Alyeska officials told us that because they initially anticipated closing all action items by December 1994, they did not use the priority levels as a basis for determining which work should be done first. Some priority level-1 items have been closed, such as the possible problem of natural gas liquids being mixed in with the crude oil in the pipeline—a situation that could lead to a safety problem at pump station one—and the redesign of a control system that used fuses to protect against electrical current surges (a design restricted under the National Electric Code). Many others, however, remain open. For example, the ADL study found that Alyeska had no risk management system in place at the terminal to (1) identify key equipment and facilities' hazards; (2) assess the consequences and probabilities of

[7]Level-3 and –4 items may not require a CAP.

occurrence; and (3) evaluate possible prevention and mitigation measures. According to Alyeska officials, the TAPS owners have approved an overall policy for such a risk management system, and it will be tested in pilot programs. Full implementation is scheduled for November 1995; training is to be completed in the first part of 1996.

In connection with the 208 QTC items that we focused on, as of the end of April 1995, Alyeska had resolved 95 items, and CAPs were approved for 166 of the 180 items requiring CAPs.

Table 2.3: Status of QTC's Action Items as of the End of April 1995

		Items with corrective action plan				
					Items closed by Alyeska	
Priority level	Total items in ACT data base	Number requiring CAP	Number with approved CAP	Percent	Number	Percent
1	43	42	36	86	12	28
2	82	80	76	95	40	49
3	62	51	50	98	30	48
4	21	7	4	57	13	62
Total	**208**	**180**	**166**	**92**	**95**	**46**

Examples of closed level-1 and –2 items include better monitoring of emissions volumes from tanker vents during filling at the Valdez terminal and improved maintenance procedures for a diesel engine that was not being properly maintained. Most level-1 items remain open. For example, a contractor is producing drawings of the current configuration of various facilities in a multiphase project. Approximately 40 percent of the drawings to be produced in the initial phase have been provided to Alyeska; the remainder are to be received by the end of July 1995.

Progress Was Slower Than Expected, but Most Costly Items Are Near Completion

In the spring of 1994, Alyeska anticipated having to close about 3,000 action items. On that basis, it projected that it would complete action on and close all items by December 1994. The final total of action items, however, was considerably higher than expected. In January 1995, Alyeska had revised the planned completion date. Alyeska's plan, as of February, calls for closing 85 to 90 percent of the 4,920 items by December 1995 and closing the remaining items by the end of 1996, except for a very small number of items generally associated with the Vapor Recovery Project at the terminal (a program to recover hazardous vapors from the oil tankers) and the Tank Cathodic Protection program (a corrosion prevention

program for oil storage tanks). Completion of these will extend beyond 1996.

The two most expensive projects are those involving correcting electrical deficiencies, known as the AKOSH/NEC[8] Safety Compliance Program (ANSC) project, and efforts to update the drawings to match the equipment in place, known as the As-Built project. These two projects, which account for 70 percent of the projected costs to resolve the deficiencies, are near completion. Alyeska spent almost $133 million on the ANSC project in 1993 and 1994 and plans to spend an additional $41 million to complete it by August 1995. Alyeska also spent over $22 million on the multiphase As-Built project in 1994 and plans to spend an additional $15 million to complete the current phase by June 1995. The next most costly project authorized for 1994 and 1995 was related to correcting problems with the trays carrying electrical cables. Correcting these problems is expected to cost $5 million at the pump stations; additional expenditures will be necessary at the Valdez Marine Terminal.

In total, Alyeska reported that it spent about $222 million on corrective actions in 1994 and expects to spend an additional $72.5 million in 1995. Alyeska's Vice President responsible for the corrective action process estimated that an additional $5 million to $7 million will be spent in 1996 on corrective actions. He also said that beginning in 1996, the costs for the corrective actions to address major items will be included in the pipeline's operating budget and not identified separately.

One problem that affected Alyeska's ability to meet the initial goal of closing all action items by December 1994 was the unexpected number of items added to the data base after the goal was set. The additions occurred because the number of action items identified in the second phase of the ADL study was more than double what Alyeska had expected. Phase two of the study identified 3,100 items, over 70 percent of the entire ACT data base. Alyeska received the Phase II report identifying these items in July, less than 6 months before its original deadline for completing the corrective actions.

[8]AKOSH stands for the Alaska Occupational Safety and Health standards, which are Alaska's standards that apply to electrical safety and health matters for existing facilities. NEC stands for the National Electrical Code, which applies to new structures or to modifications of older structures. The ANSC project developed and used inspection criteria based on these two standards. JPO approved these criteria. Inspectors used these criteria to identify items that did not conform to these standards, and nonconforming items were corrected by the project.

Despite these increases, our work indicates that Alyeska closed fewer than expected deficiencies because many high priority items proved to be more difficult to correct than Alyeska had anticipated and involved lengthy work programs that are being actively pursued. For example, many items in the quality assurance, preventive maintenance, and electrical integrity areas cannot be resolved until a variety of subissues are resolved. As chapter 3 explains in more detail, successful resolution of the 47 action items related to electrical integrity requires making close to 32,000 specific corrections throughout the entire pipeline system, as well as fixing thousands of electrical housekeeping items and completing a variety of specialized engineering studies assessing additional potential risks. The additional training required to implement some of the corrective actions was greater than anticipated, according to Alyeska managers.

Alyeska Has Taken Steps to Better Manage Closure of Action Items

When it became apparent that the December 1994 goal could not be met, Alyeska took several steps to provide a clearer focus on how it was progressing on priority items. Two of these steps are particularly important: the development of a "key items" list and a work scheduling system.

Key Item List

In May 1994, according to Alyeska officials, and at JPO's request, Alyeska created a key item list to track those items that Alyeska and JPO regard as most important. The purpose of the list was to provide a more viable method of tracking progress on the most important and most costly items and to ensure that the work on lower priority items is not depriving higher priority items of resources. At the end of April 1995, the list included 229 items, as follows:

- All 95 items assigned a level-1 priority (43 of these items were identified by QTC).
- All 82 level-2 priorities identified by QTC, plus 52 other level-2 priorities that have an estimated cost of $2 million or more to correct.

As of the end of April 1995, Alyeska had completed the corrective actions and its Quality Assurance group had approved those actions for 76 of these key items, or about 33 percent (see table 2.4). Alyeska had developed CAPs for all of the 224 items requiring CAPs, and JPO had approved 179 of these CAPs. Five items did not require CAPs—four of them are closed.

Table 2.4: Status of "Key Item" List as of the End of April 1995

		Items with corrective action plan				
					Items closed	
Priority level	Total key items in list	Number requiring CAP	Number with CAP developed	Number with CAP approved by JPO	Number	Percent
1	95	94	94	73	29	31
2	134	130	130	106	47	35
Total	**229**	**224**	**224**	**179**	**76**	**33**

Operations Impact Plan

Alyeska has also developed an Operations Impact Plan to select and manage the work that involves field resources. According to Alyeska officials, the primary purposes of this plan are (1) to set priorities for work that requires field technicians' time and (2) to schedule work according to its priority and the amount of technicians' time available. This plan represents an important change in approach because it moves away from Alyeska's earlier approach of attempting to correct all deficiencies concurrently without considering priorities.

According to Alyeska officials, the five items with the highest priority will be worked on first during 1995: (1) preparing for compliance with title V air quality regulations, (2) developing a maintenance management system, (3) enhancing the local and wide-area communications facilities, (4) resolving electrical integrity problems, and (5) developing a quality assurance program. These items are expected to be completed by December 1995. Further down in the rankings are such matters as developing a technician training and advancement program based on tested performance and an information management system that will provide the operations organization with on-line access to various information, such as equipment drawings.

