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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Key Crude Oil And Products Pipelines Are Vulnerable To Disruptions

Pipelines--transporting about three-fourths of the crude oil delivered to refineries and one-third of the refined products moved from refineries to consumers--are highly vulnerable to disruptions caused by human error, sabotage, or nature.

Damage to key facilities on just a few pipeline systems could greatly reduce domestic shipments, causing an energy shortage exceeding that of the 1973 Arab oil embargo.

The petroleum industry is not emphasizing physical security and neither industry nor Government has developed contingency plans for reducing adverse effects of petroleum shortages should key pipeline facilities be damaged, causing serious disruptions.

The Department of Energy should, among other things,

- develop contingency plans to mitigate effects of petroleum shortages caused by prolonged pipeline disruptions and
- improve physical security, where needed, at critical pipeline facilities.



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report describes the lack of adequate physical security by industry and non-existent contingency planning by both industry and the Federal Government for domestic crude oil and petroleum products pipeline systems. We are recommending that the Department of Energy exercise its existing authority and that the Congress give the Department the needed additional authority to ensure that critical facilities have acceptable physical security measures and that--as a back-up--the Federal Government has adequate contingency plans.

Copies of this report are being sent to the Secretary of Energy and the Director, Office of Management and Budget.

A handwritten signature in black ink, appearing to read "Robert M. Stewart".

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

KEY CRUDE OIL AND
PRODUCTS PIPELINES
ARE VULNERABLE TO
DISRUPTIONS

D I G E S T

Pipelines play a critical role in this Nation's economic and social well-being--transporting about three-fourths of the crude oil delivered to its refineries and about one-third of the refined products moved from refineries to consumer areas. However, pipelines are vulnerable to disruptions caused by human error, sabotage, or natural disaster.

In the event key facilities on just a few important pipeline systems were damaged, domestic shipments could be greatly reduced. The United States could suffer an energy shortage exceeding that caused by the 1973 Arab oil embargo.

GAO found that the petroleum industry is not adequately emphasizing the physical security of some key pipeline systems. And neither industry nor the Federal Government has plans for dealing with the critical impact of petroleum shortages should key pipelines become seriously damaged and disruptions occur.

PIPELINE SYSTEMS ROLE

Long-haul pipeline systems consist of one or more mainline pipes with a series of pumps to push the product through the system. Pipelines used to transport large crude oil volumes originate at gathering facilities where crude is collected from several sources, including other pipelines or transportation modes, and they terminate at refineries. Those used to transport petroleum products (gasoline, fuel and heating oils, jet fuel, and kerosine) usually originate at refineries and terminate at distribution points in or near consumer areas. For many systems, centralized computer control is commonplace and virtually necessary for handling the tremendous traffic. (See pp. 6 and 23.)

THREE IMPORTANT SYSTEMS

The existence in the pipeline network of a few pipeline systems which transport substantial volumes of the petroleum used every day underscores their importance. The Trans-Alaska and Capline pipeline systems, for example, have maximum capacities of 1.2 million barrels daily, and their annual deliveries total about 400 million barrels, or together about 15 percent of all crude transported to refineries. The Colonial petroleum products pipeline system has a maximum daily capacity of 2.1 million barrels and transports about 600 million barrels of motor gasoline, fuel and heating oils, and jet fuel on an annual basis. This volume represents about 9 percent of total domestic demand for refined products and an average of 40 percent of the demand in 13 Southeastern and Mid-Atlantic States, and the District of Columbia.

Together, Trans-Alaska, Capline, and Colonial move a total of 4.5 million barrels daily. This is more than one and one-half times the daily volume of crude oil the United States lost at the height of the 1973 Arab oil embargo and about eight times the volume the United States was getting from Iran before imports stopped in 1978. (See p. 6.)

Should the petroleum moved through any of these important systems be suddenly and seriously curtailed, adverse consequences could be enormous. The 1.2-million-barrel-per-day Trans-Alaska pipeline system (TAPS) is reducing U.S. import requirements by at least \$24 million daily. There is no alternate transportation for moving Alaskan crude should TAPS become inoperative. Therefore, the United States would be forced to increase imports--providing more crude could even be purchased--or domestic refineries would have to decrease their processing levels. (See p. 39.)

The Capline system is important because it provides Midwest refineries with about 25 percent of their crude oil needs. Its throughput cannot

be absorbed by other transportation modes should serious disruption occur. Capline is also important in that the Department of Energy will heavily depend on the system for distributing crude from the Strategic Petroleum Reserve. Since adequate alternate transportation is not available, stringent conservation, gasoline rationing, declines in factory output, colder homes, higher unemployment, or other problems could result. (See p. 36.)

A disruption of the Colonial system could have similar adverse consequences for Southeastern and Mid-Atlantic States--far greater than those created by the 1973 Arab oil embargo. Virginia, Maryland, North and South Carolina, Georgia, New Jersey, and Tennessee would be especially hardpressed. These States get from 52 to 82 percent of their refined products through Colonial. Other pipelines or transportation modes cannot absorb enough of Colonial's "throughput" to prevent adverse consequences. (See p. 11.)

PIPELINE SYSTEMS' VULNERABILITY WIDELY RECOGNIZED

Pipeline system vulnerability, especially to sabotage, is recognized in Government and industry. During GAO's evaluation, public and private officials consulted and Government studies reviewed widely recognized this vulnerability to sabotage. Facilities and locations named as most critical were pump stations, input stations, river crossings, intersections with other systems, and centralized computers which remotely control operations. They said these are the most attractive targets for saboteurs because, if damaged, they could require up to 6 months or more for repair.

Government studies have also recognized the crippling effect on energy distribution which could result from widespread sabotage. One of the studies concluded that destruction of just 10 critical points would completely halt refined petroleum product movement through three major pipeline systems, including Colonial. Another study

noted the vulnerability of the Nation's two largest refined petroleum products pipelines--Colonial and Plantation. These pipelines, which provide the eastern seaboard with most of its products, have centralized controls housed in the same building, which is publicly accessible. (See p. 15.)

Although pipeline systems' vulnerability to both sabotage and earthquakes is recognized, their vulnerability to sabotage has received little or no attention. Industry has at least developed standards which the Department of Transportation requires for designing and constructing pipelines to protect them from earthquakes. However, no similar attention has been given to protecting pipelines from sabotage. (See p. 26.)

PHYSICAL SECURITY INADE-
QUATE AND CONTINGENCY PLANS
VIRTUALLY NON-EXISTENT

Even though pipelines are extremely important, physical security at key facilities generally is inadequate for discouraging sabotage. There are no formal plans for dealing with serious disruptions due to any cause. (See p. 26.)

GAO visited several pump stations, input stations, and other facilities of the Colonial, Capline, and Trans-Alaska systems and noted physical security measures ranging from virtually nothing to armed guards and highly sophisticated electronic detectors. (See p. 29.)

A GAO visit to one facility, operating as both an input and a pump station, demonstrated the ease of access and the potential for disruptions. GAO officials freely drove onto the station's fenced grounds, parked, and entered the operations building before having their identifications checked. They observed several other vehicles freely entering and departing the site without checks. They also observed that the station's main and backup power transformers were adjacent to each other, making sabotage potentially more disruptive. Even though the

station employs six people on an 8-hour day shift, only one employee is present during each of the 8-hour evening and morning shifts and no guard force is used. Station employees are responsible for security as part of their normal duties. (See p. 26.)

Another pipeline system's major input station GAO visited can also be entered freely. Although the station's gates are locked during the night, no record is kept on who has keys. In addition, the general public easily can walk along an unrestricted catwalk which extends from a public road over the station's perimeter fence to a building in the station housing the system's primary computer controls. (See p. 26.)

Physical security at facilities along the Trans-Alaska pipeline system was considerably more extensive. Pump stations, terminals, and the Yukon River crossing employed armed guards and, in some cases, television cameras for controlling access and daily aerial surveillance. Additionally, Alyeska Pipeline Service Company (the line operator) is negotiating a contract with a consulting firm to assess system security and to test certain instruments for suitability in enhancing line security.

Although physical security at some important pipeline facilities is minimal, neither industry nor Government officials GAO contacted see a need for formal plans to deal with interruptions in the flow of petroleum. They believe that industry can quickly repair damaged facilities and prevent lengthy disruptions without formal plans. Furthermore, they are convinced that pipeline disruptions by sabotage should not be of much concern because of the historically low level of sabotage against pipelines. Also, they question the need for increased security at pipeline facilities and believe that no level of physical security will stop well-trained, determined saboteurs. (See p. 26.)

The Federal Preparedness Agency--the agency responsible for overall Federal emergency preparedness, policy direction, and guidance prior to July 1979--recognizes that overall Federal emergency preparedness provisions against sabotage and other criminal attacks have not been adequately implemented. In addition, the Department of Energy is unsure of its

responsibilities and, in any event, does not place pipeline security high enough on its priority list to warrant special attention. (See p. 42.)

CONCLUSIONS

GAO recognizes that no level of physical security will be fail-safe against highly motivated, well-trained saboteurs. However, physical security measures, such as locking gates and checking personal identification, are basic precautions which may discourage persons who are less motivated and/or not so well-trained. Additionally, measures such as separating operational and back-up equipment may reduce the potential effects of sabotage on the movement of petroleum supplies. The industry is not emphasizing basic precautions--even at some critical facilities--which, if damaged or destroyed, could require months to repair.

Although industry is capable of quickly repairing minor damage--such as breaks in pipe--the time to repair complex facilities, such as pump stations, may extend to 6 months or more. In the interim, the flow of petroleum could be severely curtailed and cause excessive hardships, since neither industry nor Government has contingency plans.

While the potential consequences of inadequate physical security may be acceptable to industry--where risks are shared by many companies--GAO does not see such risks as acceptable to the Nation as a whole. Because of this Nation's heavy dependence on petroleum supplies and the enormous adverse effects a supply interruption could have, important pipeline facilities need better physical protection--and the Federal Government needs to have back-up contingency plans. This Nation has too much at stake in pipeline systems not to have a focal point in the Government for

--keeping abreast of developments which could interfere with petroleum movements through pipelines;

--Developing and enforcing minimum physical security standards for pipelines

which are critical to national welfare,
and

- developing plans for minimizing the potential adverse effects should disruptions occur.

RECOMMENDATIONS

The Secretary of Energy should establish within his Department a focal point for energy security matters and make it responsible for

- analyzing the entire petroleum network to identify critical pipelines and related facilities which, if damaged, could seriously disrupt the flow of petroleum and adversely affect the Nation's well-being, and
- collecting relevant intelligence information from cognizant Government agencies and providing the petroleum industry with advance warning of potential dangers, such as sabotage, which could damage pipelines and related facilities and interrupt petroleum supplies.

Additionally, GAO recommends that the Secretary begin developing actions in the following areas, while the Congress considers strengthening these authorities with legislation,

- Minimum physical security standards for critical pipelines and related facilities.
- Contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems.

To minimize the cost and reduce the time to implement their physical security and contingency program, GAO recommends the Department draw upon, coordinate with, and otherwise build on, for civilian purposes, the expertise already established within the Defense Logistics Agency.

GAO recommends that the Congress consider legislation which will give the Department of Energy clear authority to

- make on-site visits to pipeline facilities necessary for identifying and analyzing critical pipelines and related facilities;
- develop minimum physical security standards and establish penalties for non-compliance and administrative procedures for appeal;
- conduct periodic inspections for determining compliance and for reassessing physical security requirements; and
- develop and periodically update contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems, including Capline, Colonial, and Trans-Alaska.

Legislation should also be enacted to make the willful damaging of an interstate petroleum pipeline or its related facilities a Federal criminal offense and impose a fine and/or imprisonment for any person committing such acts.

To expedite implementation of these functions, the Congress should require the Department of Energy to submit--within 6 months after enactment of the legislation called for above--its overall program for pipeline security and contingency planning. The program should become effective 90 days after the Congress receives it, providing neither House rejects it by resolution within that time.

AGENCY AND INDUSTRY COMMENTS

The Department of Energy and pipeline companies, in commenting on a draft of this report (see apps. I through IV), noted that

domestic pipelines will always be vulnerable to well-trained saboteurs but that few acts of disruptive sabotage have occurred during this Nation's history. As a result, they believe that the physical security of pipelines as well as contingency planning for any disruption should be the responsibility of private industry. Unwarranted Federal involvement at this time, they suggest, would only create additional regulations and add to the already inflationary economy, especially for those pipelines that have implemented stringent physical security measures.

GAO agrees that pipeline security should rest primarily with pipeline operators, but affirms that some minimal level of Federal oversight is needed because of the criticality of some pipelines to the Nation. GAO is not advocating a new agency--or even an extensive addition to an existing agency; rather that the Department of Energy exercise its present authority and that the Congress give it needed additional authority to ensure that critical facilities have minimally acceptable physical security and contingency planning. This would not mean necessarily that all pipelines would be affected. In fact, it would apply only to those pipelines considered critical to the Nation in the event of a prolonged disruption. Even for those affected, the cost would be miniscule--and thus justified--in relation to the reduction in risk and increase in public confidence that the Nation's economic and social well-being will not falter due to a pipeline disruption.

In addition--to further reduce cost to the Government--GAO fully expects that the Department, in carrying out its responsibilities, will draw upon, coordinate with, and otherwise build upon the expertise already established, for military purposes, within the Defense Logistics Agency.

In the case of the Colonial Pipeline Company, positive steps have been taken to improve security--as a result of GAO's visit and

disclosures in the draft report, as well as through Colonial's voluntary participation in the Defense Logistics Agency's program. (See app. IV.) These actions are indicative of the benefits to be derived by pipeline companies as a result of minimum Federal oversight and mandatory participation in programs such as offered by the Defense Logistics Agency--precisely what GAO is advocating.

C o n t e n t s

	<u>Page</u>
DIGEST	i
CHAPTER	
1 INTRODUCTION	1
Federal agencies and petroleum pipeline security	1
The Congress and petroleum pipeline security	1
Scope of review	3
2 KEY PIPELINE SYSTEMS NEED SPECIAL EMPHASIS	5
Pipeline system characteristics and operation	6
Three critical pipeline systems	6
Capline pipeline system	6
Trans-Alaska pipeline system	7
Colonial pipeline system	11
Pipeline systems' vulnerability is widely recognized	15
Exposed facilities	22
Centralized control	23
Inadequate numbers of maintenance personnel	23
Available spare parts may be insufficient	24
Detailed pipeline information is widely disseminated	24
Physical security against sabotage is not being emphasized	26
Security measures are inadequate for deterring sabotage	26
Factors affecting physical security levels	29
Past experience and threat perceptions	30
Effectiveness of physical security	30
Confidence in industry's ability to adequately respond to adversity	31
Risk consequences	33
Potential adverse effects of disruption could be enormous	34
Inadequacies of alternative forms of transportation	35
Capline	36
Colonial	37
Trans-Alaska pipeline system	39

CHAPTER	<u>Page</u>	
3	FEDERAL CIVIL PREPAREDNESS PROVISIONS ARE NOT BEING IMPLEMENTED	41
	DOE has no emergency plans for pipeline systems	41
	Overall Federal emergency preparedness is incoherent	42
4	CONCLUSIONS AND RECOMMENDATIONS	47
	Conclusions	47
	Recommendations	49
5	AGENCY AND INDUSTRY COMMENTS AND OUR EVALUATION	52
	Federal Preparedness Agency	52
	Department of Energy	52
	Alyeska Pipeline Service Company	53
	Shell Pipeline Corporation	54
	Colonial Pipeline Company	56

APPENDIX

I	May 8, 1979, comments from the Department of Energy	59
II	May 15, 1979, comments from Alyeska Pipeline Service Company	60
III	May 11, 1979, comments from Shell Pipeline Corporation	62
IV	June 4, 1979, comments from Colonial Pipeline Company	66

ABBREVIATIONS

CRS	Congressional Research Service
DOD	Department of Defense
DOE	Department of Energy
FPA	Federal Preparedness Agency
OPEC	Organization of Petroleum Exporting Countries
TAPS	Trans-Alaska pipeline system

CHAPTER 1

INTRODUCTION

FEDERAL AGENCIES AND PETROLEUM PIPELINE SECURITY

* Federal agencies are authorized: under Presidential
Executive Orders 10421, as amended, and 11490, as amended,
to implement programs providing for the physical security
of facilities important to national defense and the essen-
tial civilian economy. Respectively, the orders

--establish Federal agency responsibility for developing
and executing programs and measures to minimize vulner-
ability of facilities within their jurisdiction to
sabotage, espionage, and other hostilities; and

--specify facilities for which individual agencies
are responsible.