Conclusions

While Alyeska's success in resolving the action items has been slower than originally anticipated, the company has made substantial progress. When Alyeska anticipated that everything could be quickly corrected, it essentially tried to do everything at once, without considering the significance of the problem. Now that its schedule has been extended, Alyeska is trying to match priorities with available resources so that higher priority items are corrected first.

Alyeska Is Making Progress in Correcting Electrical, Quality, and Preventive Maintenance Deficiencies

We analyzed three areas in which QTC identified substantial deficiencies—the integrity of electrical systems, the quality program, and Alyeska's approach to preventive and predictive maintenance. QTC had concluded that problems in these areas presented potential threats to the safety of the public and the environment. Our objective was to examine Alyeska's actions in these areas to determine whether the planned actions will address the problems QTC identified.

Although the implementation of corrective measures in all three areas is not yet complete, Alyeska is making progress in correcting these deficiencies. The actions taken and planned, if fully carried out, appear adequate to address the problems that were identified.

Integrity of Electrical Systems Has Received Considerable Attention

QTC reported that the pipeline's electrical systems constituted "the greatest hardware threat to the health and safety of the public and the environment/ecosystem." As evidence, QTC pointed to the numerous electric code violations, such as improper grounding, already identified in other inspections. Other violations raised questions about the ability of the supports for cable trays that carry cables to various locations around the terminal and the ability of the pipeline to withstand earthquakes. Alyeska had begun an inspection to identify and correct electrical problems, but QTC found that Alyeska's inspection program was not adequate to ensure that all electrical problems on the pipeline would be identified and adequately resolved. QTC concluded that a more broadly scoped effort was needed. In response, Alyeska developed a two-part process to assess the electrical systems of the pipeline: a detailed inspection and a series of studies of broad-based issues.

Detailed Inspections Showed Thousands of Site-Specific Deficiencies

In response to QTC's findings, Alyeska revised the inspection process and inspected the entire pipeline for electrical safety problems. It developed the ANSC project to ensure that inspection criteria were established, inspections were conducted in an organized fashion, nonconformances were documented, corrective actions were approved in advance, corrective actions were taken, and the completed work was checked. Alyeska folded this new program into an inspection process that had already started at the Valdez terminal and pump stations, before QTC began its review. The resulting inspection covered the pipeline, including the

terminal, the pipeline's pump stations,[9] and ancillary facilities. The inspection was completed in December 1994.

The ANSC inspection identified about 32,000 individual items that did not conform to the project's inspection criteria. To keep track of these nonconforming items, Alyeska created an extensive document control procedure and a data base system that is separate from the ACT data base. Like the ACT data base, this system tracks the items and classifies them according to priority. About 4 percent of the items were top priorities—that is, they were considered critical to the workers' safety or the pipeline's integrity and were not backed up by another system. Like the ACT data base, this system also breaks the deficiency identification and correction process into a series of steps so that progress in completing work can be tracked. Once identified, the deficiencies are validated by engineers. Progress is tracked through such steps as the development of corrective action plans, review and approval of those plans by JPO, implementation of corrective action, and approval as necessary by Alyeska's quality control inspectors and JPO's inspectors.

In addition to the almost 32,000 nonconforming items, Alyeska's systemwide approach also identified about 17,000 electrical-related "housekeeping" items that could largely be fixed on the spot, like replacing missing screws in cover plates or tightening grounding connections. These items were identified and fixed by teams of electricians in advance of the inspection, and others were fixed by electricians who accompanied the inspectors. Alyeska also developed a tracking system to ensure that these items were fixed.

About 26,000 Identified Deficiencies Have Been Corrected

Early in the inspection process, Alyeska estimated that it would be able to correct all of the action items by December 1994. However, the inspections themselves took until December to complete. As of the end of April 1995, Alyeska reported having corrected 19,182 items on the pipeline and 6,940 at the terminal, or about 82 percent of the total. Alyeska also reported that as of January 1995, all of the 17,000 housekeeping items had been fixed.

Alyeska's president said the company's initial estimate for completing the action items in the ACT data base, including ANSC, had been too optimistic. In October 1994, Alyeska revised the target for completing all items to

[9]Pump Station 7 and the Pump Station 8 Topping Plant were not inspected because they are being evaluated for potential shutdown.

December 1995. However, in March 1995 the company estimated that, weather conditions permitting, it would complete the ANSC project by August 1, 1995.

Special Engineering Studies Are Under Way

In addition to the inspections, Alyeska is conducting 20 special engineering studies related primarily to electrical issues. Alyeska initiated the studies as part of the ANSC project to determine the best engineering solution to major issues. The need for special studies is one indication of the complexity of many of the electrical problems. (These studies are listed in app. I.) Eleven of these studies have been completed, and completion is imminent for most of the remaining studies. While completing the studies will close some items, in other cases the studies may identify the need for additional actions, and completing those actions may take some time. For example, the study of the cable trays' structural integrity will likely be completed in May 1995, but the draft identified the need for modifications at both pump stations and the terminal. The schedules for the completion of all related construction work are not yet available. We reviewed three of the studies related to grounding, inspection of motor control centers, and power switching systems to determine whether the studies accurately assessed the problems and whether the recommended actions will address the problems. We believe that the studies accurately assessed the problems and that the actions in progress and planned should correct the problems identified. (These studies and our conclusions are discussed in app. II.)

Approach to Quality Program Is Being Revised

The right-of-way agreement requires that Alyeska have a comprehensive quality program to protect the safety of workers, the public, and the environment. Alyeska's quality program has been the subject of criticism at various times since the pipeline's initial construction. In its November 1993 study, QTC reported that Alyeska's quality program was dysfunctional and was thus incapable of ensuring that TAPS had been constructed and could operate efficiently and safely. In January 1994, QTC provided recommendations on how Alyeska should revise its quality program. Alyeska is revising its program to correct the deficiencies QTC identified. However, for a small number of items, JPO has agreed that Alyeska can take a different approach than the one recommended in QTC's January 1994 report. Completing the corrective actions will take longer than planned.

Problems With Alyeska's Quality Program Have Been Reported Since Initial Construction

Alyeska's problems with its quality program have been long-standing. During the early phases of TAPS' construction, we reported a variety of problems with how Alyeska was implementing its quality program. For example, in 1976 we reported that TAPS' construction was about 22 percent completed before Alyeska obtained final approval for its quality program.[10] During this phase of construction, Alyeska's quality program was not consistently correcting violations of the stipulations to which Alyeska had agreed. Federal and state monitors, rather than Alyeska's quality program staff, were requiring the correction of nonconforming work.

Although improvements were made in July 1975 to correct the problems we identified, we identified similar problems in the 1976 construction season. After construction was completed in 1977, Alyeska continued to have problems with its quality program. QTC described the program, as it existed from about 1980 to 1990, as woefully inadequate.

After the Exxon Valdez oil spill in 1989 and other problems, Alyeska began to upgrade portions of its quality program, but these efforts again proved insufficient. Staffing was increased from 11 in 1990 to about 34 in 1993, and Alyeska began revising the documents directing its quality program. Alyeska issued a revised quality program manual in October 1992 and a quality standards manual in September 1993. Despite these steps, the implementation of a quality program was still fragmented.

QTC reported that Alyeska's quality program was dysfunctional. Specifically, according to QTC, Alyeska's management had a reactive mindset and did not support its quality program. In addition, QTC concluded that the program lacked the organizational authority and independence to protect public health and safety, could not show that Alyeska met basic commitments to the regulatory requirements set out and agreed to in its quality program manual, and lacked the key components needed for a quality program to function.