The Federal Preparedness Agency (FPA) ^{1/} was responsible,
prior to July 1979, for coordinating overall Federal emergency
preparedness and for providing policy direction and guidance
to other agencies. By Presidential Executive Order 12038
(Feb. 3, 1978), the Department of Energy (DOE) was assigned
responsibility for preparing national emergency plans and
developing programs covering transportation and storage
facilities for petroleum supplies.

THE CONGRESS AND PETROLEUM PIPELINE SECURITY

No Federal legislation deals comprehensively with the
issue of physical security of petroleum pipelines. Exist-
ing legislation either addresses security for a specific
pipeline system or emphasizes protection of the environment
and human life, and the avoidance of property damage. The
Alaska Natural Gas Transportation Act of 1976 (Public Law
94-586), for example, mandates the President to address
"national security, particularly security of supply," when

^{1/}Within the General Services Administration. Prior to Exec-
utive Order 11725 (June 27, 1973), FPA functions were car-
ried out by the former Office of Emergency Preparedness,
Executive Office of the President. These functions of FPA
were reassigned to the Director of the new Federal Emergency
Management Agency by Executive Order 12148 (July 20, 1979).

recommending the selection of a route for the Alaskan gas pipeline project. The Mineral Lands Leasing Act of 1920, as amended by Public Law 95-153 (dated Nov. 16, 1973), specifies that pipeline safety measures be imposed as conditions of right-of-way permit to "protect the safety of workers and protect the public from sudden ruptures and slow degradation of the pipeline." It also specifies measures to safeguard the environment and to facilitate restoration where damage occurs.

The Congress recently expressed concern about pipeline security in general. The concern stemmed primarily from recognition of (1) the importance of pipeline transportation for moving Alaska's huge oil and gas reserves and (2) the importance of all pipelines in transporting petroleum resources vital to this Nation's economic well-being. Several bills introduced in the 95th Congress proposed various means for dealing with the physical security of pipelines and other energy systems, but none resulted in legislation. A Senate bill (2548), which was referred to the Committee on Governmental Affairs on February 21, 1978, proposed establishing within DOE an Office of Energy Security to coordinate Federal activities to maintain the security of the Trans-Alaska pipeline system and to preserve and secure all U.S. oil and gas resources. Principal tasks of the proposed office would include

- coordinating, supervising, and providing policy direction and inspection of people and facilities to secure oil and gas (1) processing, (2) transportation, and (3) handling against threats, thefts, terrorism, or other criminal attacks, and sabotage; and
- monitoring and conducting tests of facilities for the purpose of recommending to DOE and the Congress ways for improving the security of oil storage facilities, pumping stations, and pipelines.

No action was taken on the bill.

A House bill (11622), referred to the Committee on Interstate and Foreign Commerce on March 16, 1978, would impose a \$15,000 maximum fine and/or a 15-year maximum imprisonment for anyone who willfully damages or destroys any interstate transmission pipeline facilities. The text of this bill, although modified in some other respects, has been reintroduced as House bill 51 in the 96th Congress.

The concerns expressed by the Congress coincide with our review objectives. Our objectives were to

- assess the vulnerability of major U.S. oil and refined petroleum product pipelines to sabotage, natural disasters, or other causes;
- determine the impact major disruptions may have on the U.S. as a whole or on certain geographical areas;
- assess the adequacy of industry and Federal Government measures to protect pipelines from disruptions; and
- assess the adequacy of industry and Federal Government contingency planning for minimizing the impact of disruptions.

SCOPE OF REVIEW

Our evaluation focused on the security plans and activities of Federal and State Government agencies and private companies relating to the Capline, Trans-Alaska, and Colonial petroleum pipeline systems. We held discussions and, where appropriate, reviewed studies and documents at the following Federal agencies:

- Department of Energy.
- Federal Preparedness Agency.
- Department of Defense (DOD).
- Department of Transportation.
- Department of Justice (Federal Bureau of Investigation).
- Department of the Interior.

We made contacts and held interviews with various State agencies in Alaska, Texas, and Louisiana.

We also contacted officials of petroleum companies including those operating pipelines, those who share pipeline ownership and are also shippers, and others who are shippers only. We discussed company contingency plans for re-routing

petroleum supplies should major pipeline disruptions occur. We also surveyed physical security at pipeline facilities in Alaska, Louisiana, Mississippi, Texas, and Virginia. In conducting the surveys, we were assisted by experts from DOD's Defense Logistics Agency. The Defense Logistics Agency has an Industrial Facilities Protection Program under which it annually surveys physical security at petroleum and other facilities important to national defense. Private companies participating in the program do so voluntarily.

CHAPTER 2

KEY PIPELINE SYSTEMS NEED

SPECIAL EMPHASIS

This Nation's economic and social well-being depends on having adequate crude petroleum and refined petroleum products where and when needed. Crude petroleum is refined into such products as

- heating fuels for homes, offices, and factories;
- gasoline for motor vehicles;
- jet fuel for commercial and military aircraft;
- fuel for running industrial equipment;
- feedstocks for petrochemical plants; and
- energy for numerous other purposes.

Domestic demand for refined petroleum products in 1977 was 6.7 billion barrels. Most of it was for: motor gasoline (39 percent), distillate fuel oil (18 percent), residual fuel oil (16 percent), jet fuel (6 percent), and natural gas liquids (8 percent).

The petroleum industry relies on pipelines, water-borne carriers (tankers and barges), and over-land carriers (trucks and railcars) to move crude petroleum from production sites to refineries, and then move the refined petroleum products from refineries to consumer areas. Pipelines are by far the major mover of crude petroleum and the primary mover of petroleum products over long distances. About 4.1 billion barrels of crude petroleum shipments were made by all transportation modes in 1976, 1/ of which about 3.1 billion barrels (or 75 percent) were moved by pipelines.

1/The use of data for the years 1976 and 1977 are necessitated because they are the most recent available for total petroleum products.

Petroleum product shipments totaled about 10.3 billion ^{2/} barrels in 1976, of which about 3.7 billion barrels (or 36 percent) were moved by pipelines.

PIPELINE SYSTEM CHARACTERISTICS AND OPERATION

Pipeline systems vary considerably in size and complexity, depending on the use and demand for the products being carried. Small diameter pipelines generally are used for collecting crude petroleum from wells and delivering it to central gathering points. Larger diameter pipelines, as well as other transportation modes, move crude from gathering points to input terminals on major transmission lines. These major pipelines move crude oil to refineries and products from refineries to consumer areas often hundreds of miles away. They consist of one or more mainline pipes with a series of pumps that push products through the system. For many systems, centralized computer control is commonplace and virtually necessary for handling the tremendous traffic.

THREE CRITICAL PIPELINE SYSTEMS

The Capline, Trans-Alaska, and Colonial pipeline systems illustrate the importance of a few domestic pipelines in transporting crude and refined products. Together, the Capline and Trans-Alaska systems transport volumes equal to about 15 percent of the crude oil shipped to domestic refineries daily. The Colonial system transports a daily volume of refined petroleum products equal to about 9 percent of domestic demand. Yet, the 6,049 miles of pipe used in all three systems equals less than 3 percent of the Nation's 230,000 miles of pipeline. These important systems are described below.

Capline pipeline system

Capline is a 40-inch diameter crude oil pipeline system extending 632 miles from St. James, Louisiana, to Patoka,

^{2/}This number is greater than total domestic demand because some of the same products shipped by one carrier were also shipped by another.

Illinois. (See fig. 1.) The line has a maximum daily capacity of 1.2 million barrels and annually delivers about 400 million barrels of crude oil, supplying Midwest refineries with about 25 percent of their needs. This volume equals about 7.5 percent of all the crude oil processed by United States refineries in 1977. Capline receives 900,000 barrels of crude oil from Gulf of Mexico tanker and barge deliveries and another 300,000 barrels from other pipelines in Louisiana and Mississippi.

The entire Capline system is monitored and controlled by a remote computer center at St. James. Crude oil is boosted through the system by 16 pump stations located at 40 to 50 mile intervals. Five connecting pipelines distribute the crude from Patoka to Midwest refineries.

Refiner reliance on Capline for crude emphasizes the system's importance to Midwest refineries. Some refineries receive more than 50 percent of their crude oil supply through Capline. For example, one refiner supplying 2 to 3 percent of the demand in a 13-State area receives 92 percent of the crude for two refineries through Capline.

Capline has added importance because it is the largest of three pipeline systems designated for distributing crude from DOE's Strategic Petroleum Reserve in southern Louisiana and Texas. The reserve is intended to decrease U.S. vulnerability to the effects of a reduction in petroleum, such as those caused by the 1973 Arab oil embargo.

Trans-Alaska pipeline system

The Trans-Alaska pipeline system (TAPS) is a 48-inch crude oil pipeline extending from Prudhoe Bay on Alaska's North Slope south to Port Valdez. (See fig. 2.) An operations control center at Valdez remotely controls and monitors the entire 800-mile pipeline, which contains about 9 million barrels of oil at any given time. Eight pump stations boost crude oil through the system at a daily rate of 1.2 million barrels, providing annual deliveries of about 400 million barrels. This volume equals about 7.5 percent of crude runs to all United States refineries in 1977. The system's capacity can be expanded to 2 million barrels daily (730 million annually) by constructing four additional pump stations and installing additional pumps at existing stations.

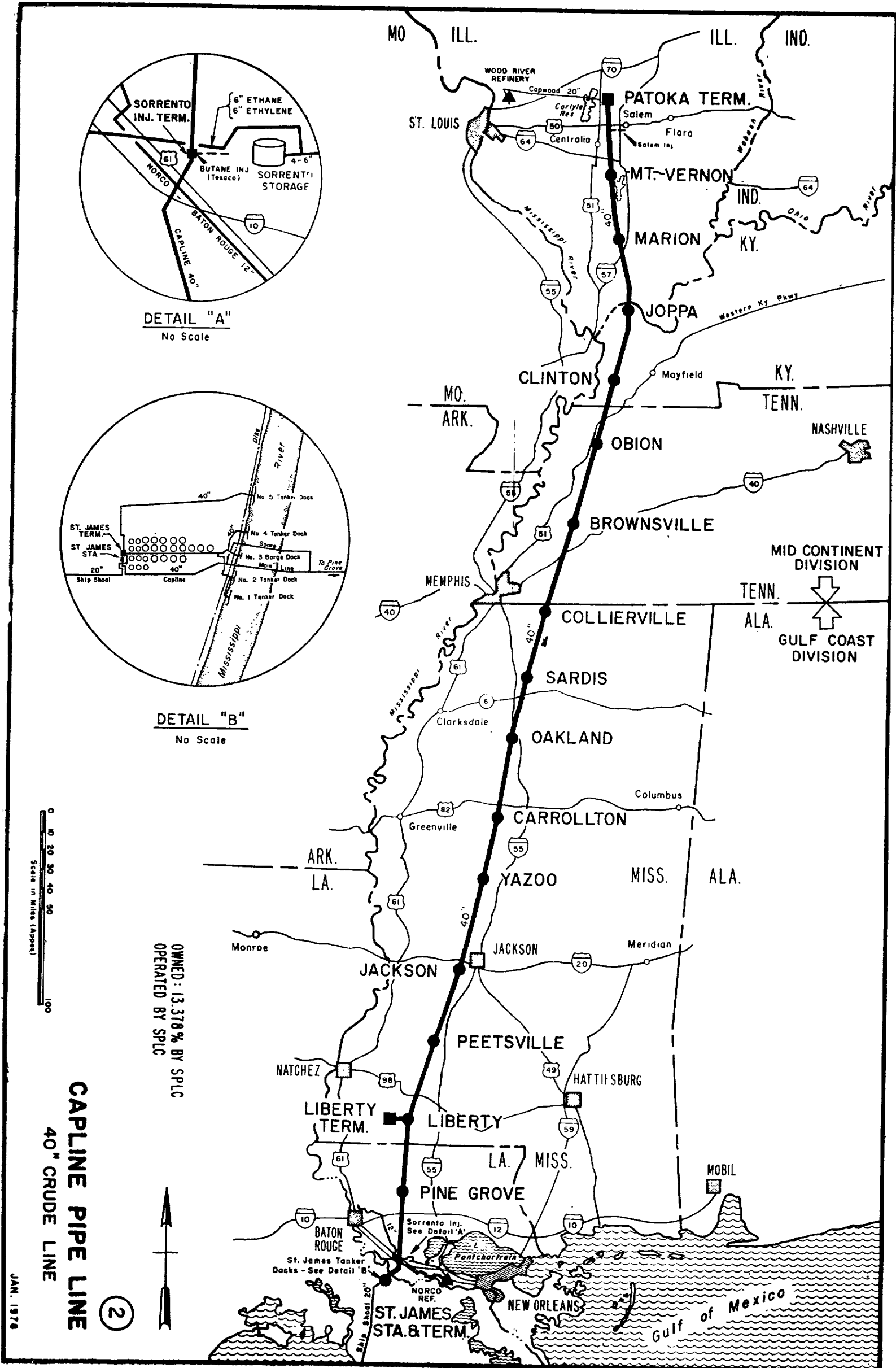


Figure 1. Capline crude oil pipeline system.

TAPS is the only year-round means of transporting crude from Alaska's oil rich Prudhoe Bay. In July 1978, we reported that crude oil production from Alaska's North Slope was displacing Middle East crude oil imports. From the time TAPS began operations in June 1977 through the end of 1977, an estimated \$1.3-billion improvement in the U.S. balance of payments accrued through foreign oil import reductions. An additional improvement of an estimated \$5.8 billion occurred in 1978. Greater future reductions in our balance of payments are expected because of the anticipated increase in this line's capacity.