Alyeska Is Correcting Its Quality Problems

Alyeska has since taken or is in the process of taking a number of steps to change the quality program from top to bottom. These steps have included ways to clearly establish management's support for an effective quality program; reorganize the quality program to increase its authority, independence, and resources; provide a system for documenting compliance with regulatory requirements; develop essential components

[10] Trans-Alaska Oil Pipeline—Progress of Construction Through November 1975 (GAO/RED-76-69, Feb. 17, 1976).

of a quality program; and put procedures in place to make the program work.

New System for Establishing Management's Support for Quality

In 1994, Alyeska established the Alyeska Integrity Management System (AIMS) to provide an overall framework for ensuring the integrity of the pipeline and terminal—no accidents, no leaks, no compliance violations, and reliable, cost-effective operations. A key part of AIMS establishes management's commitment to Alyeska's quality program. Focusing this attention is an important aspect of changing Alyeska's mindset in connection with a quality program. Reporting that Alyeska's mindset was not focused on prevention, QTC was concerned with the lack of focus on prevention through strategic planning, adequate procedures, and compliance with regulatory requirements that would be brought about by an effective quality program. AIMS appears to have the kind of structure needed for greater emphasis on quality. AIMS has two components. The first is a set of 69 expectations grouped into 13 elements which describe what is expected of Alyeska in order to ensure the integrity of its operations. One element establishes a quality program as an expectation. Specifically, it states,

> "A comprehensive quality program is crucial to assure management and the public that the Alyeska Pipeline Service Company is operating with integrity (i.e. in a manner that is safe, environmentally sound, and reliable) and in compliance with all regulatory, legal and Company requirements."

The quality element includes four expectations:

- A comprehensive, documented quality program is understood and complied with by employees.
- The effectiveness of the quality program is periodically and objectively assessed and the program is continuously improved.
- Corrective and preventive actions are identified, documented, implemented, and tracked to completion.
- Systems are established to identify, evaluate, and resolve the quality concerns of employees and contractors.

The second component provides a defined process for periodic evaluations of the extent to which the expectations are being met. The process provides for three levels of assessment—self- assessments, at least annually, by the local organization to ensure regulatory, legal, and company policy compliance; functional assessments, at 2- or 3-year

intervals, by qualified company personnel to assess key areas of AIMS, especially relating to compliance; and independent assessments by skilled company personnel or outside experts to assess compliance with AIMS. Independent assessments will begin in 1996 and will cover the entire company every 3 years, one-third at a time. The first round of self-assessments was completed in November 1994. The AIMS Coordination Leader told us that in the first round of assessments, the various units averaged about 1.5 out of a possible 4. He added that as a result of the assessments, each of the 23 units assessed developed an improvement plan to address the most significant action items identified in the assessments. In total, the plans cover about 500 items. The plans call for completing action on these items by the end of 1995. In turn, the employee incentive program ties employees' compensation to completing these plans in 1995.

Reorganization for Greater Authority and Independence

QTC reported that Alyeska's quality assurance group, which conducted audits and surveillance, reported to the Vice President of Administration, who had no prior experience in any phase of a quality assurance program. In addition, the Quality Services group, which provided inspection services for pipeline and terminal operations, reported to the Vice President of Engineering and Projects and thus, according to QTC, lacked the independence and the required freedom to document conditions adverse to quality. Nationally and internationally recognized guidance on the development of quality organizations emphasizes the importance of these organizations having the organizational authority, responsibility, and freedom to (1) identify problems affecting quality, (2) report problems and recommend corrective actions, (3) control processing until nonconforming conditions are corrected, and (4) verify corrective actions.[11] In response to QTC's finding, in early 1994 Alyeska reorganized its quality program. It combined the audits and surveillance group and the inspections services group into a single organization, the Quality Department, headed by the Quality Department Manager. Alyeska also relocated the department under a newly created Vice President for Quality, Environment and Safety, who, organizationally, is on the same level as the Vice President for Operations.

In June 1995, about 31 staff were in the Quality Department, about 14 in Audits and Surveillance, 11 in Quality Services, and 6 in Management and

[11]International Standard: Quality Management and Quality Assurance Standards-Guidelines for Selection and Use (ISO 9000), International Organization for Standardization, 1987, and Specifications for Quality Programs: API Specification Q1 (SPEC Q1), Second Edition, Jan. 1, 1988, American Petroleum Institute.

Administrative Support. In addition, 18 other staff perform quality functions, including nine quality generalists assigned to the business units. The 1995 quality staffing level of 49 represents an increase of 15 from the 1993 staffing level of 34. The staff resources devoted to the quality program are temporarily augmented by about 37 staff who are dedicated to short-term projects and will be phased out in 1995 as projects wrap up.

After we had completed our field work, on June 1, 1995, the President of Alyeska advised us that Alyeska plans to further revise the organization of its quality program. The program's reorganization will take place in two stages. First, beginning in July 1995, the position of Vice President for Quality, Environment, and Safety, will be abolished. The environment and safety functions will be assigned to another Vice President. The quality program, with the exception of audit and surveillance, will be assigned to a newly created Operations System Integrity Department under the Vice President for Operations. The audit and surveillance function will be transferred to the Vice President for Business Practices, who is also responsible for Alyeska's audit function and the Employee Concerns Program. Alyeska officials believe that placing the audit and surveillance function in a separate group from Operations will enable it to retain its independence to report on conditions that may be adverse to quality.

The inspection function will be reassigned from Quality, Environment, and Safety to the Operations System Integrity Department within the Operations group and eventually reassigned to the Maintenance and Modification Department within Operations and the Business Units during the second stage of reorganization. Although this reassignment will once again have the inspection function under the persons responsible for transporting oil and maintaining the pipeline—the Vice President for Operations and the Business Unit Leaders—Alyeska officials believe that the quality program will be better received and evolve into a continuous improvement mode more quickly if the personnel responsible for operating the pipeline take ownership of the quality program rather than have a separate unit outside of Operations attempt to instill quality in the way Operations personnel do their work.

According to Alyeska officials, steps are being taken to ensure that the inspection function will continue to be effective. In the proposed reorganization, the inspection function and the project management/facility operations functions will remain on separate reporting paths within Operations. In addition, the Operations System Integrity Manager is establishing quality councils, and inspectors will be

invited to participate in the councils along with Alyeska employees. These councils are being established to provide a forum for front-line workers to provide input for improvements in the quality program or to raise issues or problems involving quality. In addition, the officials told us that the Ombudsman Program and the soon-to-be-implemented Employee Concerns Program, which are located outside of Operations, will provide a relief valve in the event that quality-related issues are not being appropriately handled by line organizations. Alyeska plans to review and benchmark these changes against other companies and industries late in 1995 to ensure that this is the most effective approach. In our opinion, the effectiveness of these changes will become clearer over time.

Process for Identifying and Ensuring Compliance With Regulations Is Being Established

QTC also found that the TAPS project failed to ensure compliance with agreements, codes, standards, and government regulations because Alyeska failed to fully identify its regulatory requirements and incorporate those requirements into operating and maintenance implementing procedures. QTC noted that this failure by Alyeska to implement its own policy of regulatory compliance dates back to the original issuance of the Quality Assurance Manual, Revision 0, dated June 7, 1977.

In response to QTC's finding, Alyeska is establishing the Alyeska Regulatory Compliance System (ARCS) to help ensure that commitments, such as the requirement to comply with the federal and state right-of-way agreements, and affected documents, such as the procedures for implementing the agreement, are identified and updated in a timely fashion. The system will contain each requirement, such as a law or regulation, interpret its specific relevance to Alyeska, link it to a principal implementing procedure, identify the organization responsible for implementing the procedure, identify implementing documents such as maintenance procedures, and specify any training requirements.

In October 1994, Alyeska created the Information Management Service Unit to implement this tracking system and several related programs. The requirements were divided into eight subject areas, including environment, and fire safety and industrial hygiene. The process of identifying the regulatory requirements has been completed for six of the eight subject areas in the tracking system. The Service Unit plans to partially implement ARCS in the fourth quarter of 1995 for the six areas. Alyeska plans to fully implement the tracking system around December 1996. At that time, it is expected that the required data will have been developed for the remaining two areas—Oil Spill Contingency Planning and Codes and

Standards—and that safe maintenance procedures will have been completed.

Development of Program Components Previously Absent or Not Working

QTC reported that program components key to an effective quality program were either not functioning or were missing altogether. The document control process had broken down to the extent that no assurance could be made that approved drawings accurately reflected the equipment in place or its operation. Neither was there a master list of structures, systems, and components that should be included in a quality program or documentation indicating the importance of the equipment to the pipeline's integrity. In addition, cause and corrective action programs were not in place to learn from malfunctions and maintenance histories.

Alyeska is correcting these deficiencies. It is

- developing a master equipment list to identify the structures, systems, and components to be included in the TAPS quality program and developing a procedure for documenting and controlling the list;
- developing a document establishing the importance of various equipment to ensure the integrity of TAPS and thus the extent to which elements of the quality program apply to the equipment;
- developing a risk-based cause and corrective action program that will use maintenance histories to improve future reliability; and
- updating the "as-built" documentation to ensure that drawings of all TAPS' structures, systems, and components reflect current configurations, performing a limited functional check to ensure that the selected equipment operates as provided in specifications, and developing implementing procedures to ensure that the documentation and conditions of TAPS' equipment and facilities remain current and consistent.

Creation of Policies and Procedures

QTC reported that Alyeska's quality program, as described in various quality manuals, has been inadequate as a total approach to quality and reported that the manuals, as defined, have not been implemented. QTC's Phase 2 report identified actions for Alyeska to consider in developing its revised quality program. Alyeska considered and incorporated almost all of these actions, and in May 1995, JPO conditionally approved Alyeska's revised program. The Quality Program Manual establishes Alyeska's overall quality program and policies. The implementing procedures address various areas, including ones that QTC identified as lacking: the Regulatory Compliance Matrix, Master Equipment List, Trend Analysis,

and Causal Factor (root cause) Analysis. After a period of orientation and training, the revised quality program will go into effect on June 15, 1995 for all new work.

Some Obstacles Remain in Efforts to Improve the Quality Program

As with other areas, the actions required to improve the quality program have proven to be more difficult than Alyeska originally expected. Thus, a fully implemented quality program will not be completed until at least December 1996, although key components are in place now, and others are expected to be put into place during the latter half of 1995. Alyeska's response to QTC's recommendation for a regulatory compliance system is one example in which progress is slower than anticipated. Although Alyeska's 1994 plans called for implementing the Alyeska Regulatory Compliance System in the first quarter of 1995, completion of the system will be implemented in stages. The system will be partially implemented in the fourth quarter of 1995, when time is available at the terminal and pump stations to provide needed training and when the communications upgrade, called the wide-area network, which will enhance computer communications between field operations and Anchorage, is completed. Full implementation of ARCS is scheduled to be completed in December 1996 when two subject areas—Oil Spill Contingency Planning and Codes and Standards—have developed needed information and when the maintenance organization completes its program for developing the required procedures for maintaining equipment to required standards.

Alyeska Is Upgrading Its Maintenance Program

The maintenance designed to keep plant and equipment in good operating condition is generally achieved by identifying all of the structures, systems, and components requiring maintenance (a master equipment list) and developing schedules and criteria for when maintenance is to be performed. QTC found that Alyeska's program for maintaining the pipeline's components (such as the pipe, pumps, valves, and electrical equipment) lacked a comprehensive approach for analyzing and "trending" the condition of this equipment or for using such information as a means of establishing a maintenance program that is predictive in nature.[12] Alyeska had no master equipment list and no implementing procedures for a comprehensive maintenance program. QTC found that Alyeska's individual maintenance procedures lacked clarity, specificity, and technical validity.

[12]Maintenance takes three main forms—corrective, preventive, and predictive. Corrective maintenance involves repairing or replacing a component when it fails; preventive maintenance involves servicing the component on a regular basis, such as the amount of calendar time or hours of operation that have transpired. Predictive maintenance is similar to preventive maintenance except that it develops maintenance schedules based on equipment condition rather than calendar time or hours of operation.

For example, the procedures did not specifically call for the types of parts/materials/tools to be used in a procedure; called for incorrect parts/materials/tools to be used; or called for incomplete/inadequate/inaccurate steps to perform preventive maintenance.

Alyeska Is Correcting Maintenance Problems—Completion Not Likely Until 1996

Alyeska has taken and plans to take a number of steps, such as developing the master equipment list discussed under the quality program, to correct the maintenance program deficiencies identified by QTC. It has also begun developing a revised maintenance program that will include the results of its corrective actions. Together, the actions, when completed, should provide a basis for improving maintenance and for creating a predictive maintenance program that can better focus maintenance resources where they are (1) most needed to ensure safety and pipeline integrity and (2) most cost-effective. The completion of all necessary steps is not likely until at least mid-1996 at the earliest.

Master Equipment List and Related Information

Alyeska is developing a master equipment list to identify equipment needing maintenance and an integrity list that will relate the importance of this equipment to the integrity of the pipeline. The quality program requires greater focus on the equipment that is more critical to the safety and integrity of the pipeline. The equipment list is being developed as part of the as-built project and functional-check processes described in the earlier section on quality. The integrity list for the level-I items was completed in November 1994, and the list is scheduled to be completed for the level-II, level-III, and nonintegrity items in the fourth quarter of 1995. The initial as-built project for the 12,000 to 14,000 most critical drawings is scheduled to be completed in June 1995; a supplemental project for 5,000 to 6,000 less critical drawings is scheduled for completion in June 1996. The functional check out project is associated with the as-built project and is also a two-phase project. Each phase will be completed before the corresponding phase of the as-built program. The master equipment list is scheduled to be completed about the end of 1995.

Information System for Analyzing Maintenance Histories

Alyeska is developing an Integrated Maintenance Management System (IMMS) to enable it to track and learn from the maintenance histories of key equipment throughout the pipeline. The information derived from maintenance histories can provide a basis for improved reliability and, possibly, reduced maintenance costs. A basic element of the system is a

software system (called PassPort) that will allow Alyeska to collect and analyze maintenance histories on key equipment. The first stage of this system, the automated work order system, began testing at a pump station in spring 1995 and will come on line during the third quarter of 1995. Alyeska is also upgrading its wide-area network communications link between the pipeline's facilities to allow the system to acquire and track maintenance histories from the equipment at the terminal and the pump stations. The computer-supported maintenance system and the related communications upgrade will provide a basis for tracking the histories of all integrity-related equipment on the pipeline. Alyeska's plans call for completing the upgraded communications system in November 1995.