Colonial pipeline system

The Colonial petroleum products pipeline extends about 1,600 miles from Houston, Texas, to Linden, New Jersey. (See fig. 3.) It is centrally controlled by computerized facilities at Atlanta, Georgia. The system consists of over 4,600 miles of pipe, including two main lines, 30 to 40 inches in diameter. It delivers products from Gulf Coast area refineries to 249 marketing terminals in the South and along the East Coast. Colonial's 81 pump stations currently move products at a 2.1 million barrel daily rate providing about 600 million barrels of deliveries annually. This volume represents about 9 percent of total domestic demand for refined products in 1977. An ongoing expansion program will eventually increase system throughput capacity to about 840 million barrels annually (2.3 million daily). (See fig. 4, pp. 16 to 19.)

Through continuous expansions, Colonial has increased its market share from 24 percent in 1965 to about 40 percent currently. In 1978 Colonial's deliveries of gasoline, kerosine, and fuel oil met the demand in a 13-State area, from Louisiana to New York and in the District of Columbia, as shown on page 12.

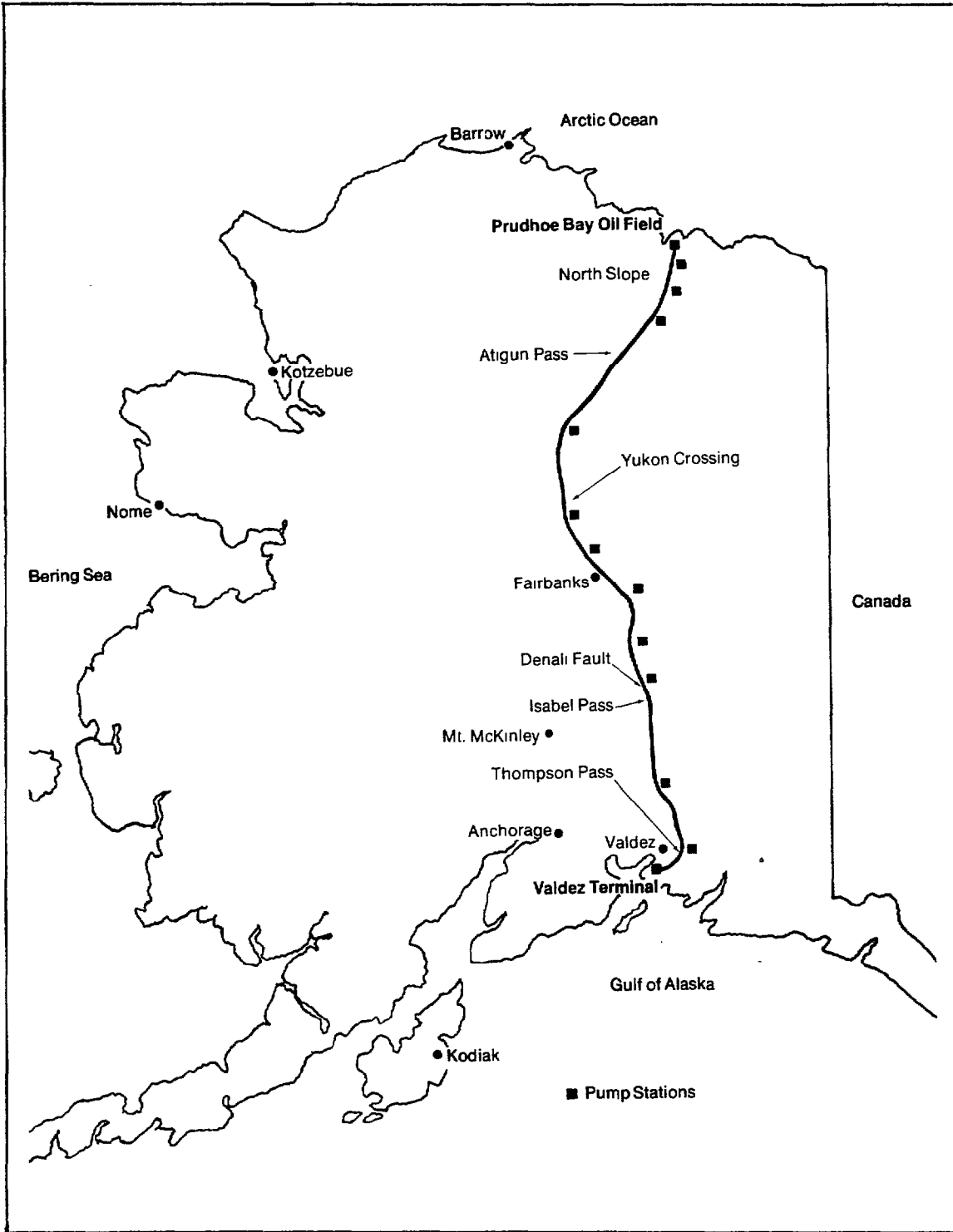


Figure 2. Trans-Alaska crude oil pipeline system.

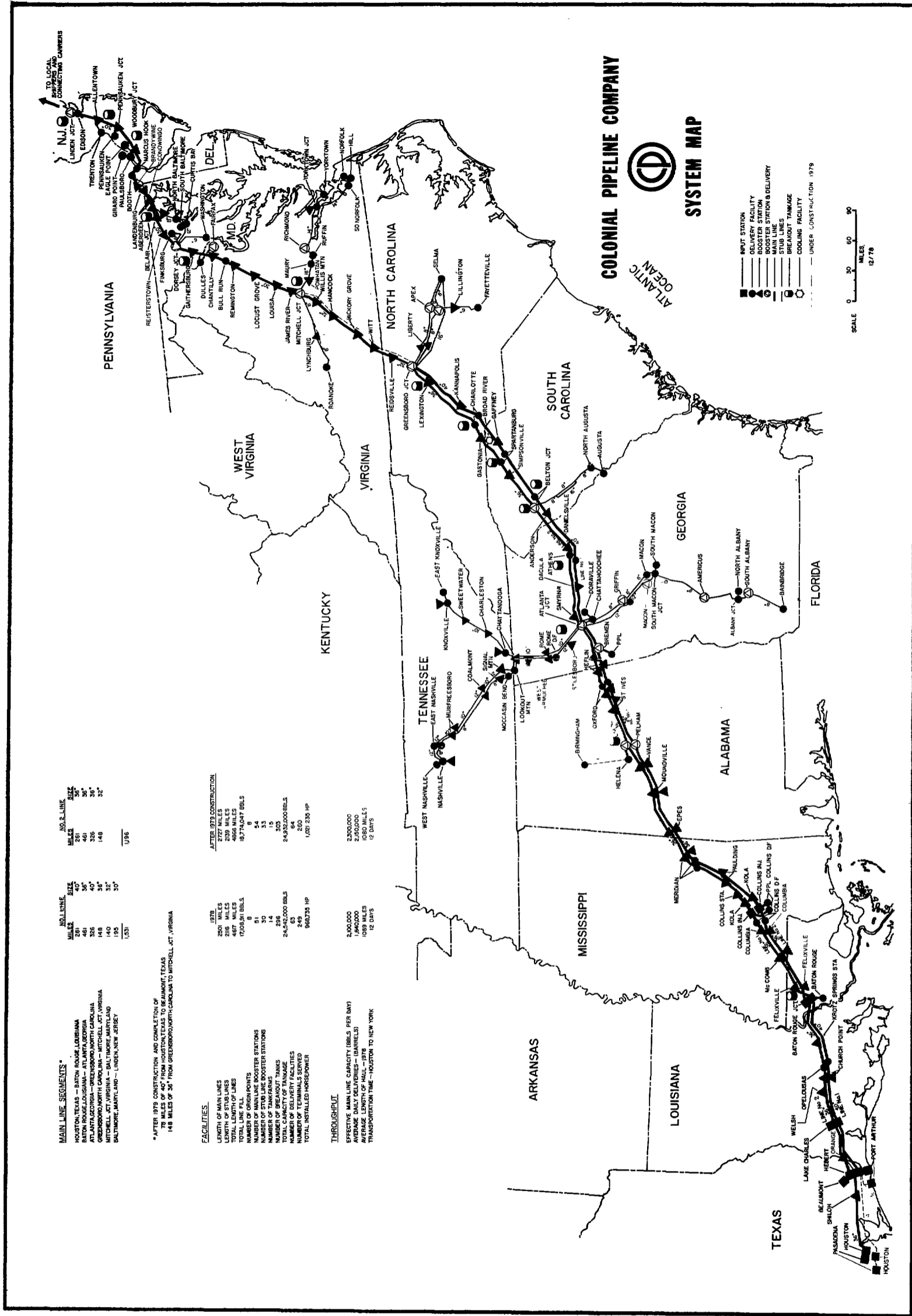


Figure 3. Colonial petroleum products pipeline system.

<u>State</u>	<u>Percent of consumer petroleum products supplied by Colonial</u>
Virginia	82.1
New Jersey	80.0
North Carolina	66.3
Maryland	58.4
Tennessee	52.7
South Carolina	51.9
Georgia	51.8
Alabama	35.3
Washington, D.C.	25.4
Mississippi	16.8
New York	16.2
Pennsylvania	15.1
Louisiana	5.3
Delaware	<u>2.3</u>
Total area average	<u>40.1</u>

Products transported by Colonial provided seven States with at least 50 percent of their total requirements, emphasizing the system's importance. The volume Colonial carries makes it the largest volume domestic petroleum products pipeline.

PIPELINE SYSTEMS' VULNERABILITY
WIDELY RECOGNIZED

Pipeline systems' vulnerability to sabotage and natural disasters is recognized in industry and the Government. Government studies we reviewed and industry and Government officials we contacted considered pipeline input terminals, pump stations, river crossings, and exposed interconnections with other pipeline systems as important points of vulnerability. They stated that if these facilities and locations were damaged, substantial reductions in petroleum movement could exist for a period of up to 6 months or longer while facilities were being repaired or replaced. 1/

1/The actual time required to repair a facility varies depending on its size, complexity and other factors such as weather and safety conditions. A damaged Trans-Alaska pipeline pump station required about 9 months for repair.

FIG. 4 COLONIAL'S ON-GOING EXPANSION PROGRAM

**SCENES FROM COLONIAL PIPELINE CONSTRUCTION-1978
(ATLANTA-GREENSBORO 40" DIAMETER PIPELINE)**

RIGHT OF WAY EASEMENTS AND PERMITS MUST BE ACQUIRED BEFORE ANY WORK COMMENCES. AFTER PERMISSION IS OBTAINED TO CROSS PROPERTY, THE CONSTRUCTION PROGRESSES IN THE FOLLOWING SEQUENCE:

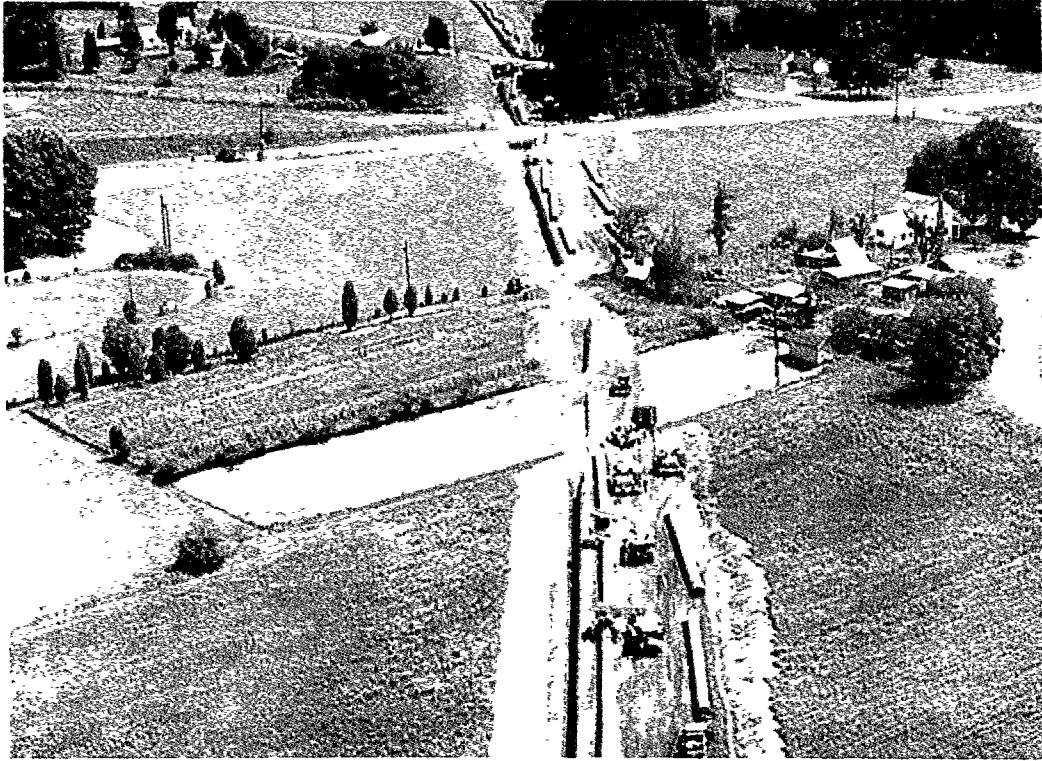


A CONSTRUCTION WORK AREA (RIGHT OF WAY) IS CLEARED OF TIMBER OR BRUSH AND GRADED.



A DITCH IS EXCAVATED TO AN APPROPRIATE DEPTH AND WIDTH. JOINTS OF PIPE (40 , 60 , OR 80' IN LENGTH) ARE HAULED TO THE RIGHT OF WAY AND STRUNG ALONG THE DITCH.

FIGURE 4 CONTINUED



TRACTORS WITH SIDE BOOMS HOLD PIPE IN LINE SO EACH SECTION OR JOINT CAN BE WELDED TO THE NEXT TO FORM ONE CONTINUOUS PIPE. ALL WELDS ARE INSPECTED.

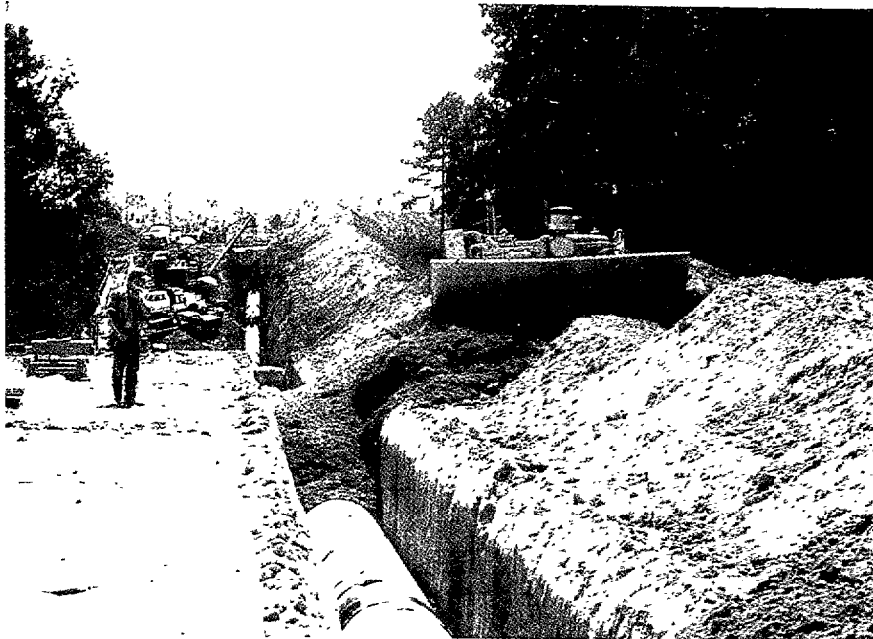


THE PIPE IS COATED WITH PROTECTIVE MATERIALS EITHER "OVER THE DITCH" OR AT A SITE REMOVED FROM THE CONSTRUCTION AREA. PIPE COATINGS ARE INSPECTED AND TESTED.

FIGURE 4 CONTINUED

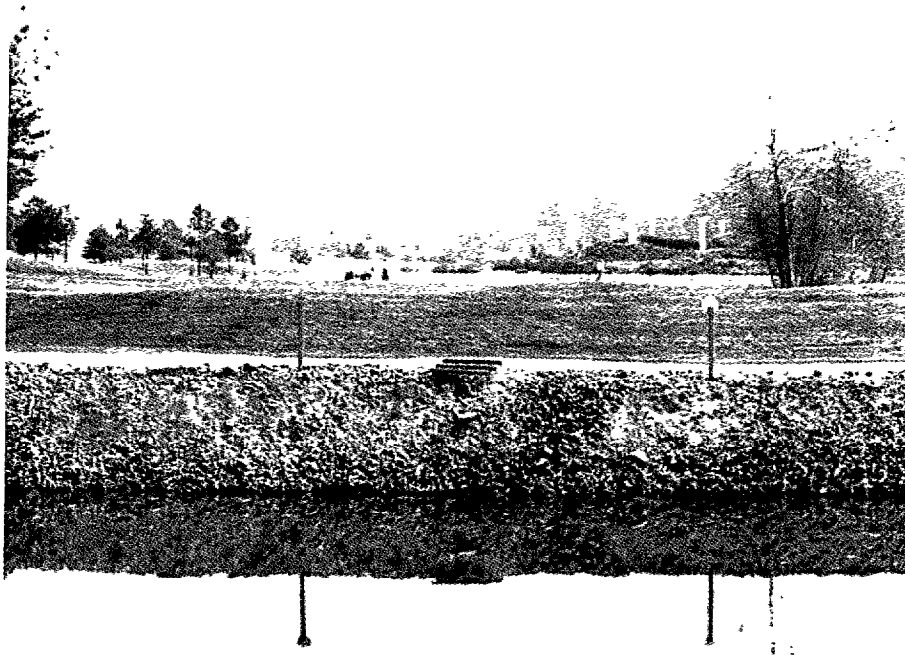


THE COMPLETED SECTION OF PIPE IS GENTLY LAID IN THE DITCH. IN ROCK AREAS, THE PIPE RESTS ON EARTHEN OR POLYURETHANE PADS.



CLEAN DIRT (FREE OF ROCK AND DEBRIS) IS THEN USED TO BACKFILL UNDER, AROUND AND OVER THE PIPE. SURPLUS DIRT IS USED TO FORM A CROWN OVER THE DITCH TO ALLOW FOR SETTLEMENT. THE COMPLETED PIPE IS PRESSURE TESTED.

FIGURE 4 CONTINUED



FOREIGN MATERIALS ARE REMOVED FROM THE CONSTRUCTION AREA. USING DISCS, HARROWS AND PLOWS; CONTRACTOR LEAVES RIGHT OF WAY IN AS NEAR THE ORIGINAL CONDITION AS POSSIBLE. CONSTRUCTION PATH (WITH THE EXCEPTION OF CULTIVATED LAND) IS FERTILIZED AND SEED. THIS SCENE IS ACROSS THE ATLANTA COUNTRY CLUB



PUMP STATIONS ARE CONSTRUCTED APPROXIMATELY 30 TO 60 MILES APART AT SITES SELECTED FOR OPTIMUM HYDRAULICS. THESE PUMP STATIONS MAINTAIN PRESSURE AND FLOW THROUGH THE PIPELINE SYSTEM.

The net effect of damage to critical pipeline facilities would be the same regardless of the cause of destruction. Pipeline vulnerability to sabotage, however, affords a greater opportunity for major supply disruptions. For one thing, because line pipe is usually buried and above ground facilities are widely dispersed, pipelines are virtually unaffected by natural hazards, except earthquakes. For another, industry standards and Government regulations specify requirements for designing and constructing pipeline systems to withstand earthquakes and other forces. The Department of Transportation's regulations (49 C.F.R. 195.110) require that anticipated external pressure be provided for in designing pipeline systems. They specify that design must meet American National Standards Institute requirements.

There is no such emphasis on mitigating the potential adverse effects that could result from sabotage. Vulnerability to sabotage is highlighted in several Government studies. A March 1978 Congressional Research Service (CRS) report 1/ states that although all energy transportation forms are vulnerable to sabotage or terrorist action, pipeline systems are perhaps uniquely vulnerable. According to the report:

"These pipelines were constructed and are operated with almost no regard to their vulnerability to persons who might, for whatever reason, desire to interfere with this vital movement of fuel. They are exposed and all but unguarded at innumerable points, and easily accessible even where not exposed over virtually their entire routes. Given the rise of violent terrorist activities around the globe and the proliferation of knowledge and devices which could be utilized for sabotage, this vulnerability of the most important energy transportation systems of the Nation threatens the national security."

* * * * *

"A person desiring to disrupt the flow of energy to a given region or in the most damaging way

1/"National Energy Transportation; Volume III, Issues and Problems," Washington, D.C., pp. 159-161.

to the Nation as a whole would obviously focus his efforts on those systems which carried the largest amount of energy."

A 1973 Department of the Interior report 1/ asserts that petroleum systems could be seriously damaged by widespread sabotage. The report contends that because some major natural gas and refined products lines running from the Gulf Coast to the East Coast are constructed extremely close to each other, damage at certain locations could stop the flow of most gas and products being shipped to the eastern United States. It also contends that "as the industry expands to serve the Nation's needs, vulnerability is increasing thus making a presently dangerous situation worse."

A 1970 Stanford Research Institute report 2/ (funded by DOD's Office of Civil Defense) identified pipeline facilities having potential vulnerabilities affecting national survival. The report identified 126 "hit points" on petroleum products pipelines which if damaged or destroyed could virtually stop all the Nation's pipeline product movement. The points are on the systems of 51 pipeline companies which ship either petroleum products or both crude oil and products. The points include:

--Sixty-eight pump stations.

--Eight terminals.

--Twenty-seven combined pump stations and terminals.

--Twenty-three pipeline junctions, crossings, or points of proximity.

The study concluded that the destruction of only 10 critical points would completely halt refined petroleum product

1/"Vulnerability of Total Petroleum Systems," Defense Civil Preparedness Agency, Washington, D.C., May 1973. Detachable Summary.

2/"Potential Vulnerability Affecting National Survival," Stanford Research Institute, Menlo Park, California, Sept. 1970.

movement through three major pipeline systems, including Colonial. As mentioned previously, repair or replacement of facilities, such as pump stations and terminals could take 6 months or more.

Two of the Government studies cited the following reasons why pipelines are vulnerable:

- Exposed, unguarded facilities.
- Computerized operations in one location.
- Limited number of experienced maintenance personnel.
- The lack of readily available critical spare parts.
- The availability of public information on pipeline systems' operations.

Exposed facilities

Most above-ground pipeline facilities, such as pump stations, pipeline junctions, and terminals, in the contiguous United States are fenced but have no security guards and not all are manned 24 hours a day. These conditions increase vulnerability. CRS and Defense Civil Preparedness Agency assessments concluded that above-ground, unguarded and unmanned facilities are the pipeline system's most vulnerable points. They recognize that buried as well as exposed line pipes are vulnerable but, if damaged or destroyed, would not create a major disruption because they usually can be repaired or replaced within two or three days. The loss of a single pump station, however, may require months for repair. Meanwhile, system throughput could be reduced by up to one third or more. The actual amount of throughput reduction which may result from the loss of a given pump station largely depends on the terrain and distance over which the petroleum must be transported. The loss of a pump station in mountainous terrain would cause a greater reduction in throughput than the loss of a station on the same system pushing product over flat terrain.

Centralized control

Computerized controls are necessary for efficiently scheduling, controlling, and monitoring the input as well as the output for certain pipeline systems which handle large volumes. Computers permit control of pump stations and other operating equipment from a central location, but are attractive targets for saboteurs. Automated equipment at a central control center monitors the pipeline system and relays instructions to remote facilities--manned and unmanned.

If damaged, repair of a central control facility may require several months, depending on the center's size and complexity, extent of damage, and other factors such as parts availability. Although pipeline systems have manual controls which could be a viable way of eliminating downtime, manual operation of some pipelines would be less efficient and could result in substantially reduced throughput. In addition, as a result of automation, fewer people now operate many systems and additional trained personnel needed for manual operation would be difficult to obtain in a short timeframe. Pipeline companies may be able to shift personnel from one pipeline or location to another, but these shifts could reduce the efficiency of other systems as well.

Inadequate numbers of maintenance personnel

Improvements in pipeline materials, construction methods, and operating procedures reduced many once-common causes of pipeline failures and helped companies reduce the number of personnel in their maintenance crews. Also, these improvements shifted emphasis in pipeline maintenance from repair to preventative measures. Most pipeline companies, except some that operate in remote and isolated areas, find it uneconomical to maintain fully staffed and equipped maintenance crews and, therefore, rely heavily on local contractors. What company maintenance personnel there are largely serve as inspectors and company representatives in dealing with maintenance contractors. Company maintenance crews have extended territorial ranges and may be responsible for maintaining sections of the system up to several hundred miles.

Lightly-staffed maintenance crews may be adequate for quickly repairing minor damage. But these crews may not be

able to quickly repair major damage due to sabotage or other acts. The government's pipeline vulnerability studies recognized the need for a greater number of skilled personnel to repair pipeline system damage. One study pointed out that the shortage of skilled personnel would exacerbate the problems associated with major damage and add days to the period required to restore a pipeline's operations.

Available spare parts
may be insufficient

Pipeline companies store spare parts, such as pipe and pump motors. However, the repair of more serious system damage, such as destruction of a pump station or other key facility, would almost certainly require a special order for replacement. The vulnerability studies mentioned earlier pointed out that repair equipment needed to restore key facilities, if not readily available, would prolong the adverse impact of a pipeline disruption. System equipment, such as booster pumps, may be specifically designed for a particular system and replacements must be requisitioned from the manufacturer. The lead time required to obtain necessary repair equipment would add to system downtime. For example, a manufacturer may require from 6 to 12 months to fill an order for a specific replacement pump.

Detailed pipeline information
is widely disseminated

Data revealing pipeline systems' locations and throughputs is widely disseminated by the petroleum industry and by State and Federal agencies and contributes to pipeline vulnerability. We recognize that much of the information is essential to private sector operations and necessary for Government agencies in performing regulatory responsibilities. For example, the petroleum industry, others in private sector, and Government agencies, need to know the whereabouts of pipelines to avoid accidents, environmental damage during construction, discrimination in the use of pipelines, and/or for other purposes. However, so much information is available, even through public libraries, that it is easily accessible to persons who may also want to damage a pipeline.

The practice of disseminating pipeline information has been popular for so many years, that stopping it now may be of little or no avail. Prior to relinquishing functions to DOE's Federal Energy Regulatory Commission in 1977, for example, the Interstate Commerce Commission routinely published data on oil pipeline throughput. Additionally, detailed maps of the Nation's crude oil and petroleum products pipeline systems are periodically published by the American Petroleum Institute. Editions published in 1975 on a scale of one inch equalling 24 miles make it easy to find key systems' locations and facilities. Since pipeline right-of-way crossings at highways and waterways are clearly marked as required by Federal regulations, the combination of detailed maps and markers makes locating a specific pipeline facility a relatively simple matter.

The CRS and Defense Civil Preparedness Agency vulnerability studies recognize the risk of disseminating detailed pipeline system information but, by being readily available, contribute to the problem. They identify specific weaknesses in pipeline systems and operations and provide detailed information on some pipelines. The CRS report can be purchased from the Superintendent of Documents, U.S. Government Printing Office, and the Defense Civil Preparedness Agency report is approved for unlimited public distribution. In addition, the Office of Civil Defense's vulnerability assessment may be further distributed by the holder with specific prior approval of the Office of Civil Defense.

Even newspapers print detailed pipeline system information. A March 4, 1979, Washington Post article, entitled "Gasoline Supply Tightens; Curtailments Seen Here: Pipelines a Key," included some important information about two refined petroleum products pipeline systems and their importance to the Washington, D.C., area. It included an area map (see fig. 5) and, among many others, the following remarks:

"Washington receives 90 percent of its gasoline, heating and commercial oil and aviation fuel through two underground pipelines that run 1,500 miles up the eastern seaboard from refineries in Texas and Louisiana."

* * * * *

"The products fill the pipelines at all times * * * ."

* * * * *

"Two of the tap points along these pipelines serve the Washington area from suburban Virginia--one at Newington south of the Beltway, another North of Fair City Mall in Fairfax City."

* * * * *

"Small auxiliary pipes run from these tank farms [at the tap points] to Dulles and National Airports, carrying aviation fuel * * *."

* * * * *

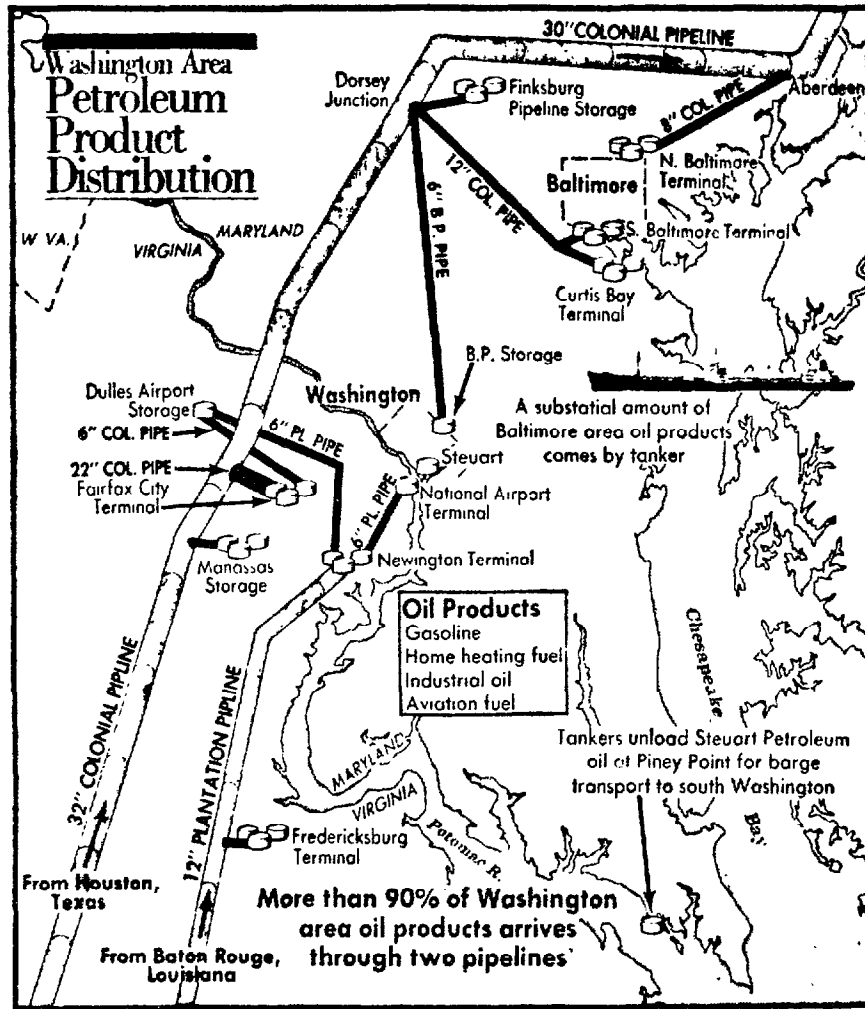
"Like the gas tank of your car these tanks are full just after delivery, then gradually they empty. Depending on demand, they can get very close to the bottom before another delivery from the pipeline comes."