Alyeska describes the maintenance system it is developing as a risk-based maintenance program which provides for (1) learning from maintenance experience that is collected and tracked in the PassPort data base and (2) using predictive maintenance procedures to improve reliability and reduce costs. Without such a program, resources could be inefficiently used to maintain equipment whose failure will have little impact on operations or for which preventive maintenance is not economical. Instead, it would be more cost-effective to operate this equipment until it fails and then replace it. On the other hand, inadequate maintenance could be performed on equipment where the likelihood of failure and/or the consequence of failure warrant more extensive maintenance, according to Alyeska maintenance officials. In a risk-based maintenance program, maintenance is performed on a schedule determined by both the consequences of failure and the likelihood of failure. The risk assessment element is scheduled to be implemented in late 1995 and early 1996 as training is provided. Predictive maintenance requires (1) the determination of conditions, such as increasing vibration, temperature, or wear, that will indicate when maintenance is needed in time to prevent equipment failure and (2) a monitoring program to identify those predetermined conditions. The PassPort system will help identify the conditions that call for maintenance, and the risk analysis will identify the equipment important enough to make monitoring worth the cost.

New Procedures for Supporting Maintenance

Alyeska is developing maintenance procedures, called safe operating and safe maintenance procedures, describing how to prepare equipment for maintenance and how to perform maintenance on pipeline equipment. The completion of this program has stretched into 1996 because Alyeska is developing the criteria for identifying which equipment needs to have maintenance procedures developed. The contractor had developed over

600 procedures at a pump station and the terminal before the project was put on hold. The contractor, as directed, was developing procedures for items at equipment locations that are identified by tag number. While the tag numbers are unique, the equipment with the tag numbers is not. Thus, this method resulted in many duplicate procedures being written for the same equipment. A different system, based on component identification and a judgmental determination of importance, is being developed. The new approach will reduce the number of procedures that have to be developed and updated as equipment changes are made over time. The completion of this process is now scheduled for 1996.

Conclusions

Alyeska is taking steps that when completed and fully implemented, should correct the problems QTC identified with electrical integrity, quality, and maintenance. However, the process for all three is taking longer than planned. Alyeska's efforts in these areas have been affected by the complexity and breadth of the work to be done. Considerable time will be needed before the degree of success of the effort can fully be assessed. The need for additional time to fully assess progress is particularly true for the quality program, which is undergoing continuous reorganization. In addition, once the corrective measures are addressed, implementing them over the long term will require a continuing commitment of resources, as discussed in the next chapter.

TAPS' Regulators Have Taken Steps to Improve Oversight

Effective oversight is a key component of ensuring safe pipeline operations. Although federal and state regulators made substantial attempts after 1990 to better coordinate their efforts, significant problems with regulatory effectiveness were still being pointed out by outside reviews as recently as 1994. The Joint Pipeline Office is addressing these problems. For example, it has strengthened JPO's regulatory staff, and JPO is in the process of reorganizing its monitoring program to address prior limitations. These developments are encouraging signs that the regulatory program is continuing to improve.

Earlier Regulatory Problems Demonstrated a Need for a More Coordinated Approach

In a 1991 review of TAPS oversight,[13] we concluded that the existing form of oversight did not provide for effective monitoring of TAPS' operations. The five principal federal and state regulatory agencies did not have a systematic, disciplined, and coordinated approach for regulating TAPS.[14] In fact, BLM officials told us they were not regulators. Instead, they largely relied on Alyeska to police itself.

We also found that the Exxon Valdez oil spill and the discovery of corrosion in the pipeline in 1989 had been an impetus for the regulators to reevaluate their roles. This reexamination led to a 1990 decision to develop JPO. We concluded that the establishment of JPO was a positive step toward better regulation.

During the next several years, the regulatory agencies gradually increased their participation in JPO. When we issued our 1991 report, 6 of the 12 agencies with significant jurisdiction over TAPS' operations had agreed to participate in JPO. By 1994, 11 of the 12 agencies had signed an agreement to support JPO and to work cooperatively to protect public safety, the environment, and the integrity of TAPS.[15] Similarly, they increased the staffing committed to JPO from a skeletal staff to 57 employees by 1993.

[13]Trans-Alaska Pipeline: Regulators Have Not Ensured That Government Requirements Are Being Met (GAO/RCED-91-89, July 19, 1991).

[14]BLM, EPA, the Department of Transportation's Office of Pipeline Safety, and the Alaska Departments of Natural Resources and Environmental Conservation.

[15]The U.S. Fish and Wildlife Service declined to sign the agreement, stating that it was unable to make a significant new commitment of time and resources to JPO.

QTC Audit, Other Studies Showed Increased Oversight Had Not Been Sufficient

Hearings held in July 1993 by the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, provided indications to BLM that JPO's efforts to regulate TAPS to date were not adequate and that further action was needed to improve JPO's regulatory oversight of TAPS. In response to these hearings, the Director of BLM clarified BLM's authority in relation to the other TAPS regulators. He testified that BLM not only would exercise its authority over federal lands but, as lead agency of JPO, would invoke its authority consistent with the TAPS Authorization Act to carry out thorough pipeline oversight.

One of BLM's first actions was to contract with QTC. The 1993 QTC report provided a stark picture demonstrating that Alyeska and its regulators still had a considerable distance to go in ensuring the integrity of the pipeline's operations. Although the QTC report did not directly address how effectively regulators were doing their jobs, QTC's findings demonstrated that JPO's efforts to date had not been sufficient to identify major problems and ensure their correction.

In response, JPO, in early 1994, selected Booz-Allen & Hamilton, an independent consulting firm, to assess its monitoring and inspection program. In its June 1994 final report on a comprehensive monitoring program for JPO, Booz-Allen concluded that JPO was not effectively addressing the prevention of pipeline hazards. The report stated that closely monitoring Alyeska's maintenance, quality assurance, and configuration management[16] could have precluded most of the findings in QTC's audit.

Booz-Allen concluded that for JPO to be successful in meeting its responsibility for TAPS oversight, it needed a new model for monitoring TAPS. This model would place more emphasis on identifying potential hazards and addressing them rather than waiting to detect and mitigate hazards that had already occurred. (In placing greater emphasis on prevention, however, regulatory activities would still address the monitoring of compliance and emergency response.) Booz-Allen found that JPO needed to make several changes to shift to such a model:

- Monitoring risk management in nine major TAPS' process areas—quality assurance, safety, configuration management, operations, maintenance, risk determination, environmental protection, project design, and project

[16]Configuration management is the process for assuring agreement between the design requirements for hardware, the hardware in place, and the documentation for the hardware.

performance. JPO officials said that in the past, they had focused only on the latter three areas.
- Performing the monitoring work in a multidisciplinary team organized under a single director.
- Collecting far more information than in the past, structuring it for management decision-making and action, and making it available for outside audits, interests, and inquiries.

JPO Has Taken Additional Steps to Improve Oversight

Our most recent work indicates that JPO is making an effort to improve its oversight. Since our earlier work, JPO has changed and now recognizes its regulatory function. In addition, JPO has

- expanded its staff, supplemented by contractors, to handle oversight responsibilities;
- established a project group to monitor Alyeska's response to the QTC findings; and
- begun to reorganize and carry out other steps needed to implement the Booz-Allen model for comprehensive monitoring.

Funding and Staffing Have Increased

Funding levels for JPO's operations increased from about $3.5 million in 1993 to more than $5 million for fiscal year 1995.[17] Under the agreements authorizing the pipeline, Alyeska is obligated to pay BLM's costs for oversight activities related to TAPS. In 1995, BLM estimates its portion of these costs will be $3.5 million. (Although JPO's operations are primarily focused on TAPS, it does monitor other pipelines in Alaska and conduct other related activities, such as reviewing and issuing permits for pipelines being considered for construction.) In addition, from February 1994 through March 1995, Alyeska paid $9.2 million for TAPS-related activities by JPO consultants and other associated contract costs; by June 1995, Alyeska's payments for these costs will reach $12 million.