PHYSICAL SECURITY AGAINST SABOTAGE
IS NOT BEING EMPHASIZED

The Department of Transportation's minimum Federal safety standards for liquid pipelines require, in the interest of public safety, that pipeline companies provide protection for pump stations, terminals, and other exposed facilities from vandalism and unauthorized entry (49 C.F.R. 195.436). The petroleum industry views theft as its greatest threat, and the physical security measures at pipeline facilities generally reflect this view and are not designed to discourage saboteurs.

Security measures are inadequate
for deterring sabotage

Pipeline operators provide physical security against ordinary risks, such as theft and vandalism, but the level of physical security is not adequate for protecting systems from potential saboteurs determined to disrupt pipeline operations. For example, Capline and Colonial pipeline facilities, such as terminals and pump stations, are fenced but locked only at night or when unmanned. Controls over locks and keys are extremely loose. Capline issues keys and transmitters or magnetic cards to employees to permit access to the main input terminal facilities, but no record



By Richard Furno—The Washington Post

Figure 5. Washington area petroleum distribution. Source: Washington Post, Mar. 4, 1979.

is kept of their issue. The locks have been changed only once in the past 5 years. Similarly, Colonial does not keep a record of employees and contractors issued keys for universal locks at facilities we visited. Both pipeline companies view security as an employee function in performing normal operations and do not have uniformed guard forces.

Managers of both the Capline and Colonial systems were unable to provide us with their costs for providing pipeline security. They said that their operational personnel are responsible for security and that no separate accounting is made to show security costs.

Despite fencing and locks, unauthorized entry to key facilities is easy. The effectiveness of fencing at Capline's main input terminal, for example, is reduced by a catwalk extending over the fence from a public road to the building that houses computer controls for the entire Capline system. Entry to the building is uncontrolled during the day, although the doors to computer facilities remain locked at all times. This is an important point of vulnerability, considering a company official's statement that Capline has an inadequate number of personnel for manual pipeline operation.

Recent theft incidents at Capline and Colonial pump stations also demonstrate the ease of entry to pipeline facilities. For example, juveniles entered a Capline pump station and broke into the facility housing computerized controls. They stole tools but did not damage operating equipment. As a result, Capline installed burglar bars and deadbolts at this station but not at others where such incidents had not occurred. A similar theft incident occurred at a Colonial pump station but the company did not implement additional physical security measures.

Our visit to a major Colonial input station further demonstrated the ease of access to pipeline facilities. The station has five mainline pumps and other equipment. It employs several people who work 8-hour day shifts and only one person on each of the evening and morning shifts. We drove a privately owned vehicle onto the station grounds, parked, and without restriction entered the station house where computerized controls were directly accessible. Also, a station operator briefly left us alone in the control room to inform the station attendant of our presence without

checking our identifications. During the visit, we observed various vehicles entering and leaving the facility without identification checks. We also observed that the station's main and backup power transformers were readily accessible and in close proximity to each other--making a potential saboteur's job much easier.

The input facility we visited was receiving refined petroleum products at a 682,000-barrel daily rate but has a maximum receiving rate of 1.3 million barrels per day. One Colonial official said input stations, such as the one we visited, are the system's most critical facilities. The criticality of input stations and their virtually unrestricted accessibility make them susceptible targets for malicious damage.

Unlike other pipeline systems, TAPS has security measures aimed at preventing malevolent damage to the pipeline. These measures are designed to discourage most outside disruptive action rather than a determined saboteur. Nearly 100 uniformed guards patrol line facilities, such as pump stations and terminals, and fences are constructed around pump stations, storage facilities, and valves along the line. All pump stations are guarded on a 24-hour basis, and one has a camera at its entrance for security purposes. In addition, daily aerial surveillance further enhances their security program. The pipeline's operator, Alyeska Pipeline Service Company, recognizes that even these security measures may not be enough to stop a determined effort to damage the pipeline. Alyeska is negotiating a \$185,000 contract with Stanford Research Institute to assess the vulnerability of certain facilities and to test additional physical security mechanisms for suitability in an arctic environment. Alyeska's 1979 budget includes \$7,944,000 for pipeline security, or about 0.1 percent of the system's approximately \$8 billion replacement cost.

FACTORS AFFECTING PHYSICAL SECURITY LEVELS

The extent of company physical security measures is a management decision based on a number of factors including, but not limited to,

- past experiences and threat perceptions,
- the effectiveness of physical security,

- confidence in industry's ability to respond to adversity, and
- risk consequences.

Past experience and threat perceptions

Pipeline systems' historical impunity from sabotage convinces industry officials that physical security is not necessary; there have been few attempts at major system damage. Capline and Colonial officials said that their pipelines have never experienced major disruptions due to sabotage and indicated disbelief in sabotage as a significant threat to system operations. An official of another company having ownership in many pipeline systems observed that while the threat of sabotage or terrorism is not new, petroleum facilities have not been prime targets. Another industry official could recall only three incidents of pipeline sabotage, of which only one resulted in damage. He said there is no hard evidence to support a sabotage threat. These perceptions and past experience substantially contribute to a low-level of pipeline security in the lower 48 States.

In Alaska, the Alyeska Pipeline Service Company has experienced recent minor sabotage incidents and, thus, is concentrating more on physical security than companies in general. The Trans-Alaska pipeline was bombed in 1977, but no oil was lost and no shutdown was required because the pipeline wall was not penetrated. It was again bombed in 1978 and shut down for 21 hours--12 for repair and 9 for Federal approval to restart. About 15,000 barrels of oil were spilled. (See fig. 6.) Alyeska's security manager, however, does not perceive a sabotage threat in Alaska.

Effectiveness of physical security

Pipeline companies are concerned about security against thefts but are not convinced that any level of physical security would stop well-trained saboteurs. One industry official indicated that even if armed guards were stationed along a pipeline and at related facilities, a determined saboteur could still bomb the system. Similarly, another official stated that "there is no amount of security that can be employed to reduce a pipeline's vulnerability. A

determined saboteur will be successful regardless of the resistance he encounters. Other industry, as well as Government officials, expressed similar views regarding security. Instead of concentrating on security, they believe that the most practical means of preventing serious supply disruptions is being capable of quickly repairing damage regardless of the cause.



FIGURE 6. FEBRUARY 15, 1978, BOMBING OF TRANS-ALASKA PIPELINE.

Confidence in industry's ability to
adequately respond to adversity

Petroleum industry and Government officials expressed confidence in industry's ability to quickly repair system damage due to normal operations. Industry officials believe the petroleum industry has well demonstrated its ability to keep energy supplies moving. According to an

official of the Interstate Natural Gas Association of America, the petroleum industry has dealt successfully with disasters short of war over the past 30 years, and he believes industry can handle pipeline disruptions without Government planning. Officials of one pipeline company expressed confidence in industry's flexibility and ingenuity to keep supplies moving and added that their company has always underestimated its emergency response capability. An official of another pipeline company indicated that pipeline companies have an overriding economic incentive to maintain service when a disruption occurs: if a company cannot maintain satisfactory service when disruptions occur, customers have the option of taking their business elsewhere.

Customers of both the Capline and Colonial pipeline systems expressed confidence in the companies' maintenance and repair capability. A refiner receiving 92 percent of the crude oil for two refineries through Capline said he believes Capline is qualified to operate and support its shippers adequately without additional Government regulations or support. Another refiner receiving crude through Capline said that the system's design is sufficiently flexible to permit relatively quick and efficient repairs and return to operation. Colonial shippers expressed similar confidence.

A spokesman for a major oil company, depending on Colonial for 65 percent of its East Coast product deliveries, said it is inconceivable that Colonial's operations could be disrupted for an unreasonable period of time with the technology available and Colonial's efforts to maintain the system's integrity. He added that "normal" system interruptions can be remedied within a 10-day period. Another shipper representative said that assuming Colonial's operations can be totally disrupted is unrealistic. The official added that in the event of sabotage, Colonial would still be able to operate part of its system unless the incident involved attacks at multiple locations. He stated that if the attacks caused damage to the system's pipe, the pipe could be repaired in 2 days at the most.

Both Capline and Colonial officials expect assistance from within the petroleum industry in responding to major system damage. An official of Shell Pipeline Corporation, operator of Capline, indicated that in the event Capline were seriously damaged, personnel and equipment would be

available from other Capline locations and other Shell-owned pipelines. A Colonial official noted that large oil companies built and rely on the Colonial system and would do all they could to aid Colonial in an emergency.

During our visits to pipeline company facilities, we noted that the companies keep certain spare parts on hand and their systems have redundancies which would be beneficial depending on the extent of system damage. They routinely keep replacement pipe, pump motors, and other parts on hand for repairing the pipeline and pumps. No complete spare pumps were on hand, should one suddenly be needed. We were told, however, that the pump stations have enough pumps to allow for normal servicing without interfering with system throughput; therefore, pumps which may be idle could be moved to other stations if needed during an emergency. For short down-times anticipated by industry officials, crude oil and refined petroleum products which are stored at refineries, terminals, and distribution points may help avoid supply interruptions. According to industry officials, crude oil stored at refineries served by Capline and at the Trans-Alaska pipeline terminal will last only 7 days or less. Three of five Colonial shippers we contacted said that their storage supply in market areas served by Colonial averages 5 to 10 days. The other two shippers said that their storage supply can last from 1 to 2 months depending on the product and the time of year.

Risk consequences

The potential for loss to pipeline owners affects the level of physical security provided at pipeline facilities. Oil companies built most pipeline systems and in many cases share the benefits and risks of pipeline operations. Companies sharing ownership in pipelines either establish a separate corporation to manage the system or they jointly manage the pipeline. They share benefits and risks in proportion to their share of ownership.

Most large-capacity pipelines, including Capline, TAPS, and Colonial, are multiple-company-owned pipelines. Capline is owned by 7 companies, TAPS by 8, and Colonial by 10. Multiple-company ownership reduces the potential loss an individual company may face from disruptions in pipeline operations. Company management may be willing to accept proportionate risks rather than support expenses for improved physical security. In the opinion of one

industry official, the owner who stands to lose the most usually determines the level of security on a pipeline system.

POTENTIAL ADVERSE EFFECTS OF
DISRUPTION COULD BE ENORMOUS

The pipeline industry seems well capable of quickly repairing relatively minor pipeline damage which may result from sabotage or other acts. Whether this capability extends to major damage of the magnitude one might expect from determined, well-trained saboteurs has never been tested. Because individual companies have spread their financial risks, widespread damage to the Colonial, Capline, or Trans-Alaska pipeline systems may be acceptable to industry, but could cause considerable hardship on this Nation overall, particularly in certain geographical areas. The severity of the hardship could exceed that caused by the 1973 Arab oil embargo. Multiple damage of pump stations could disrupt these systems for months while new pumps are being manufactured and installed. Meanwhile, adequate alternative transportation would not be available to absorb these systems' volume.

The Trans-Alaska, Capline, and Colonial systems have the capacity to daily transport about three-fourths of the petroleum volume we get from the Organization of Petroleum Exporting Countries (OPEC), or more than one and one-half times the daily volume the United States lost at the height of the 1973 Arab oil embargo. Moreover, the flow of petroleum through these systems is about 8 times the daily volume we were getting from Iran when those imports stopped in 1978. A disruption of the Trans-Alaska's 1.2-million-barrel daily rate would necessitate increasing oil imports at a cost of about \$20 per barrel. Such a disruption would increase imports by about \$24 million daily, providing the oil could be purchased. If it could not be purchased, U.S. refineries would have to cutback their processing an average of 8 percent.

Capline's 1.2-million-barrel daily throughput provides midwest refineries with about 25 percent of their crude oil needs. Without that crude, the refineries would be forced to cut back the production of gasoline and fuel oil. Consequently, economic and social adversities would develop, especially if Capline is inoperative for a long period of time.

A similar impact would occur if the Colonial system were disrupted. The States served by Colonial would lose an average of about 40 percent of their gasoline, fuel oil, and kerosine should Colonial be suddenly and seriously disrupted. Virginia, Maryland, New Jersey, North and South Carolina, Tennessee, and Georgia would be particularly hard hit since they depend on Colonial for about 52 to 82 percent of their products. The other six States and the District of Columbia receive from about 2 to 35 percent of their products through Colonial. 1/

In a 1977 report entitled "The Trans-Alaska Pipeline: Problems Posed by the Threat of Sabotage and the Impact on Internal Security," the Chairman of a special Senate Subcommittee to Investigate the Administration of the Internal Security Act and Other Internal Security Laws (Committee on the Judiciary) recognized that:

"in a technologically advanced society such as ours, any serious interference with the production or flow of our major energy resources could have a devastating economic impact in time of peace and, in the event of war, might even call our ability to survive into question."

Inadequacies of alternative forms of transportation

Pipeline systems' criticality lies in the inadequacy of alternative transportation modes. Trucks, barges and tankers, and railroad tankcars supplement pipelines in their role as the major crude oil mover and the primary method of transporting refined products over long distances.

Trucks are not suitable for long-distance bulk shipments, but are the best method for handling the small, sporadic, and short movements required in distributing petroleum products locally or gathering crude oil from stripper wells. 2/

1/Colonial's products deliveries are about 62 percent gasoline and 38 percent fuel oils, aviation kerosine, and diesel fuels.

2/Those producing 10 barrels or less daily.

Barges supplement pipeline movement by distributing products from primary terminals served by pipeline directly to market or to secondary terminals. In the petroleum industry, they are used primarily for transporting heavy petroleum products not suitable for pipeline movement. Their limited carrying capability in proportion to demand, however, inhibits their usefulness as a major crude oil or petroleum products mover. Domestic tankers move petroleum supplies to areas not served by pipelines. Tankers transport crude oil to East Coast refineries since no large crude oil pipelines serve the eastern seaboard. Similarly, petroleum products movement to New England areas is by tanker or truck because there are no pipeline deliveries.

Rail movement is most practical for low volume movements of petrochemicals and volatile substances, such as liquefied petroleum gases. The use of railroad tankcars is usually limited to deliveries into remote areas served only by truck and rail.

Capline, Colonial, and TAPS are pipeline systems for which there are no adequate transportation alternatives. Refiners and petroleum products shippers depending on Capline or Colonial see no transportation alternatives capable of continuing the volumes delivered by these systems. As for TAPS, natural conditions preclude a practical alternative for transporting North Slope crude south to Port Valdez.

Capline

The operators of seven Midwest refineries relying on Capline crude oil shipments consider either barges or other Midwest pipelines as possible alternatives for crude oil deliveries. But some operators doubt whether alternative transportation could continue to deliver Capline's throughput volumes if Capline operations cease.

One Midwest refiner said that barge operations cease during the winter, and another noted that not enough barges would be available to meet the increased demand if Capline were not operating. Petroleum barge movement on the Mississippi River, which parallels Capline, indicates that at least 216 additional barges would be required daily to equal Capline's daily shipments.

All refiners we contacted considered other Midwest pipelines as possible alternatives to Capline for crude oil

deliveries. One refiner named a combination of two other pipelines and barging as alternative supply sources for his crude oil requirements. Another refiner said four alternative pipelines could partially provide his refinery needs; but the refiner recognized that a stoppage in Capline's flow would cause all Capline shippers to seek the same alternative lines. Thus, there would be insufficient capacity to permit full shipments to Midwest refineries. Similarly, another refiner noted that during high-demand seasons, all Gulf Coast to Midwest pipelines operate at capacity. According to the refiner, even low-demand periods provide only 100,000 to 200,000 barrels per day excess capacity or a maximum of only about 17 percent of Capline's 1.2-million barrel-a-day capacity. The refiner concluded that, if Capline was down for a significant period of time, other pipeline systems would not be available to satisfy industry's Midwest crude requirements.

Colonial

Five major oil companies using Colonial to ship products to East Coast markets believe no alternative transportation is available or capable of continuing Colonial's daily product deliveries in event the system were down. One official said that if Colonial's service were disrupted, his company would scramble to get tankers, trucks, rail cars and any other transportation means available to move products to market. The official noted, however, that even if combined, the alternatives could not deliver the volumes moved by Colonial pipeline. Another official, representing a company delivering 40 percent of its market demand through Colonial, emphasized that "a major disruption of Colonial's operations would be a very, very serious situation for all shippers on the pipeline."

Colonial shippers believe tankers are a feasible means of transporting products to East Coast markets but doubt tankers can meet total demand requirements. One company official said tankers would be the most feasible alternative to Colonial but questioned their availability since both tankers and barges were largely displaced by the construction of the Colonial pipeline. Other shipper representatives also recognized the scarcity of U.S. registered tankers. One said that there are not enough small U.S. registered tankers to absorb the volumes moved by Colonial. The shipper believes a timely exception to section 27 of the Merchant Marine Act of 1920--which now prohibits foreign-registered vessels from carrying domestic cargos--could

provide additional tankers in an emergency situation. According to another company official, however, even if these restrictions are waived, tonnage limitations at domestic ports could restrain foreign tanker availability from a practical standpoint.

Tankers alone cannot serve all Colonial market areas. One oil company official perceived problems in serving all market terminals even with tankers available to absorb Colonial's throughput. He said the limitations of other transportation modes would impede final product delivery to inland market areas. For example, only market terminals along the Colonial route from Norfolk, Virginia northward can be served directly by tanker. Port facilities exist south of Norfolk, but products would have to be trucked inland to market terminals. According to the official, not enough trucks are available to maintain current product deliveries. Another company official views inland transportation as the biggest transportation problem if Colonial were not operating. He said eastern coastal markets could be supplied by tanker, but inland markets not accessible by tanker or barge would face supply reductions or cutoffs.

The Plantation pipeline parallels the Colonial system but does not have the capacity to absorb Colonial deliveries. One oil company official indicated that, even now, Plantation can accommodate only a portion of the volumes which companies ask to be shipped. Consequently, displaced Colonial shippers seeking space on Plantation's line would receive prorata service and would probably not be able to maintain their Colonial product shipments.

Colonial has not experienced a major disruption due to known sabotage; however, a 2-week service interruption occurred at Beaumont, Texas, in 1973. The extended downtime resulted from delay in repairing a line break in a remote area: the safe operation of repair equipment was prevented by gasoline vapor accumulation. One oil company official said the situation became critical for many Colonial shippers. According to the official, an interruption in product movement becomes critical for his company when it exceeds the company's average 5-day storage supply. The company responded to Colonial's 1973 service interruption primarily by closing its refineries and attempting to arrange product exchanges with other suppliers serving the same market area.

Trans-Alaska pipeline system

No practical alternative to TAPS exists for transporting Alaskan crude oil from Prudhoe Bay. According to a pipeline official, tank trucks are too small to handle the enormous volume of oil contained in the line, although roads extend from Prudhoe Bay to Port Valdez. Tankers cannot get into Prudhoe Bay because of its average depth of 6 feet and the Beaufort Sea's average depth of only 20 feet. An attempt to use tankers would require the construction of tanker berths 20 miles from Prudhoe Bay and ice breakers would be required most of the year.

TAPS has experienced minor sabotage damage, but none has resulted in lengthy disruptions. However, the potential impact of disrupting the system's operations was demonstrated with the destruction of pump station No. 8 in July 1977. Due to human error in operating a pump, an explosion and fire destroyed the pump station, killing one person and injuring several. (See fig. 7.) The pipeline itself was not damaged but was shut down for 10 days as a safety precaution, delaying the flow of about 4 million barrels of crude oil. Operations were renewed by bypassing the destroyed pump station. However, Alyeska officials told us that had the destruction occurred at a more critical pump station, such as one North of the Brooks Mountain range, the transporting capabilities would have been reduced substantially more, or even curtailed altogether. Despite an intense rebuilding effort, it took about 9 months to rebuild the pump station, reducing the expected throughput capacity of 1.2 million barrels per day by about .6 million-barrels-per-day or almost one-half.

The Senate Judiciary Committee's Subcommittee on Internal Security, by resolution of March 9, 1976,

"* * * formally recognized the paramount national importance of the Trans-Alaska (crude oil) Pipeline and the concomitant need to ensure the integrity of the pipeline free from terrorists or other criminal acts * * *. Failure to ensure the integrity of the conduit for this vitally needed resource would seriously and adversely affect the internal security of the United States."

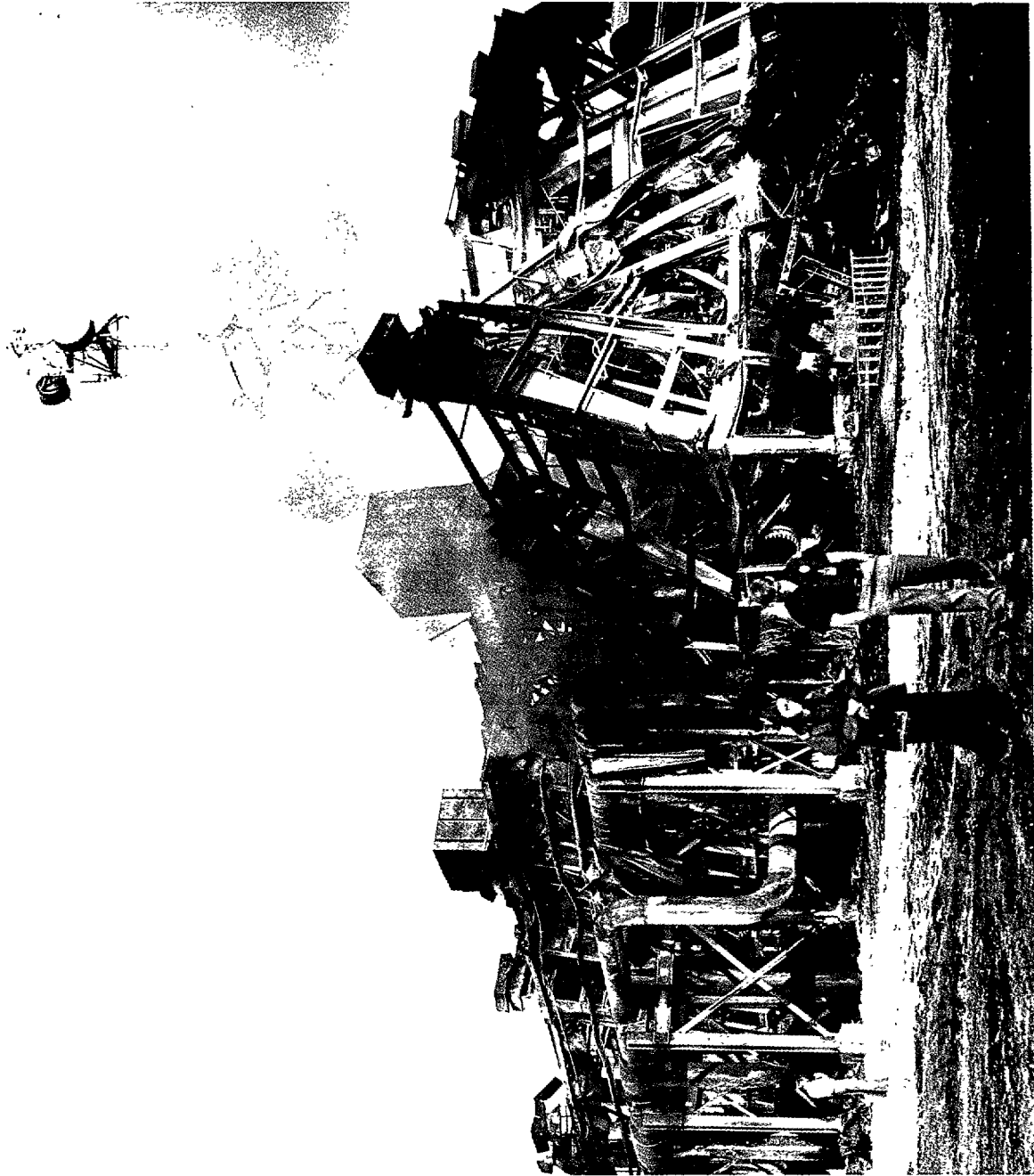


FIGURE 7. EXPLOSION AT PUMP STATION NO. 8.

CHAPTER 3

FEDERAL CIVIL PREPAREDNESS PROVISIONS

ARE NOT BEING IMPLEMENTED

In December 1952, Executive Order 10421 outlined agencies' responsibilities for developing and executing programs and measures for physically protecting facilities important to national defense and the essential civilian economy against sabotage, espionage, and other hostile activity. Executive Order 11490 (issued October 28, 1969), as amended, assigned specific emergency preparedness functions to 31 agencies.

--The Federal Preparedness Agency, within the General Services Administration, was responsible, prior to July 1979, for providing overall policy direction and guidance to other agencies regarding specific programs for protecting facilities within their cognizance.

--The Department of Energy, as a result of its creation in 1977, is responsible for physical security and emergency plans affecting pipelines and other energy systems.

DOE HAS NO EMERGENCY PLANS FOR PIPELINE SYSTEMS

DOE has not developed emergency plans for protecting pipelines or other energy facilities. The two primary reasons why necessary actions have not been taken, an official stated, are: (1) DOE is unsure of its exact responsibilities for facilities protections and energy emergency preparedness and (2) DOE does not hold these types of programs very high on the priority list of programs to review for probable revision, updating, and implementation.

DOE's Staff Operations Oversight Division, Office of the Inspector General, completed an inspection of the emergency preparedness functions within the Department in June 1978 and reported numerous problems. According to the Inspector General's report:

"Prior to the creation of the Department of Energy (DOE) energy emergency planning was dispersed within the Federal Government. There was a good deal of

confusion as to responsibilities and jurisdiction, creating the danger that emergency planning tasks would go undone. The creation of DOE was intended to improve the situation. However, that promise has not yet been realized."

During discussions of emergency preparedness and physical security, and reviews of reports on the subjects, Federal agencies acknowledged numerous problems with the subject. A DOE official, formerly with the Department of the Interior's Office of Oil and Gas, 1/ said that he was unaware of anyone in DOE or elsewhere doing anything regarding emergency plans for major petroleum pipeline disruptions. The official said that something should be done, but could not tell us who was in charge.

Another former Office of Oil and Gas official, now at Tulane University in New Orleans, Louisiana, expressed considerable dismay with the low-priority treatment emergency preparedness has received. Having authored his former employer's petroleum system's vulnerability assessments in the early 1970s, he was disappointed because funding cut-offs prevented planned, follow-on studies.

OVERALL FEDERAL EMERGENCY PREPAREDNESS IS INCOHERENT

In a 1977 draft report entitled "Review of Executive Order 10421," FPA summed up problems with emergency planning provisions and activities. According to the Agency:

- Parts of Executive Order 10421 are poorly written, e.g., operational responsibilities of the various departments and agencies are not clear.
- The Executive Order provides for physical security against covert acts only.
- Assigning critical facilities to the responsible Federal agencies for physical security cognizance

1/The Office of Oil and Gas was transferred to the Federal Energy Administration in 1974; the Administration became part of DOE in 1977.

was a problem. For example, most Federal departments and agencies did not have the funds or personnel to conduct a security program as required by the Executive order.

- Through the years numerous changes in the administration, organization, and internal structure within FPA have caused a loss in all program continuity and emphasis.
- Many years have passed without the issuance of needed revisions in policies, programs, standards, procedures, and leadership.
- The full scope of existing inadequacies in the current program cannot be ascertained because there is no mechanism to report accomplishment or failure.
- Interest has diminished over the years, and the program of emergency preparedness has become a low priority among Federal departments and agencies.

The FPA report further stated that:

"Because the physical security program, as outlined in the EO (Executive Order) was difficult to implement, the FPA was responsible for making this known in reports to the President and for suggesting alternatives. However, no reports were ever made to the President."

An FPA official stated that no assessment of Federal agency functions with respect to domestic pipelines has even been done, nor has this condition been communicated to the President. The official said that FPA is not doing any program planning for Federal actions to be taken if pipelines were disrupted for any reason, nor has it done so in the past. Executive Orders 10421 and 11490, he said, are not written clearly enough to address the possibility of domestic pipelines being disrupted. When these Executive orders were written, the primary concern was the possibility of war instead of less extreme national emergencies. The conditions of today, however, are such that clearer Federal authority and responsibility is needed to adequately address domestic pipeline systems and the possibility of their disruption, the official concluded.

The preceding evidence of conditions at FPA and DOE indicates that these agencies cannot adequately answer such basic questions as:

--What are domestic pipelines carrying and to whom?

--What specific geographical areas of the United States are significantly dependent on specific pipelines for needed petroleum products?

--What alternative modes of transportation are available (including other pipelines) should important pipelines be disrupted?

--Under what emergency situations should the Federal Government become involved?

Even though the current Federal emergency preparedness program cannot answer these basic questions, adequate authority does exist under which appropriate measures could be taken in an emergency situation to help minimize the adversities. However, we believe it would be desirable if the specifics of such measures, particularly with respect to petroleum or gas pipeline disruptions, were required to be developed before an emergency arises, to permit speedy yet orderly implementation. Since major pipeline disruptions have not occurred in the past, careful and deliberate evaluation of potential emergency measures should be made to determine those which would be most effective in mitigating harmful effects.

To a limited extent, a Department of Defense program is concerned with physical security and emergency preparedness regarding important pipeline facilities. DOD's Industrial Facilities Protection Program, administered by its Defense Logistics Agency, is orientated toward protecting important private company facilities, but only those important to military operations. The objective of the program is to provide managers of companies having important industrial facilities with advice and guidance on physical security and emergency preparedness measures for protecting those facilities against sabotage, espionage, and other hostile activity. The Defense Logistics Agency annually surveys the facilities, including some pipeline systems, and reports to management which has the option to implement or not implement the recommendations. Companies which subject themselves to the program do so voluntarily.