In addition, Alyeska agreed in September 1990 to pay a portion of ADNR's costs for monitoring TAPS. In 1995, Alyeska will contribute up to $800,000 of the expected $1 million for monitoring TAPS. JPO officials advised us that the state provides a ceiling on how much ADNR can spend, provided it raises the money through agreements, such as the agreement it has with Alyeska. Other sources of funds come from other agreements. For

[17]JPO officials stated that this amount does not include funding supplied by EPA, the Office of Pipeline Safety, and the Alaska Department of Environmental Conservation for the staff at JPO. These agencies' costs are not included in the costs reported to us by JPO. Also, the federal fiscal year ends on September 30 and the state fiscal year ends on June 30.

example, ADNR also receives money from rents on rights-of-way from owners of common carrier pipelines and sales of gravel from the rights-of-way. It expects to raise $335,000 in rents and $100,000 from gravel sales in 1995. ADNR's authorized ceiling for 1995 is $1.7 million, but it will raise only about $1.3 million through its various agreements. Thus, its budgeted spending for JPO activities in 1995 will be about $1.3 million.

Under these increased funding levels, overall staffing at JPO has grown from 57 positions in 1993 to 84 positions as of April 1995. Although JPO officials told us the staffing level was not adequate, the additional support it needs is being provided by contractors, such as Stone and Webster Engineering Corporation, an independent engineering consultant firm. JPO officials said that since Alyeska has not established all of its programs, such as maintenance, JPO did not know if its noncontractor staffing level was sufficient to address its regulatory responsibilities in the future. JPO will assign five Stone and Webster employees to its Operations Branch for audit item resolution through December 1995.

JPO's Special Monitoring of Deficiency Items Is Taking Place

Consistent with its more active monitoring role, JPO in 1994 established a project group to oversee Alyeska's correction of action items. These staff members perform such functions as approving priorities for action items, coordinating the review effort, reviewing special studies, and approving corrective action plans. To supplement this staff, JPO is working with Stone & Webster. JPO used about 45 Stone & Webster staff for such tasks as reviewing corrective action plans, verifying corrective action on-the-ground, maintaining a computer data base for tracking audit action items, and performing special investigations. JPO has also hired another engineering consultant to monitor how Alyeska closes the electrical deficiencies in the ANSC project. While the former staff of the project group still spends the majority of their time on audit items, JPO has integrated them into its new organization described below.

JPO Is Reorganizing to Implement New Comprehensive Monitoring Program

Shortly after receiving Booz-Allen's recommendations for a new monitoring model for TAPS, JPO began to reorganize to put the model into effect. The Booz-Allen study called for establishing a centralized monitoring office with four oversight groups: quality assurance, pipeline surveillance, engineering and projects, and right-of-way administration. Each of the four groups is in the process of developing detailed monitoring programs that are based on the consultant's recommendations. Table 4.1 shows each office's size, primary role, and activities to date.

Table 4.1: Organization and Activities of JPO's Operations Branch

Group	Number of positions	Primary role	Main activities to date
Pipeline Surveillance	8	Provide primary oversight of pipeline; ensure environmental protection	Initial emphasis includes assessments of TAPS' operations and maintenance, surveillance of projects, support of JPO's oil spill contingency efforts, and permitting for Alaska's Department of Fish and Game
Right-of-Way	10	Manage and administer documents, leases, authorizations, and permits that apply to federal and state rights-of-way	Work plans for 1995-96 show the top priority is issuing authorizations for pipeline work consistent with the grant/lease and federal/state laws and regulations
Engineering	6	Ensure that design, construction, operation, and other activities adhere to quality program's requirements and minimize risks	Identified 19 activities for monitoring, including shut-down events and maintenance procedures and manuals; review corrective action plans on the 4,920 identified deficiencies
Quality Assurance	6	Ensure that quality assurance programs and practices are effectively planned and executed	Developed a work plan for 1995 (includes reviews of Alyeska's quality, records management, and training programs)

Because much of this effort is still far from complete, it is too early to determine whether it will be successful. However, JPO is currently conducting assessments and surveillance activities under the Comprehensive Monitoring Program (CMP). Significant program reviews, which aggregate observations from JPO's assessments and surveillance and factor in input from employees' concerns, audit items' progress, and Alyeska's own quality reviews, will be completed through 1996; the initial emphasis will be on quality, operations, and maintenance. Configuration management and safety, two additional CMP focus areas, are currently undergoing review by JPO; reports are due by the end of 1995. JPO expects program reviews of significant depth to be completed under CMP by the end of 1996.

Besides the 31 positions in the operations branch, JPO has 29 other staff positions that are primarily involved in monitoring other activities, such as other pipelines, but who also assist in monitoring TAPS.[18] Of these, 26 are with the Alaska Department of Environmental Conservation, 1 is with

[18]The remaining 24 staff are in administration, management, and special projects.

DOT's Office of Pipeline Safety, and 1 is with EPA. These three agencies, while locating their staff at JPO, have elected to retain final responsibility for carrying out their regulatory functions. The one remaining agency is the Alaska Office of Management and Budget, Division of Governmental Coordination, which coordinates coastal consistency reviews; it has one staff member at JPO.

Conclusions

Like Alyeska, JPO is in the process of changing its approach to ensuring the safe operation of TAPS. At this point, it is difficult to provide an assessment of how successful JPO has been. Taken together, however, the efforts set in motion over the past 2 years demonstrate that JPO is making a concerted effort to improve.

JPO's ultimate success, like Alyeska's, depends partly on ensuring that its changes are fundamental enough not only to resolve existing problems with TAPS, but also to keep them from recurring. In the following chapter, we address the challenges that JPO and Alyeska face in this area.

Resolving Past Problems Requires Addressing Underlying Causes and Staying the Course to Improvement

Audits and studies of TAPS have pointed to a common underlying cause for past problems: Both Alyeska and JPO had an operating philosophy based heavily on reacting to problems rather than on ensuring quality and minimizing the chance that problems would occur. The QTC study called Alyeska management's mindset "the greatest non-hardware-related imminent threat" to the pipeline, and the Booz-Allen study found that JPO needed to substantially transform its mindset in connection with oversight. Without fundamentally changing the approach to quality and prevention, which is the key to correcting past problems, JPO cannot ensure that problems will not happen again. Alyeska and JPO have developed policies that reflect this change, and both organizations have taken steps to incorporate these changes into their day-to-day work. For Alyeska, the success of this effort may depend on its ability to establish a new mindset throughout the entire organization. For JPO, the main challenge may be maintaining a stable resource base—funding and staff—over the long term for its redefined operations.

Alyeska and JPO are partway through an ambitious attempt to resolve problems with the operation and oversight of TAPS. Their progress shows reason for cautious optimism on the basis of the substantial amount of work completed. However, tackling some tasks is proving to be more complex, time-consuming, and difficult than initially expected, and the real key to improved operation will be the implementation of many of these actions over the long term.

Alyeska Is Taking Actions to Improve Operations

QTC took issue with Alyeska's approach to support TAPS' operations both at mid- and upper-management levels. Mid-level managers, QTC said, failed to recognize regulatory requirements, did not develop procedures on how to implement those requirements, and did not provide the equipment, resources, and trained personnel required to carry out procedures. Upper management, QTC said,

> "not only failed to prevent or correct these mid-level management failures, but also has failed even to recognize the need to do so. Upper management has demonstrated a tolerance for negative practices, such as harassment and intimidation of quality control inspectors and others, and has failed to take affirmative actions needed to establish the integrity of the operation."