Two of the three pipeline systems we examined--Colonial and Capline--have been subjected to the DOD program. The Colonial system was in the program until 1975. At that time, Colonial Pipeline Company management withdrew from the system because it believed the Defense Logistics Agency's surveys were no longer useful. The Capline system is currently in the program. According to Shell Pipeline Corporation, most recommendations are implemented, but others are not, if management does not believe they are justified. Although TAPS is not included in the program, a Defense Logistics Agency official who assisted us believes that the pipeline should be.

An effort is being made to improve overall Federal emergency preparedness; however, we doubt that it will have much impact on important pipeline systems. Effective April 1, 1979, a new organization--the Federal Emergency Management Agency--came into being. By Executive Order 12148 (July 20, 1979), the President transferred all Presidential authority and functions now delegated to FPA to the new agency. The new agency is to be the focal point of contact and accountable to the President and the Congress for all emergency preparedness, mitigation, and response activities. However, the responsibilities of the agency are very broad and do not specifically address pipeline systems. Therefore, pipelines may continue to receive little or no attention.

While it is true this Nation's pipeline systems generally have experienced only minor disruptions from sabotage or other forces, this trend may worsen. An October 1977 FPA draft report entitled "Initial Planning Guidance: Federal Response to the Consequences of Terrorism" supports this view. The report states that past terrorist incidents were isolated and only had local impacts. The incidents were bombings, arson, murder, kidnappings, hijackings, and extortion. It also states,

"Of more concern to the overall security and living standard of the U.S. is the potential for change in the character of domestic terrorism. Expanded objectives and activities of extremist groups could become more regional or national in scope. Activities could involve a different class of targets with more widespread impact. Terrorism could change from isolated events to coordinated attacks causing major property damage, extensive loss of life, severe disruptions of resources,

disruptions to the continuity of government or situations of unique political significance. The possible new dimensions of the threat could cause more serious and more nationally significant consequences than previous incidents."

The report goes on to say that today's intelligence on extremist groups' motivation and capabilities is inadequate. For one thing, these groups are hard to penetrate. For another, Federal and State legislation concerning invasion of privacy compounds the problem. Further aggravating the problems, the report states, are

"The unsatisfactory nature of available data and the scattered and fragmentary sources make it difficult to estimate the severity, frequency, and possible change in character of the domestic terrorism threat. The threat will continue to be a debatable question until it has clearly been proven or disproven by experience. The most dreadful possibilities have not been realized, but they remain and must be faced realistically."

* * * * *

"Significant disruptions for a sustained period of time could produce situations such as unemployment, crippled production, shortages of important goods, reduction of personal income, decreased GNP (gross national product) or extreme hardship for the public."

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

This Nation's economy could falter if our flow of petroleum products were seriously disrupted for any extended period. Pipelines are extremely critical in transporting petroleum for meeting consumer demand. They transport about three-fourths of the crude petroleum delivered to refineries and over one-third of the refined products moved from refineries to consumer areas. Such volumes cannot be adequately handled by tankers, barges, trucks, and/or railroads should damage or destruction seriously curtail pipeline shipments. These transportation modes would be hampered by insufficient capacity, unsuitable geography, adverse weather conditions, or other factors.

The existence in the pipeline network of a few pipeline systems which transport much of the petroleum we use everyday underscores their importance. Both the Capline and TAPS, for example, transport about 400 million barrels annually or, together, about 15 percent of all crude runs to refineries. The Colonial pipeline system transports motor gasoline, fuel and heating oils, and jet fuel from refineries to consumer areas at an annual rate of about 600 million barrels. This volume equals about 9 percent of total domestic demand for refined products and an average of about 40 percent of the demand in 13 States and the District of Columbia.

Should the petroleum moved through these systems be suddenly and seriously curtailed or stopped due to widespread damage or destruction of key facilities, such as pump stations and terminals, adverse consequences could be enormous. The 1.2-million-barrel-per-day Trans-Alaska pipeline system is reducing our import requirements by at least \$24 million daily. There is no alternate transportation for moving Alaskan crude oil should TAPS become inoperative. Therefore, in the event of a serious disruption, the United States would be forced to increase its imports, providing more crude could be purchased, or its refineries would have to decrease their processing levels.

The Capline system provides Midwest refineries with about 25 percent of their processing needs. This volume cannot be adequately absorbed by other transportation modes should serious disruption occur. Furthermore, the Department of Energy will heavily depend on Capline during draw-down of the Strategic Petroleum Reserve. Since adequate alternate transportation is not available, stringent conservation, gasoline rationing, declines in factory output, colder homes, higher unemployment, or other problems could result.

A disruption of the Colonial system could have similar consequences for Southeastern and Mid-Atlantic States because adequate alternative transportation is not available. Virginia, Maryland, North and South Carolina, Georgia, New Jersey, and Tennessee would be especially hardpressed. Each of these States receives at least 52 percent of its refined products through Colonial: Virginia receives about 82 percent.

Even though pipelines are extremely critical, physical security at pipeline systems' key facilities is generally inadequate for discouraging sabotage, and formal plans for dealing with serious disruptions due to any cause are virtually non-existent. Pipeline companies and their customers do not see a need for formal plans to deal with supply interruptions. Consequently, they will have to rely on impromptu actions at the time supplies are curtailed. Likewise, the Federal Government has no contingency plans for minimizing the effects of disruptions. Industry and Government officials believe that industry can quickly repair damaged facilities and, therefore, prevent lengthy disruptions.

We recognize that no level of physical security can stop highly motivated, well-trained saboteurs. However, physical security measures such as locking gates and checking personal identification are basic security precautions which may discourage persons who are less motivated and/or not so well-trained. Additionally, measures such as separating operational and back-up equipment may reduce the potential effects of sabotage on the movement of petroleum supplies. The industry is not emphasizing basic physical security, even at critical facilities which, if damaged or destroyed, would require months to repair.

We disagree with industry and Government officials' argument that because industry can quickly restore pipeline

operations under normal conditions no formal contingency plans are needed. Although industry is capable of quickly repairing minor damage, such as breaks in pipe, the time to repair complex facilities such as pump stations, could extend to 6 months or more. In the interim, the flow of petroleum could be severely curtailed and cause undue hardships since neither industry nor Government has contingency plans.

While the potential consequences which may result due to inadequate physical security and a lack of formal contingency plans may be acceptable industry risks, we believe they are unacceptable to the Nation as a whole. Because of this Nation's heavy dependence on petroleum supplies and the enormous adverse effects a supply interruption could have, minimum physical security standards and contingency plans are needed. This Nation has too much at stake in crude oil and petroleum product pipeline systems not to have a focal point in the Federal Government for

- keeping abreast of developments which could interfere with petroleum movements through pipelines,
- developing and enforcing minimum physical security standards for pipelines which are critical to national welfare, and
- developing plans for minimizing the potential adverse effects, should disruptions occur.

RECOMMENDATIONS

We recommend that the Secretary of Energy establish within his Department a focal point for energy security matters and make it responsible for

- analyzing the entire petroleum network to identify critical pipelines and related facilities which, if damaged, could seriously disrupt the flow of petroleum and adversely affect the Nation's well-being, and
- collecting relevant intelligence information from cognizant Government agencies and providing the petroleum industry with advance warning of potential dangers, such as sabotage, which could result in damage to pipelines and related facilities and interrupt petroleum supplies.

Additionally, we recommend that the Secretary begin to develop actions in the following areas, while the Congress considers strengthening these authorities with legislation:

- Minimum physical security standards for critical pipelines and related facilities.

- Contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems.

We recommend that Congress enact legislation which will give the Department of Energy clear authority to

- make on-site visits to pipeline facilities necessary for identifying and analyzing critical pipelines and related facilities;

- develop minimum physical security standards and establish penalties for non-compliance and administrative procedures for appeal;

- conduct periodic inspections for determining compliance and for reassessing physical security requirements;

- develop and periodically update contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems, including Capline, Colonial, and Trans-Alaska.

To minimize the cost and reduce the time to implement its physical security and contingency program, we recommend the Department draw upon, coordinate with, and otherwise build on the expertise already established--for military purposes--within the Defense Logistics Agency.

Also, legislation should be enacted which would make the willful damaging of an interstate petroleum pipeline or its related facilities a Federal criminal offense and impose a fine and/or imprisonment for any person who commits such acts.

To expedite implementation of these functions, the Congress should require the Department of Energy to submit--within 6 months after enactment of the legislation called for above--its overall program for pipeline security and contingency planning. The program should become effective 90 days after the Congress receives it providing neither House rejects it by resolution.

We believe the total annual costs of implementing such a program within the Department of Energy should not exceed \$250,000. This estimate--based on the experience of the Defense Logistics Agency, which already has a security program in place for military purposes--assumes a staff of five professional security specialists, one support staff member, and related overhead and administrative, training, and travel costs.

CHAPTER 5

AGENCY AND INDUSTRY COMMENTS AND OUR EVALUATION

FEDERAL PREPAREDNESS AGENCY

Agency officials, in orally commenting on this report, said they support our recommendations. They expressed doubt, however, that anything will result because of a lack of any major problems with pipelines in the past. They provided us with other specific suggestions on wording changes which we have incorporated in this report as we deemed appropriate.

DEPARTMENT OF ENERGY

The Department's main comment (see app. I) was that it does not have a legislative mandate to develop contingency plans or provide for the physical security of pipeline facilities. The Department also pointed out that during hearings on pipeline security in 1976, State and local governments concluded that pipeline security should remain the responsibility of private industry.

We are aware that the Department does not have a legislative mandate to provide for the physical security of pipelines; its mandate stems from Executive orders. We believe that a legislative mandate is warranted to strengthen the authorities that now exist; therefore, we are recommending that the Congress enact appropriate legislation, as discussed in chapter 4.

The 1976 hearings to which the Department refers were concerned with the vulnerability of only the Trans-Alaska Pipeline System to sabotage. Although witnesses at the hearings had differing opinions on the vulnerability of TAPS, the Senate Judiciary Committee's Special Subcommittee conducting the hearings concluded that a DOE Office of Energy Security was warranted. Senate Bill 2548 (See Ch. 1, p. 2) incorporated the language of that subcommittee's recommendations for such an office, but the bill died in the 95th Congress and has not been reintroduced.

Furthermore, we too believe that pipeline security should rest primarily with pipeline operators, but that

some minimal level of Federal oversight is needed because of the criticality of certain pipelines to this Nation.

ALYESKA PIPELINE
SERVICE COMPANY

Alyeska commented that our report does not mention the Department of the Interior's "Authorized Officer" who is responsible for overseeing the integrity of TAPS, a "situation which should be taken into account in proposing still another level of government surveillance." We discussed the physical security of TAPS with personnel in the Office of the Authorized Officer. We were told that the Officer is not involved with physical security or contingency planning to minimize the adverse effects of disruptions; he is mainly concerned with environmental protection.

Alyeska also commented that our report does not include reference to its 12-to-18-hour surveillance from aircraft equipped with cameras and radios, and whose occupants relay suspicious activity near the pipeline to ground security forces for investigation. We are aware that Alyeska and other pipeline companies or operators conduct aerial surveillance flights to comply with Department of Transportation (DOT) regulations that the lines be periodically checked and for other purposes. Alyeska, like some other companies, substantially exceeds DOT's minimum surveillance requirement. Since Alyeska does have guard personnel stationed at its critical facilities around the clock, the use of aircraft crews to communicate with the guard force would tend to enhance physical security.

Alyeska agrees with our recommendation that pipeline sabotage be made a Federal offense. Regarding our recommendations that a focal point be established within the Department of Energy, Alyeska believes that this is not necessary because the Authorized Officer within the Interior Department is concerned with all aspects of pipeline integrity. It also commented that the proposed DOE focal point could not establish realistic or effective security standards for all pipelines because of the difference in conditions from one pipeline site to another.

As mentioned previously, the Authorized Officer is not involved with TAPS's physical security or contingency planning for dealing with supply shortages. Then too, he is mandated to deal with TAPS only, instead of all crucial pipeline systems.

We recognize that security needs for one pipeline system could--and will--vary from one pipeline system to another. However, physical security standards which specifically recognize such differences could--and should--be developed. For example, a standard may require that public access to critical facilities be prevented. Compliance with that standard would allow pipeline operators to exercise considerable flexibility.

SHELL PIPELINE
CORPORATION

Shell disagrees with our recommendation that the Department of Energy should establish a focal point for energy security matters. In commenting on our draft, Shell pointed out that pipeline systems in many aspects are similar to the highway, railway, telephone, water, and electrical power networks in that they all operate in a cross-country mode through remote and sparsely populated regions and have minimum security measures in effect--yet, there have been few disruptive sabotages reported. Shell commented that since no feasible precautions will provide significant protection against determined, well-prepared saboteurs, legislation could, at best, yield only limited benefit against the not-so-well-trained. Therefore, the benefits of new legislation, Shell commented, would not justify the cost to the Government, industry, and ultimately the public in implementing security regulations against a problem which has never been significant. The costs would fuel the already enormous and unacceptable inflation rate, Shell concluded.

We agree with Shell that pipelines have many attributes similar to those of other important networks. However, crude oil and petroleum products pipelines also have some important attributes which are not shared completely by other networks. For example,

- they move products in only one direction,
- they often do not have extensive interconnections for rerouting supplies around damaged segments,
- some channel tremendous amounts of critical energy supplies through narrow paths, and

--they carry a resource which provides much of the power source for most of the other transportation modes previously mentioned.

We agree that there have been few reports of disruptive pipeline sabotage during this Nation's history. However, the continued decline in world petroleum supplies and the apparent adverse effects that this Nation could suffer from additional energy shortages could make domestic pipelines a more attractive target for saboteurs. The Arab oil embargo and the Iranian export reduction have demonstrated our vulnerability to reduced supplies. Prolonged disruption of a major pipeline system could only exacerbate current problems.

Improved physical security at critical pipeline facilities cannot guarantee that acts of sabotage will never occur. However, as the level of security increases, more sophistication would be required of persons aiming to damage the facilities. This would not only tend to reduce the frequency of problems, but could also reduce the potential adverse effects of sabotage. For example, if personnel at a sabotaged facility practiced physically separating backup from operational equipment, then the time to repair the damage could be substantially reduced if the backup equipment were not also damaged or destroyed.

Admittedly, increasing the cost of providing a service without a corresponding increase in the amount of that service would be inflationary. In the case of pipeline security, however, we believe that the increase in cost would be miniscule--and thus well justified--in relation to the reduction in risk and increase in public confidence. In addition, we are not advocating a new agency--or even an extensive addition to an existing agency--but rather that the Department of Energy exercise its existing authority and that the Congress give the Department needed additional authority to ensure that critical facilities have acceptable physical security measures. It should also be understood that most pipeline systems are not critical to this Nation as a whole or even to large geographical areas. Therefore, most would not be subjected to new physical security emphasis. Then too, critical pipelines, such as the Trans-Alaska, which already employ extensive physical security precautions may be affected very little by Federal involvement.

We believe the total annual costs of implementing the type of security and contingency planning program we are recommending within the Department of Energy should not exceed \$250,000. This estimate--based on information provided by the Defense Logistics Agency, which already has a security program in place for military purposes--assumes the need for five professional security specialists (a Security Chief, GS-15; Deputy Chief, GS-14; and three security specialists grades, GS-11/13; and one support staff member, Administrative Clerk, GS-6) along with related overhead and administrative, training, and travel costs.

The staff's main function would be to first analyze the entire petroleum transportation network to identify those critical pipeline systems (perhaps a dozen or so) which, if damaged, could seriously disrupt the flow of petroleum to key areas; work with pipeline companies in developing minimum security standards and requirements; make on-site visits to monitor compliance; and develop and have contingency plans in place and ready to implement in the event an emergency situation arises. Maximum reliance would be placed on pipeline companies themselves. In addition, the staff, in carrying out its responsibilities, should draw upon, coordinate with, and otherwise build on the expertise already established within the Defense Logistics Agency, which should also help to minimize costs to the Department.

COLONIAL PIPELINE COMPANY

Colonial in commenting on our report (see app. IV), also noted that even a highly sophisticated physical security network would leave its pipeline system vulnerable to attack by determined saboteurs. Despite this fact, in the past, Colonial had voluntarily chosen to participate in the Defense Logistics Agency's disaster preparedness program which they admit resulted in implementation of various measures to improve the line's physical security.

In addition, Colonial stated that current efforts are also underway which will further improve their physical security measures. For example, Colonial fully recognizes that the computerized system control center is the heart of their pipeline system. To reduce this operational vulnerability work is underway to have, by late 1980, a totally independent, fully-computerized back-up system. Colonial

believes they are providing adequate physical security measures to deal with current international political conditions and that additional security services, at this time, would only provide the nominal benefit of a deterrent effect to the occasional vandal. Large wartime scale security measures, they believe, could not be justified in a civilian economy ravaged by inflation. Colonial concluded by stating they appreciate the serious dangers if saboteurs select domestic pipeline systems as targets, but trust they can draw on the expertise of Federal counter-insurgency and military agencies for measures which may be necessary.

We agree with Colonial that highly sophisticated physical security measures, including current efforts, would still leave pipeline systems vulnerable to attack by determined saboteurs. However, as we previously mentioned, implementation of physical security measures would certainly help reduce the severity of any disruptive acts against pipelines. Also, physical security measures by industry are only part of what we believe is needed to help minimize pipeline disruptions; contingency planning by industry and Government is the other, and perhaps more important, part of a total security program. The current lack of any contingency planning by industry necessitates Federal involvement.

We disagree with Colonial that our recommendations would not be beneficial or cost-effective and, therefore, would be inflationary. Our recommendations do not advocate a new agency--or even an extensive addition to an existing agency--but rather that the Department of Energy exercise its existing authority and that the Congress give the Department needed additional authority to ensure that critical facilities have minimally acceptable physical security measures. And once again, we believe most pipeline systems would not be subject to any new physical security emphasis. Only those pipelines identified as critical to the Nation in the event of disruption would be subject to a Federal physical and contingency planning program. Also, most domestic pipeline systems already employ some physical security precautions and, therefore, would not be greatly affected, either in program implementation or cost.

In addition, Colonial's response implies that we are advocating "large wartime scale security measures." We are not. As previously stated, we are calling for some very basic security precautions such as locking gates, and checking personal identifications and such other measures as

separating operational and back-up equipment to reduce the potential impact of any disruptive act. Moreover, we are advocating contingency plans--by the companies themselves, and by the Government--to deal effectively with a serious disruption, should one occur.

Obviously in the event of some hostile potential or wartime situation, we would anticipate that industry would be able to draw upon the expertise of Federal counter-insurgency and military agencies.

Finally, we did note, in the case of Colonial, that certain positive steps have been taken to improve security--both as a result of our visit and disclosures in the draft report, as well as through Colonial's voluntary participation in the Defense Logistics Agency's program. (See app. IV.) We believe these actions are indicative of the benefits to be derived by major pipeline companies as a result of minimum Federal oversight and mandatory participation in programs such as offered by the Defense Logistics Agency--which is precisely what we are advocating in this report.



Department of Energy
Washington, D.C. 20545

May 8, 1979

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

We appreciate the opportunity to review and comment on the GAO draft report entitled "Key Crude Oil And Product Pipelines Are Vulnerable To Disruption." Our views with respect to the text of the report are presented below.

Congressional hearings on the subject of pipeline security in 1976 showed that various State, Federal, and military units had concluded that security for pipelines should be handled by the concerned commercial companies. Commercial oil companies provides security for their own refineries and storage facilities, the Bureau of Reclamation provides security for certain dams (e.g., Grand Coulee), the Department of Army's Corps of Engineers provides security for dams which were constructed by the Corps of Engineers (e.g. Bonneville). There is no major responsibility overlap in this area.

The Department of Energy (DOE) does not have a legislative mandate to provide security for commercial pipelines alluded to in the GAO report. DOE is responsible for developing protective systems for nonnuclear energy resources under its control.

We would be pleased to provide any additional information you may require in this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "Don C. Gestiehr".

Donald C. Gestiehr
Director
GAO Liaison



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May 15, 1979

Letter No.79-1047-G

Mr. J. Dexter Peach
Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

Your letter of April 20, 1979 arrived in my office on Friday afternoon May 4, 1979. Since I was not available the week of May 4, I asked Mr. F. R. Fisher (Manager of Environmental Protection and Government Reports) to call Mr. Bresky and advise him that our comments on the attached draft would be delayed.

Today, Mr. Fisher called Mr. Bresky and gave him our comments which are summarized as follows:

1. The draft does indicate that TAPS security is more substantial than the other pipelines studied. However, nothing is said about the role of the Authorized Officer (DOI) who under the Agreement and Grant of Right-of-Way is responsible during operations to oversee pipeline integrity. This should be taken into account in proposing yet another level of government surveillance.
2. While the detailed description of the TAPS operation does include description of some of our security precautions, it does not include reference to our aerial surveillance. We now have two fixed wing and two helicopter aircraft assigned exclusively to security surveillance. These are used to observe the entire line 13 hours/day in summer and 12 hours/day in winter. The aircraft are equipped with cameras and radios and any suspicious activities near the pipeline are relayed immediately to ground security forces who then investigate.
3. Chapter 4 (Conclusions, Observations and Recommendations) is likely to be the section most often referred to by readers. Unfortunately, there is no mention of TAPS security program in this chapter. We recommend that some such reference be included to put this chapter in perspective.

4. While we concur on the recommendation that pipeline sabotage be made a federal offense, we do not agree that additional legislation will increase security effectiveness, at least in the instance of TAPS. Close government surveillance of all aspects of pipeline integrity is already established through the Department of Interior (Authorized Officer). In addition, we feel that any overall establishment of physical security standards and enforcement will not be realistic or effective because of the site specific differences between pipelines. Certainly the security aspects of pipelines in densely populated areas are entirely different from those in Alaska where there are very few people and where access to much of the pipeline is restricted.

Thank you for giving us the opportunity to review this draft. I hope that the above comments are useful in preparing the final report.

Very truly yours,



F. G. Turpin
President

FGT/FRF/em

xc: Jerald Boykin, Houston

Shell Pipe Line Corporation



Two Shell Plaza
P. O. Box 2648
Houston, Texas 77001

N. G. Wilson
Manager
Pipe Line Operations

May 11, 1979

U. S. General Accounting Office
ATTN Mr. Fredrick D. Berry
One Allen Center, Suite 955
Houston, TX 77002

Gentlemen:

We appreciate the opportunity to review your 80-page draft of a proposed report, "Key Crude Oil and Products Pipelines are Vulnerable to Disruptions" (Code J08720), and offer specific recommendations for several changes in the text (see attached marked copy of draft report) and our general comments on the overall report and its recommendations. The report is a general synopsis of pipeline transportation in the United States with more specific comments on the three systems studied, i.e., Capline, Colonial, and Alyeska. As was correctly noted in the report, the security measures now generally in effect for pipelines in the lower 48 are known to Government and Industry and have been previously reported in surveys conducted by the Federal Government. Thus, in this report we found nothing which should not have been known to responsible members of the Industry or the Federal Government.

Before commenting on the report's recommendations, it should be pointed out that the pipeline systems and their attendant pump stations, connecting manifolds, and tank farms are in many respects similar to the highway network with its bridges, tunnels, and interchanges; the railroad network with its bridges, tunnels, marshaling yards, and storage sidings; the electrical power distribution systems with their substations and switching centers; the telephone networks with their remote microwave repeater stations; and the domestic water supply systems with their aqueducts and lift stations. These great transportation and distribution systems are similar in that each operates in a cross country mode, often through remote and sparsely settled regions with minimum security measures in effect. Yet the operating record is very good with few disruptive sabotage acts reported. Moreover, as the report indicates, no feasible precautions will provide significant protection against determined, well-prepared saboteurs. Thus, legislation could, at best, yield the limited benefit of some protection against any easily deterred saboteurs. The cost to government, industry, and ultimately the public of implementing such regulations would far outweigh the slight benefit of partial protection against a problem which has never been significant. Such costs would fuel the already enormous and unacceptable inflation rate.

The following are our comments on your recommendation that the Secretary of Energy establish within his Department a focal point for energy security matters and make it responsible for:

GAO Proposal I -- analyzing the entire petroleum network to identify critical pipelines and related facilities which, if damaged, could seriously disrupt the flow of petroleum and adversely affect the Nation's well-being.

Comment: The pipeline network has been analyzed many times by Industry and Government, and its critical lines are well known. This proposal has no useful purpose.

GAO Proposal II -- collecting relevant intelligence information from cognizant Government agencies and providing the petroleum industry with advance warning of potential dangers, such as sabotage, which could result in damage to pipelines and related facilities and interrupt petroleum supplies.

Comment: Advance notice of potential dangers such as sabotage would be most beneficial to pipeline operators. However, rather than establishing a new bureaucracy to pass this information on to the pipeline operator, it would appear to be more sensible to have one of the in-place intelligence organizations perform this task.

GAO Proposal III -- Additionally, we recommend the Secretary begin to develop actions in the following areas, subject to the clarification and enforcement of his authority, in legislation which we are recommending be enacted:

-- minimum physical security standards for critical pipelines and related facilities.

Comment: The pipeline operator should, and I am convinced major operators do have in place a security plan for critical locations. The operating record of the pipeline industry clearly demonstrates that additional federal security regulations are not needed.

GAO Proposal IV -- contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems;

Comment: The pipeline operator is not involved with continuity of supply. The supply organizations of the companies shipping in the pipelines are most knowledgeable and have responsibility in this area.

GAO Proposal V -- We recommend that Congress consider legislation to reinforce and clarify present Executive Orders which

have been broadly defined and weakly administered. The legislation should include provisions which will give the Department of Energy clear authority for:

-- making on-site visits to pipeline facilities necessary for identifying and analyzing critical pipelines and related facilities;

Comment: On-site visits are not necessary because critical pipelines and related facilities are well known to Industry. As raw material and refined products logistics change, other facilities become critical and can be easily identified by reviewing pipeline maps in a central office.

GAO Proposal VI -- developing minimum physical security standards and establishing penalties for noncompliance and administrative procedures for appeal;

Comment: Additional Federal regulations are not justified. Existing pipeline security measures have been proven to be adequate during four major wars and periods of serious civilian unrest.

GAO Proposal VII -- conducting periodic inspections for determining compliance and for reassessing physical security requirements;

Comment: Periodic inspections will not be required if no new Federal regulations are promulgated.

GAO Proposal VIII -- developing and periodically updating contingency plans for minimizing supply shortages which could result from prolonged disruptions in the flow of petroleum through important pipeline systems, including Capline, Colonial, and Trans-Alaska.

Comment: See comment to Proposal IV.

GAO Proposal IX -- Also, legislation should be enacted which would make the willful damaging of an interstate pipeline or its related facilities a criminal offense and impose a fine and/or imprisonment for any person who commits such acts.

Comment: Such legislation would be appropriate so long as it is clear that only actions taken without the permission of the owner or operator of the line would be unlawful (otherwise, normal replacement of lines could be prohibited).

GAO Proposal X -- To expedite implementation of these functions, Congress should require the Department of Energy to

submit--within six months after enactment of the legislation called for above--their overall program for pipeline security and contingency planning.

The program should become effective 90 days after Congress receives it providing no objections are made to it within that time.

Comment: As was pointed out in the comments to the first nine proposals, additional regulation of the pipeline industry is not warranted. Nowhere in your 80-page report is the outstanding security record of the pipeline industry over the last 80 years analyzed.

President Jimmy Carter has pledged to the nation that the inflation rate would be reduced, and steps are being taken to reduce the direct contribution by government regulation. I strongly urge the GAO to indorse the President's pledge and take one more step by withdrawing these recommendations for further pipeline regulation.

Very truly yours,



RES:SL

Attachment

Colonial Pipeline Company

3390 PEACHTREE ROAD N.E. LENOX TOWERS ATLANTA, GA. 30326 (404) 261-1470

RICHARD F. TAYLOR
General Attorney

June 4, 1979

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Peach:

Colonial Pipeline Company concurs with GAO's opinion that even a highly sophisticated physical security network for our pipeline system would remain vulnerable to attack by determined saboteurs. History has repeatedly proven that the most sophisticated defensive measures devised by man are nullified and eventually eradicated by determined foes. Nevertheless, Colonial's past participation in the "Privately Owned and Privately Operated" disaster preparedness program conducted by the Defense Department exposed areas where useful measures could be incorporated to improve our security program.

Colonial has updated employee ID cards and identification procedures. Field facility security has been enhanced with improved lighting, chain link fencing, remotely controlled gates, lock and key control receipt program, and procedures for securing manned and unmanned facilities. A card control security system will shortly be installed in the Lenox Towers headquarters building which houses the control center. Modifications are consistent with prudent industrial security standards, considering the present non-hostile world situation.

Fully recognizing that the computerized system control center is the heart of the pipeline system, Colonial can place a partially-manned backup system into operation which will maintain throughput levels in excess of 90% of current volumes. Work is underway on a fully-computerized, totally independent off-site backup system which will be operational by late 1980.

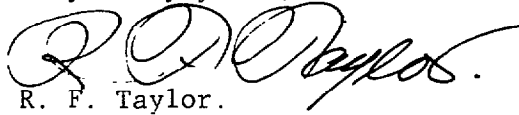
Based on our review of agency suggestions, we feel further action would be impractical, provided no significant changes occur in the international political situation. Commercial civilian

security services would only provide the nominal benefit of a deterrent effect to the occasional vandal. Large wartime scale security measures could hardly be justified in a civilian economy savaged by inflation.

We reviewed your draft with interest to discover certain valid criticisms. We ask that our current program be accurately reflected in the draft.

We can all appreciate the serious dangers if dedicated saboteurs select the Nation's pipeline systems as a target. Since this event will undoubtedly be fomented by some hostile political situation, we trust we can then draw on the expertise of Federal counter-insurgency and military agencies for the major measures which may then prove necessary.

Very truly yours,



R. F. Taylor.

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