Alyeska does not dispute QTC's characterization of past practices by some managers and supervisors. In an April 1994 briefing describing the organizational problems outlined in the QTC report, Alyeska's human

resources department concluded that the company's culture was typified by emphasizing oil transportation above all else. In addition, Alyeska was hiding problems and taking a "shoot-the-messenger" approach when problems were surfaced. It also maintained adversarial relations with regulators, pipeline owners, and contractors. Alyeska is taking steps to change the company mindset, but the changes will take some time to complete and will be difficult to implement.

Changes in Owner Companies' Approaches to Establishing Alyeska's Accountability

Part of the change in mindset has come as a result of actions taken by Alyeska's seven owner companies. In the past, according to owner company executives with whom we spoke, Alyeska's accountability was somewhat blurred by the working relationship between Alyeska and the owner companies. The Owners Committee, which oversaw Alyeska's operations through quarterly meetings, was supplemented with 11 subcommittees covering such matters as law, budget, audit, accounting, and tax. These subcommittees were often heavily involved in management decisions. As a result, the executives said, Alyeska's accountability may have become less clear.

Beginning in the fourth quarter of 1993, Alyeska and the owner companies took action to clarify expectations. An expectations manual was created, specifying which areas were Alyeska's autonomous responsibility, which authorities require owner notification but are delegated to Alyeska, and which areas the owner companies reserved for themselves. With the exception of the audit subcommittee, the subcommittee structure was dissolved and replaced by an approach in which joint task forces were created to deal with specific issues as they developed. The owners created a performance management contract that specified the actions and standards to which Alyeska management would be held. Among other things, this contract calls for completing action on at least 85 percent of the action items in the ACT data base by the end of 1995. According to three owner company presidents representing the Owners Committee, the committee reviews progress on the contract each quarter and supplements this review with monthly meetings with Alyeska management.

Changes in Alyeska's Operating Policies and Attitudes

Alyeska's top management has a new policy for corporate behavior that encourages an open and more quality-oriented approach to operations. For example, on October 17, 1994, Alyeska's president wrote a memorandum to all staff that reemphasized the objectives of the new policy. Alyeska revised and supplemented its $2.5 million baseline training

program to support the transition to its new organizational culture. It spent an additional $2.6 million in 1994, and plans to spend an additional $2 million in both 1995 and 1996 for additional training. Alyeska has developed and administered training aimed at eliminating actions that employees perceived as intimidating or preventing them from expressing their concerns. Alyeska provided training to discourage intimidation and encourage open communication to about 85 percent of its employees. It also provided training, which is aimed in part at assessing and improving the extent to which supervisors promote teamwork and treat employees' concerns fairly, to about 90 percent of those supervising three or more people. Efforts are also under way to improve and enhance an employee concerns program by making it more accessible, more reliable, and more trusted by employees.

According to Alyeska officials, these and other actions are intended to build a new culture in which employees feel safe in taking appropriate action, inflexibility or inaction is not accepted, and people take pride in their work. In addition, Alyeska has surveyed employees to measure their attitudes and degree of satisfaction and plans to conduct other follow-on surveys. A survey conducted in March and April 1994 by an outside consulting firm covering 1,225 employees disclosed that the majority of the Alyeska employees responding felt that they are encouraged to report bad news as well as good news. However, 25 percent believed that bad news would not be received positively and that retribution or no corrective action was likely. Another survey, conducted in June 1994 for Alyeska by a contractor, indicated that some of the 200 contract employees surveyed feared they would be fired if they identified problems. The results of these surveys suggest that a complete changeover in Alyeska's culture and employees' attitudes may take additional time and effort.

Greater Stability and Accountability in Management Positions

Another way in which Alyeska is attempting to change its mindset is to create more stability—and therefore more accountability—in the ranks of upper management. Alyeska's upper-level management positions have traditionally been filled by managers loaned from the owner companies for short periods—usually 2 years. This situation has contributed to frequent turnover in senior positions and an emphasis on short-term production goals, according to JPO officials. Alyeska's owner companies have made several commitments to change the loaned-executive policy in the past year. First, they adopted a policy of reducing the number of loaned executives by 50 percent from 1993 levels by the end of 1997. Second, they

called for filling positions with the best qualified person whether the person was employed by an owner company, Alyeska itself, or an outside source. Third, in those cases in which positions were to be filled by loaned executives, they called for lengthening the time of the assignment to at least 3 years.

Development of New Quality and Maintenance Programs

At the level of day-to-day operations, the changes are reflected by the new quality and maintenance programs. Alyeska's senior management believes that these new systems can provide processes and procedures that will outlive management turnover and bring more long-term stability and accountability. As we discussed in chapter 3, Alyeska's efforts to implement these systems, if carried through to completion, do appear substantive enough to bring about significant improvement.

Recent Events Show Changing the Mindset Will Be a Gradual Process

These actions notwithstanding, it will take some time to change Alyeska's culture. For example, in the summer of 1994 there were at least three instances when Alyeska supervisors or managers tried to hide problems or punish employees for reporting "bad news." However, in each case, when Alyeska's top management was made aware of the incident, it took action to resolve the problem identified by the employee and, where appropriate, followed up with counseling and/or disciplinary action for the supervisor.

JPO Is Changing Its Role

As discussed in chapter 4, past studies have pointed to the need for JPO to change its regulatory role substantially. JPO is attempting to change its philosophy, organization, and monitoring techniques. Its goal is to be a more sophisticated and technically trained regulatory/compliance organization capable of independently reviewing and analyzing TAPS' plans, design, and systems. JPO's operating philosophy is intended to be one of quality management, which emphasizes preventing rather than reacting to problems through closer study and knowledge of TAPS' systems and processes.

Conclusions

As discussed throughout the report, as we completed our work, Alyeska and JPO were still in the process of taking action to correct deficiencies and improve performance. We remain encouraged by the level of effort expended so far by Alyeska and JPO to remove the underlying causes of problems with the operation and oversight of TAPS. If the actions under way are completed and fully implemented, we believe they will provide a

basis not only for fixing TAPS' current problems, but also for helping to ensure that they will not recur. However, because much work remains to be accomplished, the full effectiveness of Alyeska's and JPO's actions cannot be assessed in the short term and will be largely dependent on the following:

- Resolving the 4,920 action items in the ACT data base. Progress reports generated from the ACT data base provide JPO with updated information on Alyeska's progress. In turn, JPO has summarized Alyeska's progress in its annual report. These annual reports are required to be provided to congressional oversight committees. Information from the ACT data base and the annual report can provide those responsible for overseeing TAPS with the data needed to assess what progress is being made.
- Alyeska's following through on its commitment to implement quality and maintenance programs. Alyeska has the primary responsibility for ensuring that the pipeline operates in a safe, environmentally responsible manner. The actions planned by Alyeska to improve its quality and maintenance programs, if implemented, will help ensure that this improvement occurs. The key to this effort is for Alyeska to create and sustain a commitment to quality throughout its organization.
- Long-term support for JPO's oversight responsibilities. Strong, effective oversight of TAPS by JPO is critical for verifying that Alyeska and the owners fulfill their responsibility to resolve all TAPS' deficiencies as quickly and effectively as possible and, more importantly, for assuring the public over the long term that Alyeska operates the pipeline in a manner that meets the right-of-way requirements for a safe, environmentally responsible operation. JPO's ability to provide effective regulatory oversight will depend on having adequate funds and staff. The funding from Alyeska provides nearly the total foundation for JPO's effectiveness. As for JPO's staffing, BLM provides almost 45 percent of the staff positions; nearly all of the remainder comes from the state. Over the long term, as pipeline throughput decreases, Alyeska is likely to experience increasing pressure to reduce its costs, and BLM officials told us that downsizing at Interior eventually may put pressure on JPO's staffing levels as well. The impact of these pressures on JPO's budget and staff can affect JPO's ability to be an effective regulator.

Special Studies

Study number	Title
A1	Outdoor Cable Tray Study (VMT)[a]
A2	Conduit Supports (VMT)
A3	Operations Control Center Upgrade (VMT)
A4	Power House Cable Trays (VMT)
A5	Cable Tray in Pump Station Control Room (PS)[b]
A6	Weeping (Rockbestos) Cables
A7	Fire Water Pump House (VMT Berths 1 & 3) and PDC[c]-7 (VMT)
A8	Grounding, Phase I and Phase II (VMT)
A9	PDC-14 Work Space Clearance (VMT)
A10	Scanner System Study (Transferred to Control and Telecommunications Long Range Plan—SCADA[d] Study)
A11A	Motor Control Center Verification (PS)
A11B	Motor Control Center Verification (VMT)
A12	Communication and Control System Evaluation (Transferred to Long Range Plan SCADA Study)
A13	Seismic Study of Cable Tray System (Transferred to Specialized Seismic Study No. 3)
A14	Switching Procedure
A15	Heat Tracing at Berth #3 of VMT (Maintenance Issue—Transferred to APSC Operations)
A16	Control System Evaluation at Pump Stations (Transferred to Long Range Plan SCADA Study)
A17	Data Base Study for VMT (to help Operations only—study is completed)
A18	Power Distribution Center Underfloor and Water Seal
A19	Grounding at Pump Stations
A20	Turbine Room—High Temperature PS 1 Through 12

[a]VMT—Valdez Marine Terminal.

[b]PS—Pump Station.

[c]PDC—Power Distribution Center.

[d]SCADA—Supervisory Control And Data Acquisition.

Special Studies on Grounding, Inspection of Control Centers, and Power Switching Systems

Relying on the expertise of our staff electrical engineer, we reviewed three of the special engineering studies—grounding, inspection of motor control centers, and power switching systems—their conclusions, and their recommendations to determine whether the studies accurately assessed the problems and whether the recommended actions will address the problems. We selected these studies because they covered (1) large numbers of specific problems and (2) areas identified by various inspectors and whistleblowers. The studies covered the electrical grounding of the terminal's power distribution system, studies by nationally recognized testing laboratories on the components in various control centers, and the system for switching power on or off at various facilities.

Grounding

The grounding system protects workers from electric shock hazards in case of electrical malfunctions. The study assessed whether the system's design was adequate and whether the system was maintained to meet design requirements. Alyeska's principal electrical contractor, Fluor Daniel, relied on previous studies as well as its own review of the grounding system. Its study included visual inspections of the system as well as measurements of current flow to ensure the integrity of ground paths. We reviewed Fluor Daniel's methodology and its study. We also visually inspected parts of the system, reviewed various electrical requirements, and discussed the system with the electrical contractor's lead engineers and with other electrical experts.

Fluor concluded that the original design and construction of the terminal grounding system was good and provided adequate safety against electric shock that might be caused by fault conditions in the power distribution system. Fluor Daniel concluded that the condition of the electrical distribution system, including the grounding system, had degraded since original construction was completed in 1977. One comment in another study, which Fluor used in its evaluation, is particularly relevant. It said that additional maintenance will be required as the electrical system ages to ensure a continued level of performance. Alyeska, however, does not have a maintenance or operating philosophy to address the aging electrical power distribution system. In response to the condition of the grounding system and the lack of a maintenance program to maintain the system, the Fluor study recommended that the condition of the grounding system be restored to a safe and effective condition and that a maintenance program be designed to ensure the system's effectiveness.

The study also recommended that several additional assessments be completed. Alyeska completed these assessments and is performing repairs as part of the ANSC project to return the grounding system to its approved design. The engineering design needed to upgrade the terminal's grounding system is completed, and construction, now in progress, is scheduled to be completed by August 1, 1995. Fluor Daniel's assessment appears to reasonably characterize the condition of the terminal's grounding system and the steps Alyeska is taking to respond to the problems identified. Alyeska maintenance officials also told us they are revising their maintenance program to ensure that the grounding system's integrity is maintained. They said the preventive maintenance procedures that will cover the grounding system are scheduled to be issued in the second quarter of 1995.

Inspection of Motor Control Centers

While the electrical installation was inspected by electrical inspectors using AKOSH criteria as a standard, the control devices that supply power have also been inspected by two nationally recognized testing laboratories—one for the terminal and one for the pipeline. Alyeska used testing laboratories because few of these units had nationally recognized testing laboratory certifications. The two laboratories inspected the units, put labels on those that met requirements, and identified corrective actions needed on others. After the corrective actions are taken, the laboratories will reinspect to ensure that corrective actions were appropriately taken. The study's approach appears reasonable for identifying the electrical deficiencies in these facilities. Once repairs are made and labels have been placed by the testing laboratories, the deficiencies will be corrected. The engineering design needed to correct areas that could not be labeled after the initial inspection is completed. The construction required by the design is now under way and targeted for completion on July 31, 1995, at the pump stations and at the terminal.

Power Switching Systems

This study reviewed the processes at the terminal for turning off or on, power to equipment that is in a building remote from the building where the on/off switch is located. The study reviewed electrical code requirements and existing conditions and developed procedures for bringing power switching procedures in line with code requirements. These procedures provide for notices that power switching is at a remote location and for plaques to be located (1) near the equipment showing where the power can be switched off and (2) near the switch to show the location of the equipment being controlled. We also reviewed code

requirements, observed field equipment with power switching at remote locations, and reviewed proposed fixes. The planned corrective actions, if properly implemented, should bring the switching procedures into compliance with electrical code requirements. At the time of our review, the placards were being purchased and maintenance procedures were being written.

Comments From the Alyeska Pipeline Service Company

Alyeska pipeline SERVICE COMPANY
1835 SOUTH BRAGAW STREET ANCHORAGE, ALASKA 99512 TELEPHONE (907) 278-1611, FAX 265-8611, TELEX 265-8439

June 1, 1995 Letter No: 95-2976-G

Mr. Charles Bowsher
Comptroller General
United States
General Accounting Office
Washington, D.C. 20548

Dear Mr. Bowsher:

The GAO report is an objective professional assessment of the work by the TAPS Owners, Alyeska Pipeline Service Company and the Joint Pipeline Office to respond to recent government, internal and Owner audits and to create tools that will be used to prevent future problems by improving operations, maintenance and quality systems. Operating statistics for 1994 and 1995 confirm that while necessary changes are being made, the pipeline continues to operate with an exceptional and continuously improving performance record.

The TAPS Owners' and Alyeska will fulfill our commitment to Congress and the public to resolve all deficiencies in TAPS and to transport oil across Alaska safely, reliably, in compliance with all applicable laws and regulations and without harming the environment. We will achieve these goals cost effectively in a manner that contributes to a long operating life for the pipeline system. We are pleased that the GAO recognized our long history of operating TAPS without a major spill. It is a record we are proud of and intend to achieve over the life of the system.

We also appreciate the GAO's recognition of the progress we have made responding to the audits and the propriety of the direction we have set.

Sincerely yours,

David J. Pritchard
President and CEO
Alyeska Pipeline Service Company

Bob Malone
Chairman
TAPS Owners Committee

cc. Mr. John Anderson, Associate Director, GAO
Mr. James Duffus III, Director, Natural Resources Management Issues, GAO

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.	Emi Nakamura Duane G. Fitzgerald Robert E. Cronin
Office of the General Counsel	Stanley G. Feinstein
Seattle Regional Office	Sterling Leibenguth William Hanson Hugo W. Wolter Stanley G. Stenersen

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (301) 258-4097 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Mail
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested