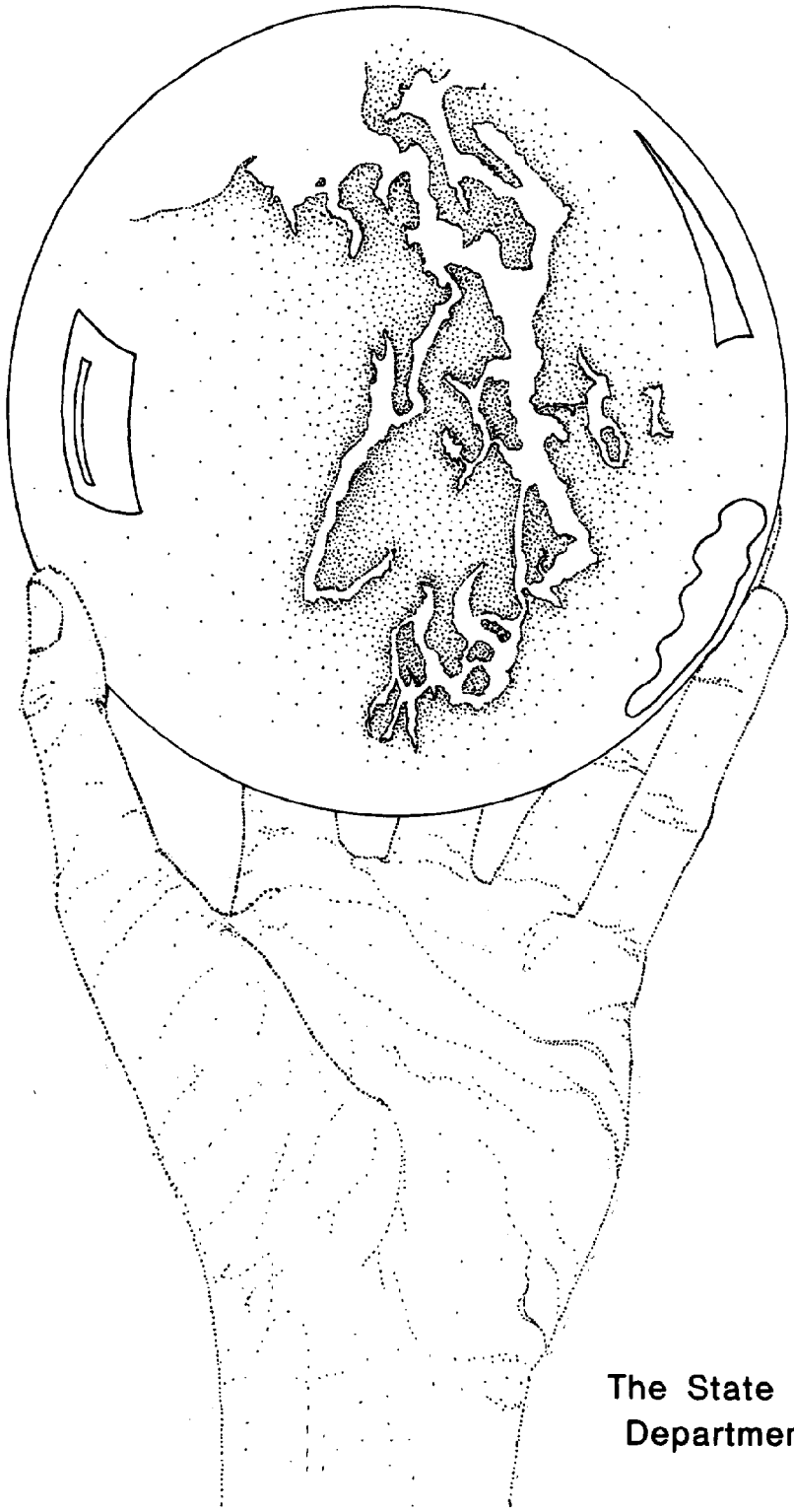
Puget Sound and the Pipe

The Role of CEIP in the Review of the Northern Tier Pipeline Application



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The State of Washington
Department of Ecology

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Puget Sound and the Pipe

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The State of Washington
Department of Ecology

by
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Report 83-10, 11/83

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PUGET SOUND AND THE PIPE

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Abbreviation Symbols and Acronyms Used in Report

ANS	-	Alaska North Slope (oil)
bb	-	barrels
bpd	-	barrels per day
BLM	-	U.S. Bureau of Land Management
CCPA	-	Clallam County and City of Port Angeles
CE	-	Council for the Environment
CEIP	-	Coastal Energy Impact Program
DEIS	-	Draft Environmental Impact Statement
EFSEC	-	Washington State Energy Facilities Site Evaluation Council
EIS	-	Environmental Impact Statement
EPA	-	Environmental Protection Agency
FEIS	-	Final Environmental Impact Statement
NOAA	-	National Oceanographic and Atmospheric Administration
NPDES	-	National Pollution Discharge Elimination System
NTPC	-	Northern Tier Pipeline Company
NTPS	-	Northern Tier Pipeline System
OIW	-	Oceanographic Institute of Washington, an institute affiliated with the University of Washington that produced studies for NTPC and earlier assessed spill risks for the state.
PSD	-	"Prevention of significant deterioration" (air quality permit issued by EPA)
SOHIO	-	Standard Oil of Ohio
TAPS	-	Trans Alaska Pipeline System
USDOT	-	U.S. Department of Transportation
WACs	-	Provisons of Washington Administrative Code
WDOE	-	Washington State Department of Ecology
WDF	-	Washington State Department of Fisheries
WDG	-	Washington State Department of Game

1.0 Introduction

This report documents the role of the Coastal Energy Impact Program (CEIP) in the review of the Northern Tier Pipeline Application and provides a summary of the key aspects of the certification process by the Washington State Energy Facility Site Evaluation Council (EFSEC). The report identifies elements of the Northern Tier controversy and the key issues in a five and a half year debate which had important implications to Puget Sound and the Washington State coastal zone.

Northern Tier proposed to bring supertankers through the Strait of Juan de Fuca and unload Alaska and Middle East crude oil at the existing community of Port Angeles. There, it would pump crude oil underneath the harbor to a nearby tank farm, then through a 42-inch pipeline that would pass eastward, eventually across Puget Sound at Admiralty Inlet. The project raised serious economic and environmental questions to both the state and local jurisdictions. At issue was a multibillion dollar project, potentially having national importance, but at the same time posing distinct, if not well quantified, hazards to the Puget Sound environment.

The CEIP program was used to better establish the risks involved and to improve the quality of information placed before EFSEC in reaching a decision on the project. As this report shows, the issues raised by the project were highly technical and beyond the normal capabilities of existing state and local agencies. They involved engineering questions not normally addressed and impacts on resources and natural processes that were not well inventoried. The report elaborates upon these information gaps and upon the argument over impacts and resources at risk and demonstrates the highly successful and effective use of CEIP monies.

Studies and testimony sponsored by CEIP were not responsible for all the key findings by EFSEC, but they were highly influential, if not critical, in a number of areas. In particular, they supplied an indispensible review of submarine geology and submarine engineering questions and were heavily drawn upon in the evaluation of oil spill risk. In addition, they served two other key functions: 1) they provided a site specific and, in some cases, species specific inventory of resources at risk, and 2) a wide ranging evaluation of impact mitigation measures. The former heightened the council's awareness of resources at risk. Products include maps, inventories, and impact studies which should continue to have value for future project review. Likewise, CEIP mitigation studies identified important mechanisms and procedures applicable not only to pipelines but any number of other projects affecting marine, aquatic, and terrestrial resources.

2.0 Background

2.1 Company Objectives

Northern Tier was originally conceived in the early 1970s as a profit-making venture that would respond to three national and international oil market conditions: 1) a surplus of Alaska North Slope (ANS) crude on the West Coast; 2) expected reductions of

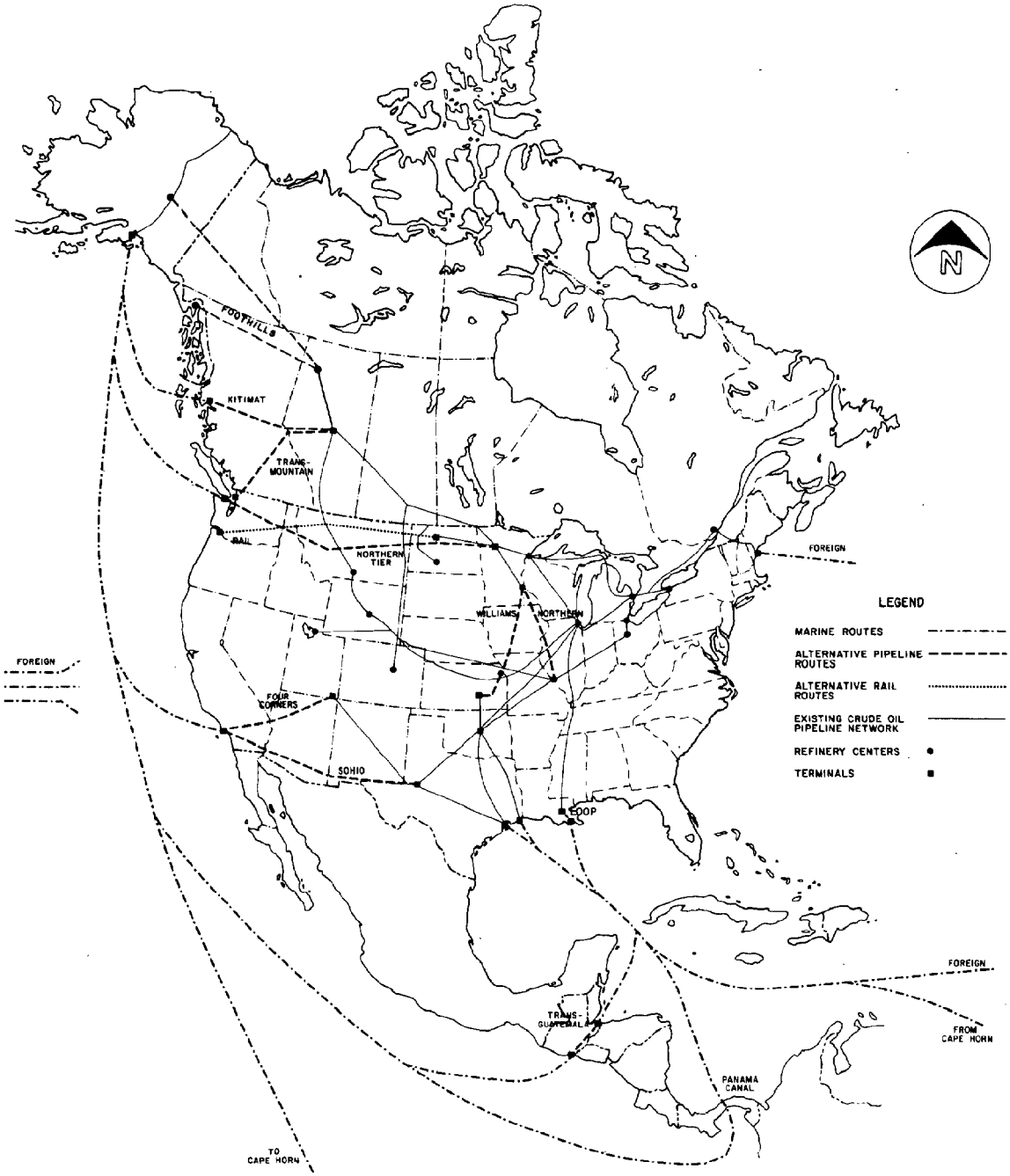


Figure 2.1.1

Alternative Methods for Supplying Crude Oil to the Northern Tier States.
Source: NTPC

Canadian crude oil exports to the United States as well as related uncertainties regarding dependable future oil delivery to U.S. refineries; and, 3) an anticipated increase in demand by Midwest and Northern Tier state refineries.

From a 1976-1977 perspective, there was some basis for believing that the project would solve a developing crude oil distribution problem. The delivery of Prudhoe Bay oil to the West Coast began in 1977. The immediate effect was a displacement of West Coast imports that was manifested in a sharp increase in oil volume shipped via the Panama Canal to the Gulf Coast. Northern Tier considered this a surplus condition, amounting to an excess of over 500,000 barrels per day, and potentially increasing to 1,200,000 bpd.

Implicit in the notion of surplus was a significant Midwest demand for the displaced West Coast oil. Northern Tier asserted that refineries in the Midwest and Northern Tier states would soon experience shortfalls, or, at the minimum, would have to pay unnecessarily high transshipment prices if the pipeline were not built. The company cited a 1975 Canadian government announcement to curtail oil exports after 1982. Refineries in the Northern Tier states would, asserted Northern Tier, be particularly affected because of their heavy dependence on Canadian crude. The demand for oil supplies within the service areas of these refineries was also projected to rise significantly. This was the finding of Northern Tier's consultant, the Pace Corporation, and this was the prediction of a U.S. Department of Energy study based upon "most probable" estimates of crude oil price increases.

The 1978 Public Utility Regulatory Act (PURPA), was a reflection of the mid-1970s market conditions. It authorized the President to make a determination of the need for crude oil delivery systems and to select one of the competing projects for expedited federal processing.*

Pursuant to these provisions, President Carter selected Northern Tier over the Trans Mountain Company and other pipeline projects for early consideration. However, by 1979, the political and economic environment was changing rapidly and called to question the rationale for Northern Tier and any other west-east oil pipeline with a large throughput, and heavy fixed costs.

2.2 Market Conditions Affecting the Project

The Iranian oil boycott and the subsequent rise in world oil prices rendered questionable, if not totally untenable, the Department of Energy's projections of future oil demand. According to economic logic, price increases would translate into reductions in consumption. Nationwide evidence was already available that shifts were occurring in demand due to conservation. It began to look as though there might actually be a decreased demand in the Northern Tier states. If Northern Tier were built, would anyone want the oil that it delivered?

*Whether the act mandated an east-west pipeline is a matter of interpretation. See Figure 2.1.1 for alternative projects and routes.

The Midwest supply situation was becoming equally problematic from Northern Tier's perspective. High worldwide prices of oil and natural gas would make continental shale oil production and domestic oil exploration more feasible. This would lessen the need to import ANS and Middle East crude oil. Moreover, full deregulation of domestic oil prices was on the horizon. Decontrol began in 1980 and would result in a complete lifting of the government ceiling prices by October 1981, thus providing further incentive to develop Midwest continental sources.

Northern Tier insisted that there was still enough demand and still enough West Coast "surplus" to justify the project. Increasingly, however, a change in emphasis was apparent. It was the undeveloped, yet recoverable, reserves of the North Slope, anywhere from 12-49 billion barrels, that would justify a line having such a high throughput capacity (933,000 bpd). From the company's perspective, no other alternative could deliver these resources to continental refiners as efficiently. Project opponents countered that oil cited by the company was "speculation" oil, that no large new fields had actually been proved. Moreover, the time it would take before any such source could be tapped would be six-eight years. Prudhoe Bay production, on the other hand (the original oil used to justify the project), was expected to decline by 1986.

The Canadian situation also became a matter of vigorous debate. At issue was the magnitude of the asserted import reductions. Evidence was introduced that the cutoff of Canadian crude might not be as total as first believed. The issue, it seems, was complicated by regional economic relationships between American states and Canadian provinces. Moreover, estimates of Canadian gas reserves were revised dramatically upward in the late 1970s, thereby lessening concern about resource drain to the United States. It became apparent that substitution between oil and natural gas would provide a basis for continued oil export.

Equally significant was the lack of American petroleum industry interest in the project. On both ends of the pipeline, commitment remained elusive. SOHIO, the largest holder of ANS crude and developable North Slope sources, was willing to offer no supply assurances. In part, this was a function of the fact that its own refineries were south of the Northern Tier states and had little to gain from a change in the distribution network. The refineries in the Northern Tier states were no more enthusiastic. They were experiencing cutbacks in production and even closing, not because they were thirsty for oil, but because demand was falling drastically.

2.3 Environmental Issues

Washington State Benefits and Puget Sound Tanker Traffic

Northern Puget Sound refineries currently receiving oil by pipeline and tankers at Cherry Point, near Anacortes, would, according to

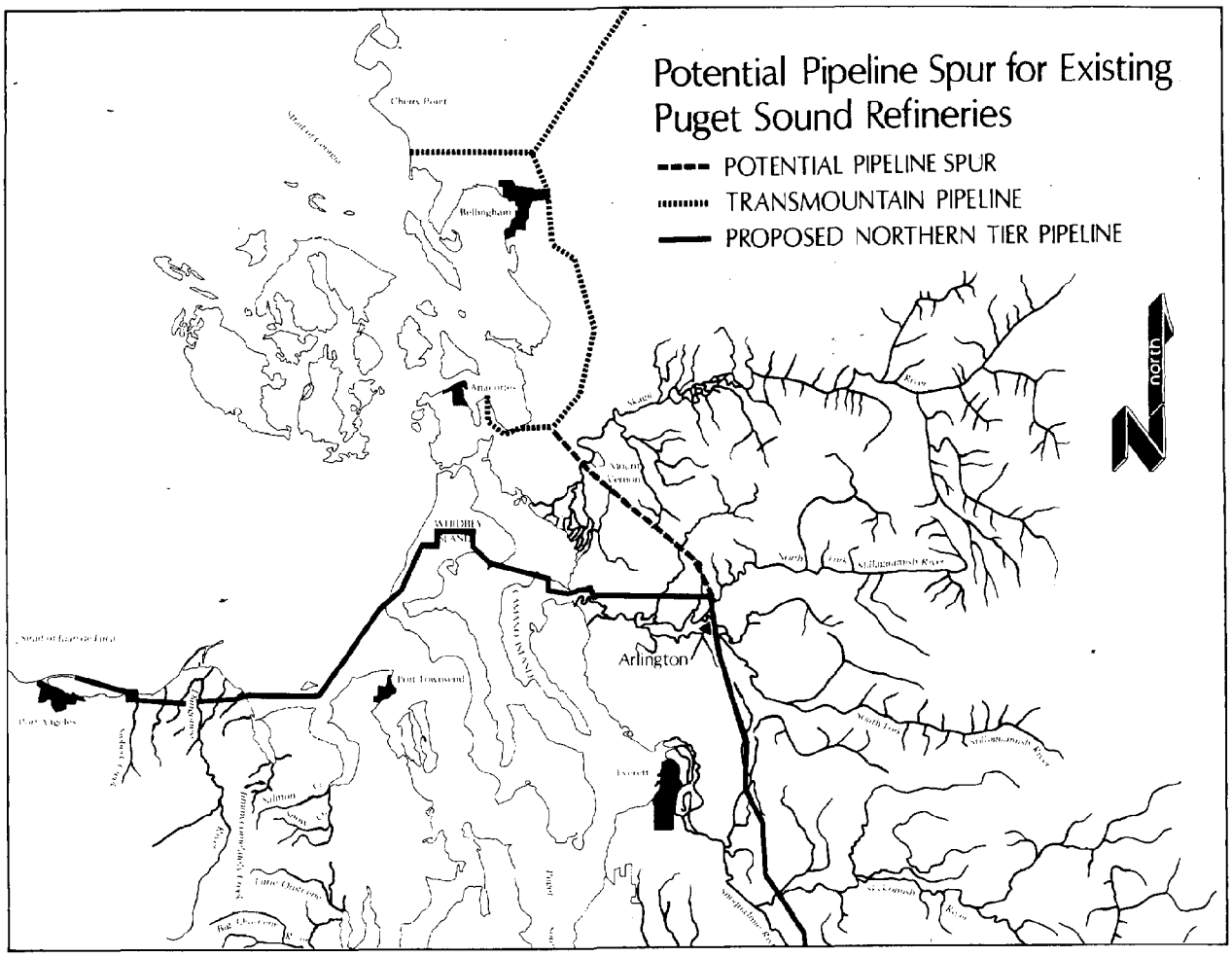


Figure 2.3.1 Source: BLM EIS

Potential Pipeline Spur for Existing Puget Sound Refineries

the company, also be beneficiaries of the project. These refineries would be supplied through spur line connection and thereby secure a reliable flow of oil. Northern Tier projected that Washington State refineries, like their Midwest counterparts, would also experience supply shortages in the 1980s because of Canadian cutbacks.

Moreover, there would be a significant environmental derivative: Tanker traffic across the sensitive waters of Puget Sound could be significantly reduced. Tankers would be able to moor and off-load at the Ediz Hook berths at Port Angeles off the Strait of Juan de Fuca and not have to cross the sensitive waters of Admiralty Inlet and the straits between the San Juan Islands and north Whidbey Island. Eliminating this traffic, argued the company, would reduce the oil spill risk to Puget Sound and the San Juan Islands. Implicit was the belief that oceanography of the Sound favored spill migration to the west and that the existing tanker traffic, admittedly less than that created by a super port at Port Angeles, was a ticking hazard to the biological resources of Puget Sound. Through the early 1970s, small spills had been on the rise. How soon would it be until a major catastrophe?

Ever since the conception of the Trans Alaska Pipeline, there had been discussion of the additional hazard posed to the sound by creating a super port inside the strait. A number of proposals had been advanced for expanding existing port facilities at Cherry Point, and other Puget Sound sites. The resulting political reaction was overwhelmingly negative: tankers would be barred from the Sound and there would be no super port east of Port Angeles. The policy was reflected in the state's Coastal Zone Plan in 1976, and more formally established by the Magnuson Amendment to the Marine Mammal Protection Act of 1978. Paradoxically, Northern Tier was justified as the vehicle for advancing this policy: more oil would be carried into coastal waters; but the overall environmental risk would be lowered--lowered in part, because tanker traffic would be reduced in the most sensitive waters. This was the company's response to its environmentalist critics.

Environmental organizations in Port Angeles were among the first groups to dispute the company's assertions. A group called No Oil Port contended that the project would cause a wide variety of impacts that were underestimated. These included the socioeconomic impacts to Clallam County and the City of Port Angeles, as well as the larger spill risks to state waters.

2.4 Project Review and the Role of CEIP

By 1978, state and local agencies were also expressing strong reservations about the project. These included geological questions relating to the integrity of the submarine line, as well as the reliability of various estimates of fire, tanker spills, and tanker explosions. Now, it seemed, a superport outside the Sound, particularly because it was paired with a submarine crossing, might not be a good risk. It became apparent that a number of important technical issues were involved.

At the state level, there was a deficiency in existing information, and in some cases expertise to provide a thorough review. For example, there was little detailed information on the submarine geology of the Admiralty crossing and no specialized staff expertise to evaluate the liquefaction hazard of a submarine pipeline. A state body known as the Oceanographic Commission had earlier been funded to evaluate oil port issues and spill risk. However, after sponsoring several studies, several of which were controversial, its funding was eliminated. This capability was available nowhere else. Certainly, no existing state or local agencies had experience dealing with a crude oil marine terminal and pipeline as large as the one proposed by Northern Tier. A meaningful review of the project would therefore require acquisition of considerable outside expertise through staffing or contract arrangements so that line agencies might participate in the site certification process.

At the local level, the problem was perhaps even more pronounced. Economic slowdowns and state restrictions on property taxation were causing reductions in staffing which, in turn, reduced local government's ability to devote the needed attention to Northern Tier project review. While the state's energy facility siting law

required Northern Tier, as applicant, to pay a permit fee and to cover the costs of the environmental impact statement, no legislative provisions existed which required the company to financially assist local governments in their participation in the project review.

The CEIP filled these funding and staffing needs. Beginning in the summer of 1978, the Washington Department of Ecology (WDOE), the state's coastal zone management agency, applied to the Federal Office of Coastal Zone Management for CEIP funds to enhance the ability of state resource management agencies and local governments to participate in the EFSEC process. Through May 1982, approximately one million dollars of federal CEIP funds, together with state and local matching shares, were used to address the environmental, social, and economic issues presented by the Northern Tier proposal. Measures to avoid, redress, or mitigate identified impacts were developed. The vast bulk of this joint state-local effort was converted to testimony and presented to the siting council in its deliberations over the proposal. As pointed out by one local official managing the CEIP subaward, "The CEIP grant was more rapidly converted into products than any other product with which I have been involved. It goes almost without saying that availability of CEIP funds made a tremendous impact on the county's ability to defend its interest in the two energy proposals."*

*Steve Rice, Snohomish County Planning Dept.

3.0 Chronology

November 21, 1975:	Formation of Northern Tier Pipeline Company. The Northern Tier Pipeline Company determines Cherry Point the preferred location for a major oil terminal.
June 1976:	WDOE issues Washington Coastal Zone Management Plan which includes a statement supporting the siting of a major crude oil handling facility no further east than Port Angeles.
July 6, 1976:	NTPC files application with EFSEC for a pipeline around the sound and marine terminal at Port Angeles.
July 28, 1976:	EFSEC determines need for additional information which is received in August and November 1976.
Sept./Oct. 1976:	Local land use and zoning hearings are held.
November 19, 1976:	NTPC supplements application.
February 28, 1977:	EFSEC finds NPTC proposal consistent with local land use plans (with the exception of proposed tank farm at Green Point.
June 16, 1977:	Major deficiencies found in application by CH2M Hill.
June 28, 1977:	Applicant granted extension of application processing time.
July 14, 1977:	Supplemental material submitted in reply to CH2M Hill report.
September 9, 1977:	Applicant submits amendment and major route change.
October 20, 1977:	Land use and zoning hearings are held on route changes.
December 29, 1977:	Applicant granted extension of application processing time.
Jan./June 1978:	Applicant amends application including supplemental materials and further route change (volumes 2, 3 and 4).
March 1978:	The council, acting on behalf of the State of Washington, makes a formal request to the federal government for a decision on whether the proposed facility is needed to provide crude oil to other regions of the nation as a whole. A definitive response is not received.

August 18, 1978:	NTPC submits amended route in King, Kittitas, Spokane, and Adams counties, largely to avoid alternate water supply hazards.
September 1978:	Washington State receives CEIP grant aid award for analysis of NTPC proposal.
October 1978:	Land use and zoning hearings are held on route changes.
November 9, 1978:	Congress passes the Public Utility Regulatory Policies Act (PURPA), expediting federal review and permit processing of a West-to-East Coast crude oil delivery system.
December 1978:	EFSEC finds recent route changes consistent with local land use plans and zoning ordinances.
February 9, 1979:	Applicant requests extended processing time for revision of proposal.
March 26, 1979:	NTPC announces cross-sound route and requests delay in completion of the draft environmental impact statement (DEIS) and start of hearings.
June 25, 1979:	NTPC again makes changes in route, proposing submarine pipeline portions under Puget Sound with a terrestrial route passing through Island and Snohomish counties. Amendments are also made altering berth and submarine unloading configurations. EFSEC initiates hearing in affected counties on land use.
July/Aug. 1979:	Land use and zoning hearings are held for revised route.
September 4, 1979:	The Bureau of Land Management-Environmental Impact Statement (BLM-EIS) completed and made available.
October 23, 1979:	Proposed land use order issued by Administrative Law Judge.
Oct./Nov. 1979:	Topical prehearing conference held.
November 13, 1979:	EFSEC issues draft EIS which largely echoes statements, conclusions of the June 25 application.
November 26, 1979:	EFSEC finds portions of the most recent proposal inconsistent with local land use: portions in Clallam County, at Port Angeles, and in Snohomish County.

December 27, 1979:	Council approves 12-month extension of application processing time.
January 3, 1980:	Contested case hearings formally open. At end, they will have resulted in a 43,153 page record with 872 exhibits.
January 28, 1980:	President Carter selects the Northern Tier proposal for expedited federal processing.
February 6, 1980:	Council denies Clallam County, Port Angeles motion for consideration of hookup.
March 19, 1980:	NTPC requests a supplement to DEIS addressing hookup. (Denied)
May 27, 1980:	Council issues request for development of the final environmental impact statement (FEIS) to CH2M Hill.
June 9, 1980:	WDOE (later joined by five other intervenors) files motion for delaying hearing, pending receipt of accurate description of submarine pipeline route. In part, this is triggered by NTPC reference to a change in the Admiralty crossing.
June 23, 1980:	Council adopts schedule for remainder of case, deferring "air quality" until end of intervenor's case.
July 14, 1980:	Administrative law judge issues order granting motions for supplement of the submarine pipeline portion of the application; council rescinds schedule for remainder of case.
July 22, 1980:	As required by council, NTPC submits complete legal description of terrestrial pipeline.
July 24, 1980:	Intervenors file appeals of order by administrative law judge.
July/Aug. 1980:	NPDES hearings held and completed.
August 19, 1980:	EFSEC issues order that NTPC has failed to adequately describe portions of the submarine and terrestrial pipeline and had not conducted adequate studies for a description of physical, geological, geographical, and hydrological characteristics of the segment. EFSEC forwards list of data deficiencies to NTPC.
August 21, 1980:	Schedule issued calling for hearings of remainder of applicant's case to commence October 15, 1980.

Sept./Oct. 1980:	NTPC conducts metering, geologic analysis of altered submarine route pursuant to EFSEC order; does not undertake all the specified studies.
December 22, 1980:	Applicant completes presentation of its case.
January 6, 1981:	Intervenors case begins.
March 1981:	Administrative Law Judge, John von Reis, denies motion for dismissal by intervenor, King County. The county argued that the applicant failed to meet state guidelines by not providing detailed pump station designs and plans and information with respect to state "WACs." Judge von Reis rules that due to the special nature of the project, relative to other fixed site energy facilities, these plans may be provided after certification.
May 28, 1981:	EPA makes initial determination to issue permit to Northern Tier under the Federal Air Act. At issue is the effect of tanker unloading facilities and the Green Point tank farm on air quality in Clallam County.
Feb./May 1981:	EFSEC holds public hearings on Northern Tier application in Port Townsend, Moses Lake, Coupeville, Port Angeles, Friday Harbor, Everett, Spokane, North Bend, and Olympia. In Western Washington, public sentiment is preponderently against the project because of perceived threats to the marine and aquatic resources of the state.
August 3-6, 1981:	All parties provide closing arguments on the application. Intervenors Port Angeles, Clallam County, Jefferson County, Island County, Snohomish County, San Juan County, King County, and the state departments of Ecology, Fisheries, and Game call for rejection of the application. They are joined by the Tulalip Tribe and various environmental groups.
September 3, 1981:	Final EIS issued.
September 14, 1981:	EPA issues PSD permit.
October 9, 1981:	Hearings end.
January 27, 1982:	EFSEC issues Order No. 636, Findings of Fact, Conclusions of Law, Order and Recommendation, regarding the Northern Tier Pipeline Application. The order recommends denial by the Governor.

March 2, 1982: Corps of Engineers issues permit 071-OYB-2-004693 for Washington Rivers/Puget Sound crossings and Port Angeles Harbor crossing.

April 8, 1982: Governor denies application 76-2 in accordance with the findings and recommendation of Order 636.

4.0 Project Description*

4.1 Summary and Scope

Northern Tier proposed to build and operate a 42-inch crude oil pipeline, 1,491 miles in length from a port facility at Port Angeles, Washington to Clearbrook, Minnesota. The planned initial design capacity was 709,000 barrels per day and the ultimate design capacity 933,000 barrels. In the State of Washington, the planned route extended from Port Angeles on the Olympic Peninsula through Clallam, Jefferson, Island, Snohomish, and King counties, then across the Cascades through three Eastern Washington counties. The Washington State portion of the route was 367 miles, including 27 miles of submarine lines in crossings of Port Angeles Harbor (6.5) miles, Admiralty Inlet (18 miles) and Saratoga Passage (4 miles).

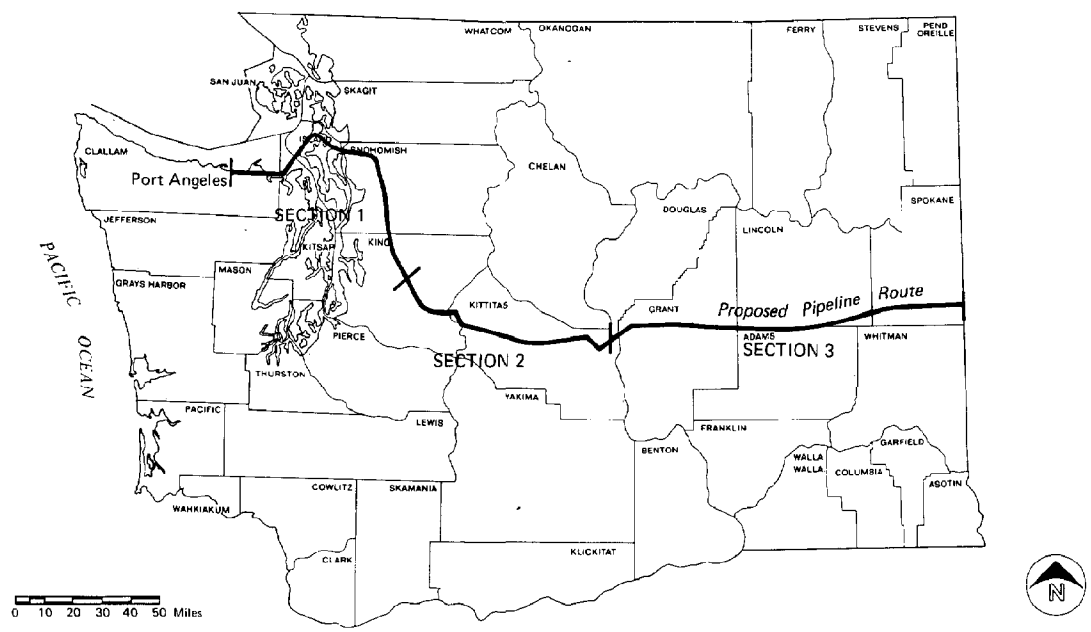


Figure 4.1.1

Northern Tier Route Sections in Washington State
Source: NTPC application

*A detailed discussion of the route, the proposed superport facilities, tank farm and overland section is provided in appendix 11.1.

Northern Tier estimated a cost of $1.885 billion for the entire system at ultimate design capacity (1981 dollars); while the cost of facilities in Washington would be approximately $818 million.

Table 4-1. Construction Cost Estimates, Northern Tier Pipeline System

(March 1981 dollars)

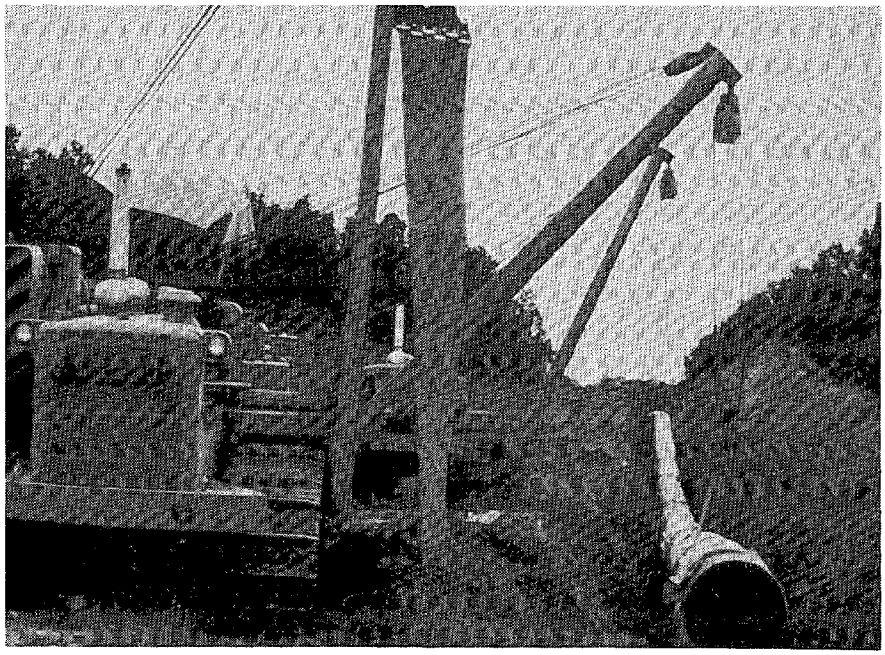
	Cost in Millions of Dollars	
	State of Washington	Entire Pipeline System
Tanker Unloading Facilities	$154	$ 154
Onshore Storage Facilities	122	122
Pipeline System		
Port Angeles to Idaho Border	542	
Port Angeles to Clearbrook, Minnesota	—	1,579
Total	$818	$1,855

Source: Beasley, July 15, 1981.

The system would be supplied by tankers delivering crude oil to a marine terminal constructed in the natural deep water harbor at Port Angeles. Crude oil would be received from Alaskan and other domestic and foreign sources and transported to inland markets. Northern Tier intended to deliver oil to existing refineries in the Rocky Mountain, upper Midwest, and eastern states. A tank farm at Green Point would be connected to two fixed tanker berths at Ediz Hook via two pipelines underneath Port Angeles Harbor. At Green Point, 11 floating roof tanks would store the offloaded oil. Eventual storage capacity would be 3.8 million barrels.

Northern Tier proposed to cross Puget Sound with submarine lines at Admiralty Inlet, 18 miles, and Saratoga Passage (Whidbey Island to Camano Island), 4 miles. These sections would be laid by barges which would lower the pipe into a deep water trench. Northern Tier asserted that the design tolerances of the lines would make them capable of resisting any reasonably expected stresses caused by submarine soil liquefaction, seismic activity, or slides. The pipe would have a minimum specified yield strength of 66,000 pounds per inch and pipe wall thickness up to 1.0 inch.

Figure 4.1.2



Northern Tier planned to lower its 42 inch pipe into a trench using sideboom tractors. The dimensions of the trench, including depth and sidewall slopes, were expected to vary, depending upon local soil conditions, trench erosion, and engineering considerations (e.g., protection against river scour).

4.2 Washington State Hook-Up Provisions

Under the terms of its federal right-of-way grant, Northern Tier was required to serve the northern Puget Sound refineries. This might entail as much as 350,000 bpd of throughput. In order to make this connection possible, a spur line would be required off the planned route near Arlington. NTPC did not provide details for the construction of that line in its EFSEC application, but indicated the following system needs if hookup were to occur:

1. An increase in the number of new tanker berths at Port Angeles from two to three.
2. Possible increase in the number of Port Angeles submarine pipelines from two to three.
3. Construction of seven additional 545,000-barrel storage tanks at Green Point (over the 18 without hookup)
4. A 2.1-million barrel storage facility at Arlington. Details would be developed after initial project certification (during a second application process).

5.0 State Review Process - EFSEC

In 1970, the Washington State Legislature established EFSEC to evaluate and license major energy facilities. Such facilities include pipeline projects as well as a nuclear and coal fired power plants. Prior to 1970, a number of state and local agencies reviewed particular aspects of energy projects and separately granted or denied permits. This resulted in costly, duplicative paper work and public hearings. Moreover, prior to EFSEC, there was no integrated assessment of each project based upon total impacts to air, water, fisheries, game, human health, and socioeconomic concerns.

The council contains representatives from 14 state agencies, appointed by their directors. The members are required to consider and balance the merits and liabilities of each application based upon EFSEC guidelines and pertinent state laws. Representatives are not limited to the special concerns of their respective agencies. A voting chairman is appointed by the Governor. In the Northern Tier deliberations, this was Nicholas Lewis whose previous agency affilitation was with the Office of Financial Management.

A peculiar feature of EFSEC's organization is the role of local governments. Cities and counties are authorized voting representation on the council when issues affecting their jurisdictions are being considered. This may result, as it did in the Northern Tier case, in counties and cities judging the merits of a case on which they have already taken a position.

In the final analysis, however, EFSEC does not actually grant or deny a permit. It only makes recommendations to the Governor. In the end, he may choose to disagree with the majority findings and recommendations of the council.

When an applicant files a formal application, this initiates a series of procedures which may culminate in contested case hearings. Within one year after an application is received and judged complete, EFSEC is required to make a recommendation to the Governor as to final approval or disapproval. As parties to the hearings, proponents and opponents of a project are allowed to present evidence and expert testimony. Any party so authorized is called an intervenor. In the Northern Tier hearings, there were 23 intervenors of which 10 received CEIP assistance.

Should EFSEC and the Governor certify a project, local land use control is preempted. That is, the applicant is freed from responsibility to secure health, building, zoning, shoreline, grading, and other related permits. Despite these exemptions, the process does require land use hearings and findings by EFSEC on land use consistency. These must be held in affected jurisdictions. The results are made a part of the EFSEC record and become a factor in deliberations. By an attorney general's opinion in 1977, the council is not required to reject a project if it is found inconsistent with land use laws and plans.

Stipulations may play a prominent role in the EFSEC process. EFSEC guidelines permit the applicant and intervenors to resolve specific issues of concerns through stipulated agreements and thereby reduce hearing time. During the course of the hearings, Northern Tier negotiated with all of the affected jurisdictions attempting to allay concerns using this mechanism. The agreements were offered to the council by the company as examples of its commitment to minimize impacts and meet local concerns. CEIP funding was used by the intervenors to develop the agreements. Each agreement included mitigation measures focusing upon local impacts and also typically addressed both plan review and liability questions. A list of stipulated agreements reached between the applicant and intervenor is found in Appendix 11.4.

A number of documents and studies are used in the project review process and become part of the EFSEC case record. These include the application, an environmental impact statement, and public testimony recorded at various public hearings. Testimony includes both prefiled statements and cross-examination of intervenors and council-called witnesses.

At the end of the contested case hearings, the council studies the record at length and issues a recommendation to the Governor. During the Northern Tier case, Administrative Law Judge John von Reis was retained to assist the council in the development of a draft order and to rule on matters of law. Judge von Reis played an active role in the evaluation of evidence and worked closely with the EFSEC staff to develop findings on the most controversial issues. Order 636, the EFSEC order recommending denial by the Governor, bears close resemblance to the Judge von Reis draft report, testifying to the influential role of the judge in shaping the outcome of the certification decision.

A key feature of the EFSEC process is its adversarial design. A decision on certification is designed to be the result of a debate over the merits of a project. The debate is played out in the presentation and cross-examination of expert witnesses by the applicant and intervenors. There are limitations in the framework, however. There is no EFSEC mechanism that ensures there will be an equality of financial resources available to project intervenors vis a vis the applicant. EFSEC is only authorized to charge the applicant the cost of preparing an environmental impact statement and a site reconnaissance study. Should an intervenor such as county, port district, or city face significant impacts from a project, that jurisdiction, whatever its resources and budgetary constraints, must sponsor its own witnesses without subsidy from the council or charges to the applicant.

In some cases, this limitation might arguably have little impact. State and local agencies, for example, commonly enlist existing staff having other functional responsibilities for the review of permit applications; however, with large, highly complex projects requiring significant specialization or detailed technical analysis, this proves to be difficult. The technical issues raised by a project such as Northern Tier simply could not be adequately addressed without a quantum increase in staffing and financial support for supplementary analysis of the presented data.

6.0 Resources at Risk

Crude oil comes to the Angeles shore
    in holds of giant steel boats
Bitter black gold from the Prudhoe Bay fields
    and sweet from the sands of Khayyam
What will it do to this land, my friend,
    where kings and silvers run free
In age-old flight from Indian nets
    and whales that rise from the deep?

At the heart of the Northern Tier controversy was the uncertain probability of significant damage to the resources of Puget Sound, the Strait of Juan de Fuca, and interrelated land and coastal resources. Just how much sensitive habitat, how many species, how much biological productivity would be jeopardized by expected worst case impacts? What would be the likelihood of either worst case or less extreme events? Northern Tier lawyers labored strenuously to prove that the project would actually serve environmental protection by reducing tanker traffic to the sound. There was no dispute that the sound, the San Juan Islands, and the inner coastal areas possessed important biological, esthetic, and recreational qualities that should be conserved.

The central arguments instead turned on the relative sensitivity of habitats and the risks posed by the Northern Tier proposal relative to antecedent conditions. Arguing from similar premises, the intervenors contended that the Puget Sound coastal province was too valuable to be subjected to any heightened oil spill risk; and Northern Tier would heighten that risk. Though the parties would disagree as to the risk and potential severity of damage, given accidents and expected pipeline related occurrences, both sides sustained an appreciation of the resources and habitat sensitivity. In fact, there was significant harmony in the testimony of Northern Tier and state witnesses regarding sensitivity of species to pipeline oil spills.

No small amount of the case hearings was devoted to the inventory -- to the stock taking of what was at risk. This included review of and reference to site specific studies of habitat as well as a substantial number of new field investigations. With the possible exception of NOAA's MESA Program, the Northern Tier review resulted in the greatest exercise yet performed by state and local government in assessing its coastal and marine resource sensitivity.

Puget Sound has been described as a vast river fed marine lake and estuary. It is flooded by 10 major river systems running from the nearby Cascade and Olympic ranges; and, under average conditions, experiences limited hydrological exchange with the marine waters of the Outer Strait of Juan de Fuca and the Pacific Ocean. The Sound is central to the region's commerce and a treasured recreational and biological resource. It is a unique confluence of natural processes including weather, currents, and tides, as well as geological, hydrological, and biological forces. The ecosystem includes an array of habitats ranging from rocky islands, sheltered beaches, extensive tide flats and estuaries, and naturally formed spits. The result is a virtually incomprehensible variety of marine life and aquatic flora and fauna.

The lowland valleys that border the Sound in Snohomish and King counties, and the Whidbey Island plateau are locally important agricultural areas, particularly noted for the production of dairy products. The harbors, including Everett, Port Angeles, Port Townsend, and Seattle to the south, are important for international

commerce, log export, commercial fishing, and industrial transshipment. The mountainous regions, particularly those on the Olympic Peninsula in the backdrop of the proposed tanker unloading site, are especially important for timber production and recreation. Similar economic values are derived in the Cascades in Snohomish County and King County.

The sound and marine waters of the state have long been exploited for commercial and recreational uses and simultaneously conserved for natural habitat value. Puget Sound's commerce and industry have, in fact, long been linked to the integrity and health of the marine and aquatic ecosystems. This relationship predates the flood of environmental legislation of the 1960s. It is reflected by aggressive state and local park acquisitions, and by longstanding efforts to maintain water quality. The State of Washington was also a leader in coastal zone conservation, establishing its own shoreline management program one year prior to federal legislation.

No better example exists of this concinnity of interest in the conservation of the sound and related habitat than the regional salmon fishery. Over 2,820 miles of streams in the Puget Sound Basin are used by anadromous fish for spawning and rearing. Out-migration from the waterways generates a renewable stock of fish worth $52 million annually in commercial and recreational catches. The health of the fishery, in turn, is intertwined with that of rare and endangered animal species, including the Northern Bald Eagle and various species of whales, seals, and porpoises. The fishery also provides the foundation to a way of life for local Indian tribes as well as long-established non-Indian commercial fishermen.

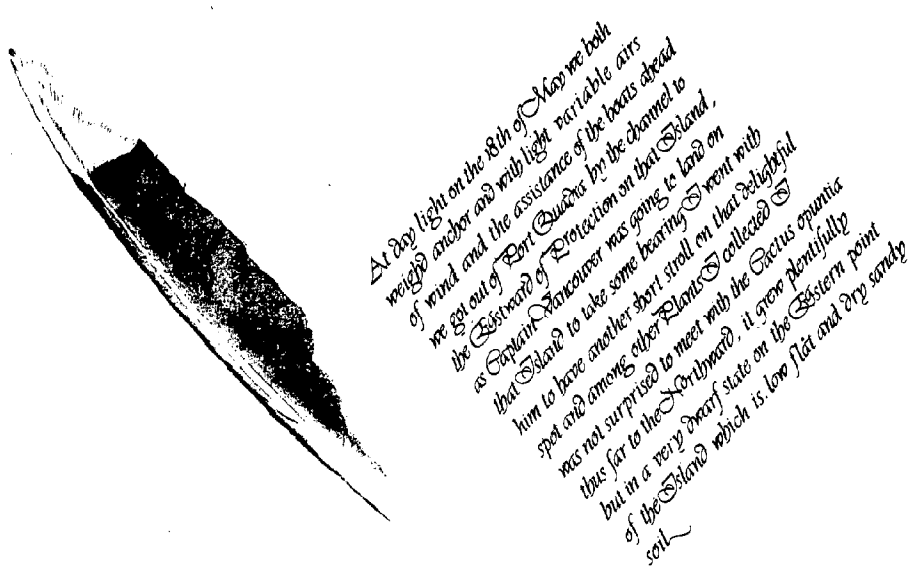


Figure 6.0.1

Menzies Journal of Vancouver's Voyage to the Strait of Juan de Fuca, 1792.

6.1 Select Geological Processes of the Coastal Zone

The Puget Sound region is an active seismic zone which has experienced frequent earthquakes of low-to-moderate intensity. Less frequent events in the Mercalli VII-VIII range have been recorded within the basin since 1949, and have been noted on the Olympic Peninsula, the Puget Sound Basin, and the Cascade province. Liquefaction, the process by which soils lose their bearing capacity by virtue of shaking and saturation, is a potential hazard in floodplains and the coastal regime. Submarine landslides and slumps are believed to occur in portions of Puget Sound where there is a combination of currents, steep slopes, potentially liquefiable soils, and seismic activity. Under certain circumstances, submarine slides can be initiated where slopes are less than 2 percent. Slopes significantly steeper are common throughout northern Puget Sound, as are other irregularities in bottom terrain such as boulders and sand waves.

In parts of northern Puget Sound, the submarine topography is marked by the presence of sand waves, the result of strong currents interacting with bottom deposits. In some areas, the rippled terrain may have amplitudes of 20 feet and wave lengths approaching several hundred feet. Because the process is dynamic, a pipeline buried in an active sand wave regime may risk being exposed by current scouring or soil movement and subjected through spanning or flotation to design stresses.

Oceanography

Wind, current, and tides work together in an intricate, yet imperfectly understood, manner within the Strait of Juan de Fuca and northern Puget Sound. The marine and shore resources jeopardized by Northern Tier would, in large measure, be a function of these forces, not only because of geological interactions but because currents would dictate the migration and dispersion of both surface and submarine oil spills. Water movement in the Strait of Juan de Fuca is influenced by tides, winds, and the large inflows of freshwater in Puget Sound and the Strait. Net flow is out of the strait toward the ocean; however, it is reversed for extended periods of time, depending upon variations in hydrographic factors.

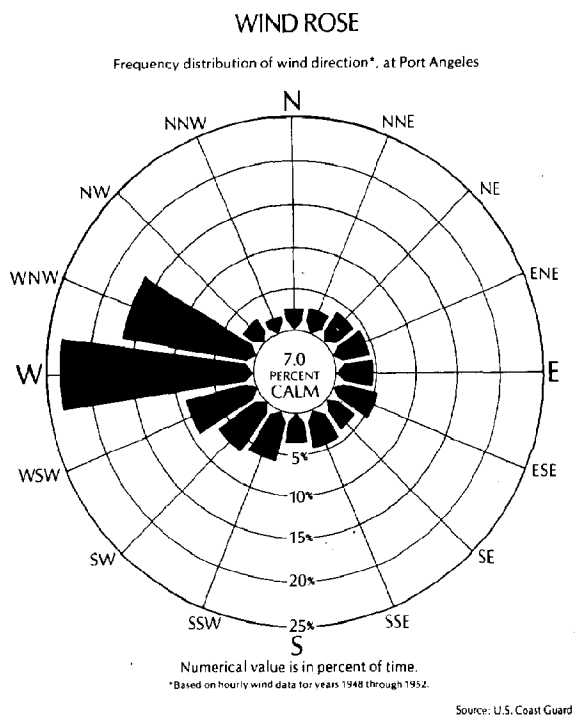


Figure 6.1.1
Wind Rose at Port Angeles

Currents in the Strait of Juan de Fuca are characterized by a westward mean flow at the surface and an eastward flow near the bottom; though these too may be reversed. Such reversals can persist for up to 10 days and may occur in both summer and winter. Currents in the eastern Strait of Juan de Fuca and Admiralty Inlet are more complex than currents in the western strait. Here, a clockwise circulation system often exists with considerable mixing of water strata over the Admiralty Inlet sill. Downwelling at the sill is likely to transport surface waters into the north basin of Puget Sound.

Puget Sound waters, like those in the strait, evidence a net outward flow, in this case northerly at the surface and southerly at depths. Currents between Port Williams and Protection Island, in the proximity to the major submarine pipeline segment, are highly variable and poorly understood.

Winds exert a strong influence on surface waters but, because of high local variability, are difficult to evaluate with respect to impact on surface flows. Westerly winds oppose drift out of the inner Strait and are most dominant at Port Angeles.

6.2 Marine Resources

North Puget Sound and Strait of Juan de Fuca

The marine waters of Puget Sound comprise a complex ecosystem of unusually productivity and diversity. Particularly noteworthy are the populations of marine mammals which include several rare, threatened and uncommon species, as well as the abundance of waterbirds and commercially important fish and shellfish.

Marine Mammals

Twenty-one species of marine mammals have been reported within the Strait of Juan de Fuca and northern Puget Sound. Thirteen of these are considered uncommon, rare or endangered. Humpback, gray, and fin whales are classified "endangered," and are known to frequent the Strait of Juan de Fuca. The northern Puget Sound region also possesses resident populations of killer whales, seals, wintering sea lions, dall porpoises, harbor porpoises, and possibly minke whales. Significant numbers of these species are found in Haro Strait and Rosario Strait.

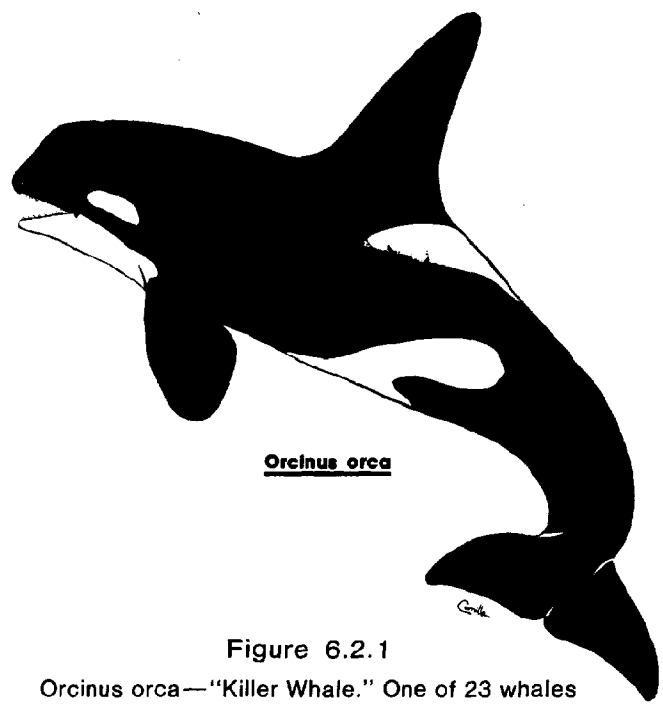


Figure 6.2.1

Orcinus orca—"Killer Whale." One of 23 whales found in Washington State waters.

Waterbirds

Waterbirds, including predators, waterfowl, and seabirds, are abundant throughout the Strait of Juan de Fuca and northern Puget Sound. Over 100 species have been identified. The strait provides roosting and staging areas for resident and migratory species, with the majority of nesting sites concentrated at Tatoosh, Protection, and Smith islands. The entire strait is important to common murres during summer and fall, with an estimated population of 150,000 birds.

Over 80 species of waterbirds are considered important by state and federal standards. Particularly notable among these are the Northern Bald Eagle (threatened status in Washington), the osprey (potentially threatened), and the peregrine falcon (endangered).

In the Puget Sound area proper, important resting, feeding, and nesting grounds have been identified for migratory and resident species. These include the south shore of Lopez Island, Rosario Strait, Skagit, Padilla, and Bellingham bays. Peregrine falcon, bald eagle, and osprey are also found in this zone. Brown pelicans (endangered) and snow geese, protected by a treaty with the Soviet Union, are also present.

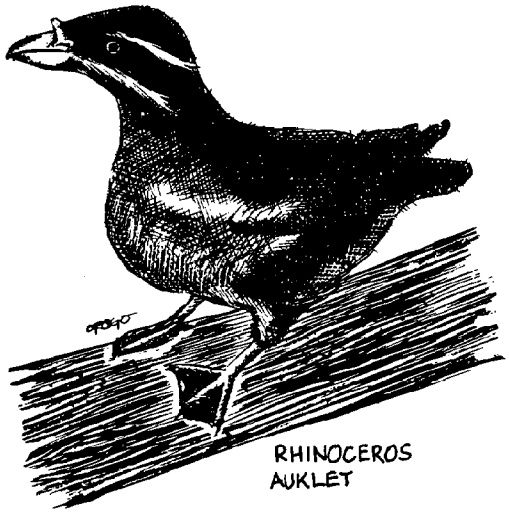


Figure 6.2.2

The Rhinoceros Auklet is named for its prominent bill. Protection Island supports the major percentage of Washington's breeding population.

Fish and Shellfish

Commercial fish in the strait and north Puget Sound zones include five species of salmon and about 50 species of bottom fish. Among the latter are flatfish, greenling and ling cod, several species of rock fish, sablefish, Pacific cod, hake, tomcod, walleye, pollock, sun perch, skates, dogfish shark, ratfish, and sculpin.

The average annual salmonid commercial catch in Puget Sound and the Strait is over 5,000,000 pounds valued at about $39,800,000 (Table 6.2.2). Over $34 million of the recreational salmonid fishery occurs in waters that could be degraded by pipeline spills. In proximity to the terminal and underwater crossings are some of the most productive fishery grounds.

All Puget Sound and many Canadian salmon runs pass through the Strait of Juan de Fuca. In addition to supporting locally valuable fisheries, these runs contribute to virtually every salmon fishery in the Pacific from California to southeastern Alaska. The Canadian fishery in the Strait of Juan de Fuca and Georgia Strait, in proximity to the Northern Tier submarine line and within spill trajectories of tanker traffic, has been valued as high as $41 million per year.

Table 6.2.1

Washington State
Recreational Salmon Catch

Area	Average		High	
	Number	Value	Number	Value
Coastal Waters	800,000	$42,000,000	1,200,000	$64,000,000
Strait of Juan de Fuca	100,000	$10,000,000	200,000	$13,000,000
Puget Sound	100,000	$15,000,000	300,000	$21,000,000

Commercial salmon fishing occurs throughout Puget Sound and the Strait of Juan de Fuca.

Recent commercial harvest levels of bottom fish from Washington coastal waters have averaged 24,446,000 lbs. valued at $10.2 million.

Table 6.2.2

Washington State
Commercial Salmon Catch

Area	Average		High	
	Number	Value	Number	Value
Strait of Juan de Fuca		$ 2,000,000		$ 3,600,000
West Beach	85,000	64,000	158,000	1,137,000
Point Roberts - San Juan Islands	3,900,000	27,000,000	5,300,000	38,000,000
Bellingham Bay	133,000	2,400,000	220,000	3,600,000
Skagit Bay	74,000	700,000	146,000	1,200,000
Port Susan Port Gardner	88,000	1,000,000	125,000	1,400,000
Discovery Bay - Admiralty Inlet	110,000	1,200,000	244,000	2,900,000
Southern Puget Sound	263,000	3,100,000	473,000	6,100,000
Hood Canal	165,000	1,700,000	475,000	4,500,000

Macroinvertebrates, including clams, crabs, oysters and mussels, exist in significant concentration at a number of state identified sites in both the Strait and the Puget Sound proper. Average annual commercial production of all shellfish in the Strait and in Puget Sound (north of Tacoma) is 13,695,724 lbs., valued at $9,684,560.

6.3 Terrestrial and Aquatic Resources

Streams

Northern Tier identified 11 rivers that would be crossed by the pipeline (see Table 6.3.1). Each of these with their feeder streams produces a large annual supply of economically important fish species. Moreover, most of the crossing would occur below impoundments or barriers that obstruct fish passage. As a result, important spawning and rearing areas could be subjected to impact. Eight of the rivers are utilized by at least three salmonid species at or above the planned crossing.

The water quality of each of the rivers is good to excellent, and the discharge of each of the systems makes an important contribution to the water quality and productivity of the state's estuaries and marine waters.

The river systems also have a significant intangible benefit by virtue of the fact that they support the lifestyle and culture of several Washington Indian tribes. Among those most directly affected would be the Tulalip and the Stillaguamish, whose accustomed fisheries are largely dependent on the productivity of King and Snohomish county streams.

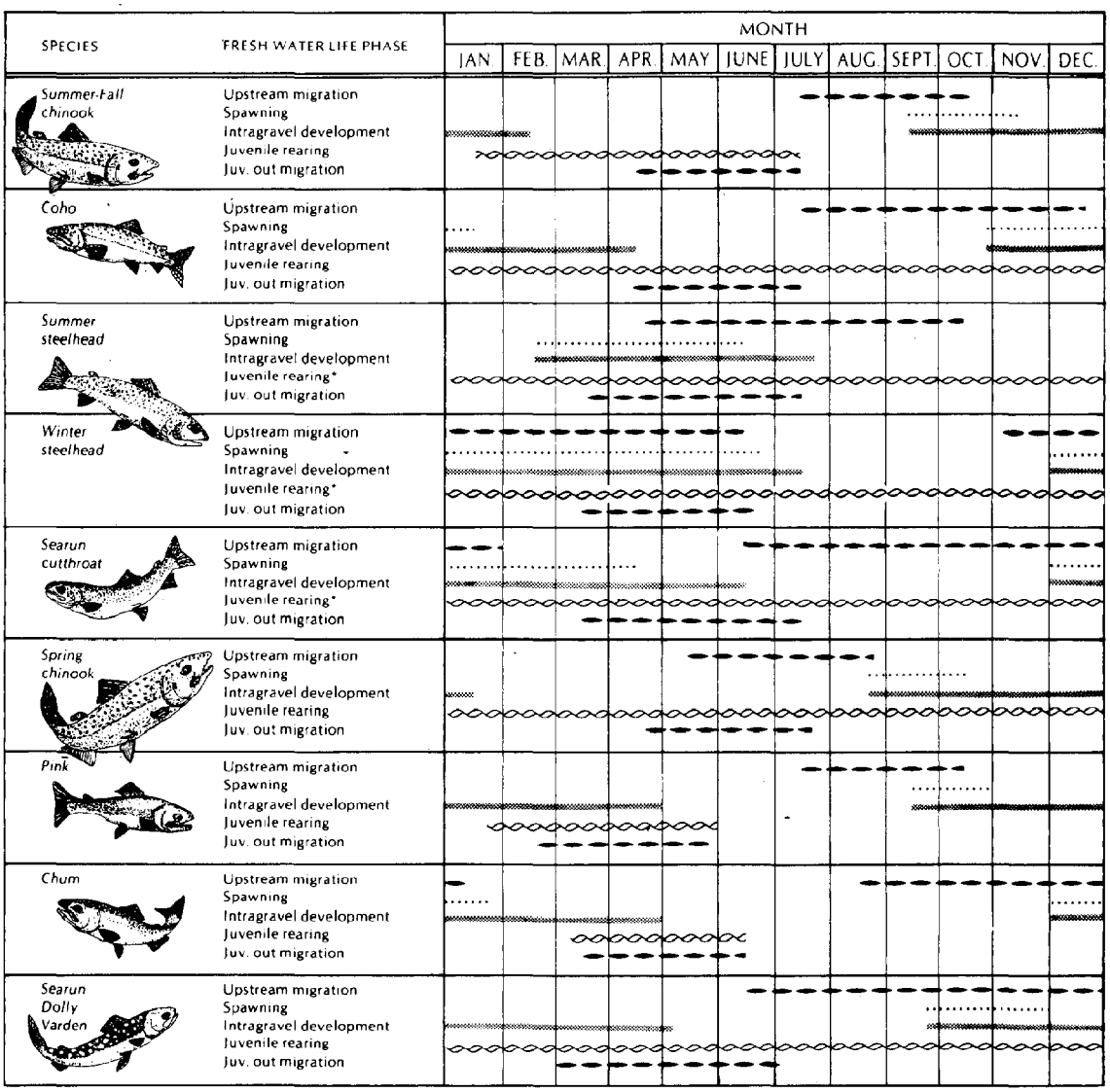
Table 6.3.1

Eleven Washington State Rivers Crossed By the Northern Tier Pipeline

River	County	100 yr. discharge	Salmonid/ species	Water Quality
Dungeness	Clallam	8,800 cfs	yes/3	A
N. Fork Stillaguamish	Snohomish	40,000 cfs	yes/4	A
S. Fork Stillaguamish	Snohomish	42,000 cfs	yes/4	A
Pilchuck Creek	Snohomish	12,000 cfs	yes/4	A
Pilchuck River	Snohomish	12,000 cfs	yes/4	A
Skykomish River	Snohomish	120,000 cfs	yes/4	A
Tolt River	King	20,500 cfs	yes/4	AA
Snoqualmie	King	65,000 cfs	yes/4	A
S. Fork Snoqualmie	King	12,000 cfs	downstream	AA
Yakima	Kittitas	31,000 cfs	unknown	A
Columbia	Kittitas	740,000 cfs	downstream	A

FRESH WATER LIFE HISTORY PHASES OF SALMON AND SEARUN TROUT

TIMING OF SALMON AND SEARUN TROUT FRESH WATER LIFE PHASES IN THE SNOHOMISH BASIN



*Normally extends over a two-year period

Figure 6.3.1

Fresh water Life History Phases of Salmon and Sea-run Trout. The debate over fisheries impacts largely revolved around gravel siltation and the timing of Northern Tier stream crossings.

Northern Tier proposed the crossing of all rivers with the wet trenching construction method. Under this approach, a trench (a minimum of 4 feet below scour depth in the channel) would be excavated by equipment working in the stream or on the banks.

No stream or river would be dewatered, diverted, or flumed prior to excavation. Therefore, water would be free to erode trench material and carry it downstream. The dimensions of each trench and the specific elevation of the buried pipe would depend upon the computed depth of scour based upon estimates of 100-year flood flow.

Flooding is common in all of the rivers crossed because of a lack of upstream controls (dams and reservoirs) and limited channel capacity. The result is that channel migration, scour, and bed instability are common. Flood hazards have prompted floodplain residents to construct systems of dikes, generally of makeshift unreliable quality, to protect property values. Annual expected damages due to floods commonly exceed $1 million in the larger rivers (e.g. Snoqualmie, Snohomish, Stillaguamish). Northern Tier would cross segments of these rivers in areas where flooding, channel migration, and scour have been common in recent history (e.g. Stillaguamish, Skykomish, Snoqualmie crossings). A pipeline break or rupture at such a location would likely cause spilled oil to flow into the numerous adjacent floodplain wetlands and to collect on floodplain farmland.

Northern Tier identified 90 additional small stream crossings in the state. These waterways range from intermittent streams to large creeks and are found mostly in Snohomish and King counties. Northern Tier would cross 33 small streams in Snohomish County. Twenty of these produce salmonid. An additional 22 streams would be crossed in King County, of which 12 are utilized by salmonid.

Table 6.3.2

Western Washington Small Stream Crossings
and Fish Usage

County	Streams Crossed by Centerline	Crossings with Salmon Use
Clallam	6	2
Snohomish	33*	20*
King	22	12*

*Snohomish County data; all other NTPC data.

Despite their productivity, most of these streams are under existing stresses due to upland forest practices, loss of riparian buffers, and other deleterious land use practices. This condition heightens the potential for threshold tolerances being exceeded and quantum reductions in productivity.

Wetlands and Wildlife Habitat Areas

Intervenor studies indicated that the centerline crossed several scores of important freshwater and marine wetlands ranging in size from less than two acres to complexes such as Davis Slough-West Pass and the Skykomish confluence which exceed 50 acres. Eleven threatened, endangered, or rare species of flora and fauna were documented in close proximity to the centerline. Table 6.3.3 gives a summary of wetlands crossed by the centerline or within the corridor.

An inventory performed by Snohomish County (CEIP funded) identified 20 relatively undisturbed wetlands that would be crossed by the route. Several of these are habitats for endangered waterbirds and various species of statewide significance (gyrfalcons, great blue heron, osprey, whistling and trumpeter swans).

Figure 6.3.2

Northern Tier's centerline crossed 20 wetlands in Snohomish County. Pictured here is one of these, the large wetland complex near the South Fork Stillaguamish River Crossing.

Table 6.3.3

Select Wetlands Along the Pipeline Route
Western Washington

County	Crossed by Centerline	Within 2 mile Corridor
Clallam County	1	4
Island County	2	Unknown
Snohomish County	20*	55*
King County	6	Unknown

*Snohomish County Inventory; all other data NTPC.

Other Critical Habitat Areas

Dungeness Bay and Dungeness Spit are located two miles north of the centerline in Clallam County, bordering the Strait of Juan de Fuca. Portions are within a designated national wildlife refuge. Several habitat types are present including mudflats, salt marsh, open water, and eelgrass beds. The area provides habitat for brandt, wigeons, western grebe, Canadian geese, and a variety of other waterbirds.

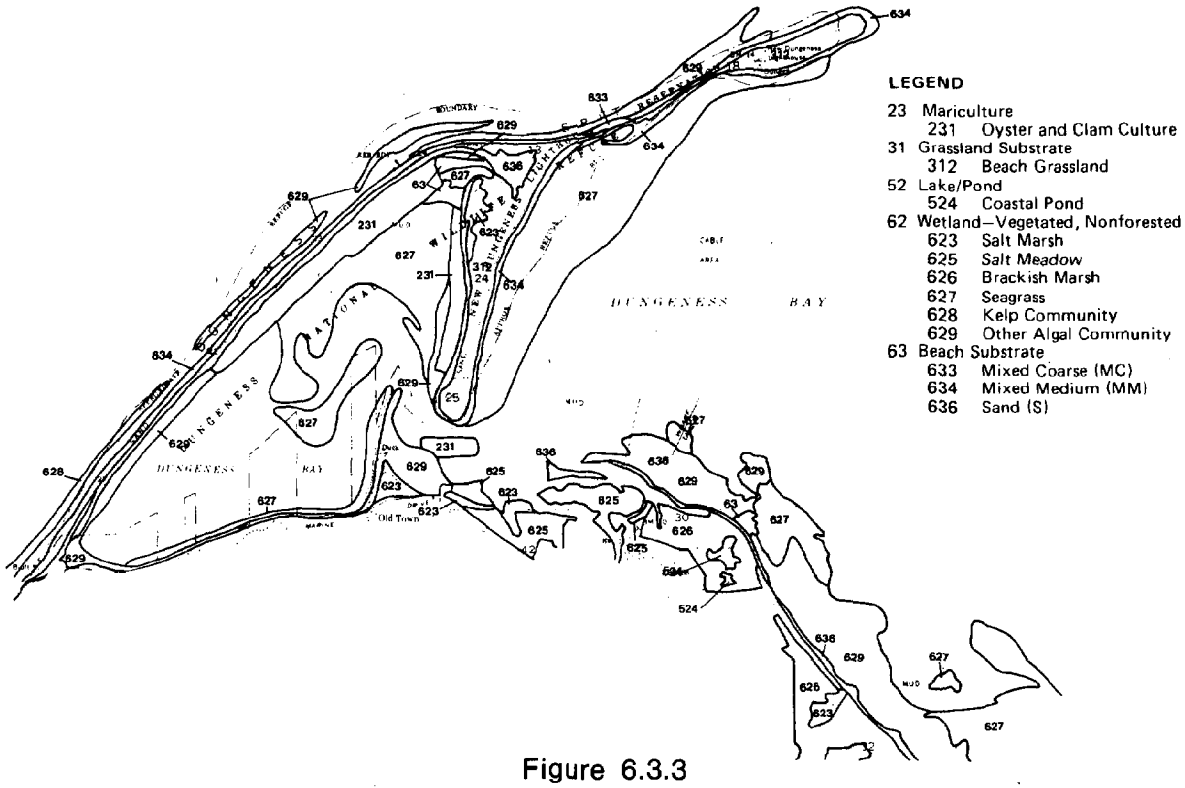


Figure 6.3.3
Marine Habitat of Dungeness Bay

Source: NTPC EIS

Discovery Bay

Located at the eastern end of the Strait, Discovery Bay, like Dungeness Bay and Sequim Bay, is a multi-species habitat. The Army Corps of Engineers has defined it as important for many species of wintering and migrating waterfowl. Among the species present are osprey, western grebe, and rhinocerous auklet. Shellfish include clams, crab, oysters, and mussels.

Smith Island

This island is a designated national wildlife refuge. Located northwest of Whidbey Island it is habitat for black oyster catchers and pelagic cormorant.

Protection Island

Located near the mouth of Discovery Bay in the strait, Protection Island is one of the most important habitats for waterbirds in the state. It is the largest breeding colony of rhinocerous auklet south of Alaska.

San Juan Islands

Located 16 miles north of the centerline but within spill trajectories of tankers in the strait, the islands possess 10 areas designated by the state as "significant" for shellfish. Shrimp, clams, and crab are abundant. Marine waters of the islands have also been designated marine biological preserves and provide concentrations of numerous fish species and threatened or endangered marine mammals. Dall porpoise, harbor porpoise, minke whales, and killer whales are found throughout the island chain. In addition, gray whales have been sighted in Bellingham and Samish bays.

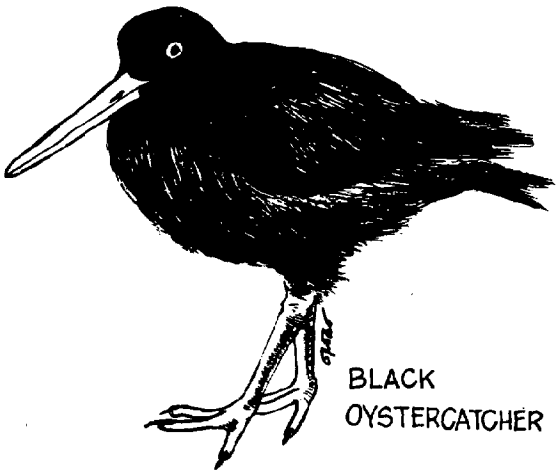


Figure 6.3.4
Black Oyster Catcher

Colockum State Wildlife Recreation Area

West of the Columbia River crossed by the centerline. This is an important elk winter range with densities of approximately six per square mile. Other resident mammals include pronghorn antelope, mountain sheep, black bear, mountain lion, and mule deer. The area also produces important upland game species and possess an abundance of rare plant species.

Gloyd Seeps

In eastern Washington crossed by the centerline. This area is managed for waterfowl and pheasant and is used for nesting by golden eagles. It is also a resting site for migrating white pelicans.

7.0 CEIP Role in EFSEC Certification Process

In 1973, the oil embargo focused national attention on the need to develop new domestic sources of energy. Recognizing that energy development would have significant effects on coastal communities, Congress created CEIP in 1976, through an amendment to the Coastal Zone Management Act (CZMA).

The CEIP assists states and local communities in coping with the social, economic, and environmental consequences of energy development in coastal areas by providing grants and loans. These sources of financial support have been used for planning, environmental mitigation, and for acquiring public facilities and public services required as a result of coastal energy activities. As amended in 1978 and 1980, the program provides funds to address impacts resulting from the transportation and storage of oil, gas, and coal and from development of alternative energy sources in the coastal zone.

WDOE, as the lead agency under the coastal zone management program, provides state resource agencies and affected local governments with the capability for enhanced consideration of energy impacts. Since the program was established, it has had a special focus on the Northern Tier certification process. The main objective of the program has been to assist units of government with the identification of environmental, recreational, and other potential Northern Tier-related impacts prior to the construction and operation of the proposed facility, and the development of impact avoidance or mitigation measures as conditions for a prospective certification order.

Allocation of federal funds to local and state agencies was coordinated by WDOE through its intrastate allocation process. Subawards were prepared and furnished to those agencies documenting the greatest need based on potential effects and concerns raised by the project. CEIP subawards contained elements allowing for the retention of outside experts familiar with oil transshipment facilities. As indicated in subsequent discussion (especially under Findings), CEIP sponsored studies brought a wealth of new critical information to bear on risk estimation, geological hazards, habitat sensitivity, and other issues.

WDOE made its initial CEIP grant application in the summer, 1978. Through June 1982, the agency distributed nearly one million dollars in CEIP funds to other state agencies and local governments potentially affected by the proposal.

The subawards were used by state agencies and local jurisdictions to develop expert testimony on important aspects of the projects. This was facilitated by funding project coordinators.

Wn. State Dept. of Game	Larry McCallum-Curt Leigh
Wn. State Dept. of Fisheries	Mary Lou Mills-Frances Solomon
Wn. State Dept. of Ecology	Bill Obert
Clallam County	Mike Doherty
Island County	Thom Gunn
Jefferson County	Rachel Nathanson
San Juan County	Alan Merson
Snohomish County	Jim Currie

The coordinators identified issues needing additional analysis, retained consultants, and performed a valuable communication function within and between departments and agencies. The result was that a valuable local knowledge of resources and resource impacts was brought to the hearings. In some cases, the coordinators actually performed detailed technical analyses and submitted expert testimony.

CEIP monies can also be credited with a considerable portion of expert review by state agencies. The state coordinators, mobilized the resources of their respective agencies and created a multidisciplinary dialogue between agencies. This resulted in a review of the application that was far more coordinated than would likely have occurred without CEIP funding. The review process included numerous inter and intra-agency conferences in which issues were identified and data needs established. The dialogue, in turn, resulted in structured investigations and divisions of responsibility. An annotated list of environmental, recreation, and socioeconomic studies funded by CEIP is provided in Appendix 11.2.

8.0 Northern Tier's Estimation of Impacts

Northern Tier represented one of the largest, most complex projects ever to be considered for certification or licensing by state and local authorities. In this respect it must be considered in the same category with nuclear power plants and the large hydroelectric projects of the Columbia River.

8.1 Linkages

Any substantial project is bound to present its own unique set of uncertainties with respect to economic and environmental impacts; however, the Northern Tier proposal, to an extreme degree, presented a probabilistic problem. That is, impacts would be especially dependent upon error sequences, breakdowns in sophisticated technology, and the action of not-well-understood natural processes. At an early state in application review, the intervenors expressed dissatisfaction and concern over the applicant's treatment of these critical relationships.

Northern Tier contended that it used conservative assumptions in evaluating both risks and impacts. It cited various design values for evaluating pipe scour hazards at river crossings, earthquake and seismic risks, remote event probability values for fires and explosions. Table 8.0.1 presents a brief overview of several of the most important company findings with espect to risk and impact. It also matches impacts with the concerns of specific intervenors who used CEIP monies to review aspects of the application and develop contrary evidence.

From the outset, the application generated skepticism. Although this can partly be ascribed to local interests opposing the project which would levy them the heaviest impacts, controversy was also fueled by deficiencies in the application and EIS. In many important cases there was simply no clear trail of logic that enabled a reviewer to test the Northern Tier conclusions.

Where the applicant claimed to have conducted detailed habitat studies, there was often little supporting evidence. Where the applicant claimed to have studied the geology of the submarine route, critical factors were not reported. In general, the trail of logic was nearly always impossible to follow. Moreover, it was clear that many of the worst conceivable impacts would be determined by interrelated factors and functions that were extremely sensitive to initial assumptions.

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Electrical Energy	Increased demand for power to operate the pipeline system aggravating future power shortages.	System would deliver 35.7 quadrillion BTUs and consume 1.3 quadrillion. It would consume less energy than existing transshipment system serving the midwest. Maximum design energy consumption at tank farm and Port Angeles pum station: 137,800 MWH, peak load 16.6 MW.	E, CCPA			Utility districts along route would supply pump station power. Total pump station requirements: 87.3 MW at maximum capacity.	E, CCPA
Municipal Impacts	Deficiencies in supply of housing, schools, medical transportation networks, police and fire services caused by construction activity and worker inflow.	No significant need for hospital facilities, physicians. No taxation of existing school capacity expected. Increased traffic in Port Angeles due to construction activities, but impacts mitigated through stipulations with city. Housing demand during construction could exceed supply by 70% (79 units), translating into increased rents. Reduction in police service below national standards (construction phase). Potential shortage in P.A. water supply; but stipulations would mitigate.	CCPA CCPA CCPA			No significant amount of traffic congestion caused except on Whidbey Island. No significant schools impact. Expected short fall of housing supply during construction in several towns; pressure on rents. Slightly aggravated sewage problems in Sequim.	I
Economic Impacts/ Benefits	Hardship to local industries, dislocation of businesses as well as positive effects including tax base increase, job creation, supply of energy.	No effect on marine, fishing, timber industries, or disruption of ferries due to construction. 124 direct jobs created by operation activities. $1.9 M in wages to Clallam Co. workers Temporary diversion of some tourist business.	CCPA	No effect on fishing industry.	T	Reduced oil surpluses on west coast. Northern Tier would lessen delivery costs, expected petroleum shortfalls in eastern Washington, Northern Tier states. $14.7 M in taxes during construction (state and local). 9-47 operation jobs.	E, CCPA E, CCPA

CCPA - Clallam County/City of Port Angeles concern
J - Jefferson County
I - Island County
S - Snohomish County
K - King County

E - Department of Ecology
F - Department of Fisheries
G - Department of Game
T - Tulalip Tribes
SJ - San Juan County
M - Miscellaneous State Agencies

* Note that impacts are drawn from NTPC application and NTPC testimony.

AV/L22(A2,4-7)

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
		NTPS would generate $11.2 M in expenditures from its payroll. Creating 600 construction jobs. Clallam County - 500 indirectly created. At peak construction, 750 jobs created (direct). $710,000 to Clallam Co. in taxes during construction, Port Angeles - $58,200. Annual property tax increase of $2.4 M.				Construction will create 1000 full time jobs. 900 jobs would be created indirectly in state due to NTPS expenditures. $7.7 million in state and local taxes during construction.	
Oil Spill Risk Seismic Hazards	Stresses to pipeline - induced by movement of ground.	Low because design ground accelerations of .20g and Mercali + VII earthquakes have only 10% exceedence possibility during project life.	CCPA	Low. No evidence of bedrock movement, faulting, submarine landslides; pipeline's "sympathetic movement" capacity reduces hazards.	I, CCPA	Low. Pipeline crosses faults but tensile strains accommodated by design.	
Liquefaction Hazard	Potential pipe rupture from loss of soil bearing strength, susceptibility of pipe to downslope movement, sinking.	Low. Soils not expected to liquefy at .20g ground acceleration.	CCPA	Low. Potential sinking of pipe 20 feet, but stresses within design values.	CCPA, J	Low. Potential for lateral spreading at river crossings but stresses within design values.	C
Spillage due to tanker collisions; other pipeline spillage.	Spills due to tanker collision, anchor drag, and penetration, river scours, other natural causes.	Port Angeles; one vessel casualty per 7 years. (1200 barrels).	CCPA	NTPC would increase tanker traffic by 395 calls per year. Average tanker spill volume 10,116 bpy; one spill per 4.7 yrs. 50% chance of spill over 10 K barrels due to tanker accidents (20 yr. project life). 25% chance of total vessel loss in 20 years. These represent conservative estimates of risk - NTPC. Low risk of submarine pipeline rupture. 10 K bb spill: 1/3200 years. The existing risk from tankers and barge traffic would be reduced if NTPS is operated as a common use facility.	I, CCPA CCPA CCPA, E, I	Low. Terrestrial-overland risk less than 2.4 bb per 3.7 years. Quantitative estimates are conservative because NTPC technology is state of the art; conservative approaches used for burying pipe at river crossings.	S

AV/L22(A3,8-11)

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Oil spill migration potential.	Migration of spills through actions of tides, winds, currrent, terrestrial migration due to river, ground water hydraulics.	Port Angeles spill contained within harbor.		NTPC projections - accident in strait would affect sensitive areas in straits, not Puget Sound. No methodology is yet available to accurately estimate migration/dispersion. An Admiralty Inlet spill could conceivably migrate to inner Puget Sound; however, these areas already exposed to risks.	SJ, F, E	Applicant performed no trajectory analysis of terrestrial dispersion through streams, ground water. Leaks approach-streams, ground water. Leaks ing 0.5% of flow would surface.	K, CCPA
Fire and explosion hazard to life and property							
Tankers	Worst case at Port Angeles:						
	a. Berthing - explosion of cargo tanks of berthed tankers.	a. Low. Tanker explosion in port 1/45 years; fires in harbor 1/18 years. Unlikely health impacts because of distance; minor building damage with no major structural damage.	CCPA				
	b. Grounding - explosion of tanker grounded in harbor.	b. Potential deaths expected within 940 ft. radius). Waterfront population would experience non-lethal effects.	CCPA				
	c. Worst case fire (from 327,000 dwt tanker).	c. .6% over 20 years.					
Tank farm and pump stations	a. Tank farm fire worst case - tank over-fill and rupture with subsequent ignition.	a. Worst cse tank fire - 1/4000 years - $500,000 damage.	CCPA			Worst case fire explosion at pump station: 1.2% over 20 years. Fatality: 1 per 1000 years.	
	b. Pump station worst case - explosion of surge relief tanks with fire. Damage over $500,000.	b. Probability of tank fire 1/40 years, expected fatality due to fire or explosion: 1 per 1400 years.	CCPA			46% chance over 20 years of fire causing $1000 damage.	

AV/L22(A3,12-15)

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Hazards of Other Geological-Hydrological Processes	Impact on littoral drift.	Excavation of pipeline slot will cause only temporary interference with littoral drift at Green Pt.	CCPA, E				
Air Quality	Violations of state air quality standards and increases over baseline conditions for select chemical compounds.	No violations of state SO2 standards predicted with or without project. No expected violations of NO2 concentrations. No violations of ozone standards predicted based upon worst case senarios. Predicted concentrations for CO are negligible. Less than 20% increase over baseline hydrocarbon concentrations. *Temporary (3 month) increase in* fugitive dust levels due to construction. In general, Northern Tier would implement "best available control technology" (BACT). Measures include use of low sulphur fuel.	E, CCPA			BACT measures include use of floating roofs and double seals for pump stations.	

AV/L22(A3,16-19)

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Oil Spill Impacts						Loss of foraging area.	G
Marine Fauna, Water Birds	Phyiscal effects on water birds, mammals, fish, and invertebrates due to chemical toxicity, habitat effects	See submarine, marine impacts.		Mortality of individual water birds due to oiling; species living on water most susceptible (loons, ducks, grebe ducks, puffins).	F, E, G, SJ		
				Effects include both habitat loss and physical dysfunction.			
				Any of important water birds in Strait could be affected especially if spill occurred during critical periods.	G		
				Catastrophic spill contaminating Dungeness Bay could kill 73,000 birds.			
				Feeding areas could be lost for up to 7 years.			
				No effective way of cleaning birds or their habitat after fouling.	G		
				Under most rigorous cleanup, only 10% of birds treated remain alive.	G		
Fish and Marine Invertebrates				Salmon show effective avoidance of oil below toxicity levels (both for fry, adults).	I, F, T		
				Potentially high local mortality in shallow marine waters for salmon fry, rocky shore areas.			
				Most detrimental impact to invertebrates would be in confined bays (eg, Crescent Bay, Freshwater Bay).	SJ, F, E		

AV/L22(A3,20-23)

Table 8.0.1

NORTHERN TIER'S ESTIMATION OF IMPACTS--
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Water Impacts - Oil		Temporary increases in turbidity in harbor and strait due to construction of unloading pipelines.	F				
Surface Water						Low. Pprobability of significant construction oil spills.	
		Effluent from oil-water separator will cause limited minor impacts to coastal waters.	E				
Ground Water and Water Supplies		Potential oil spill contamination limited to surface waters - no aquifer contamination.	CCPA			Low Ground water is at sufficient depth on Whidbey and Camano islands to prevent contamination.	CCPA, K, I
Water Impacts - Sediment							
Surface		Operation impacts minimal due to mitigation measures.	CCPA	Construction induced turbidity due to pipeline trench excavation, specially near land falls. Transport both west and east.	E, F	Low. Surface water may be temporarily degraded by several 100 mg/L but effects temporary.	E, S
						Northern Tier would reduce impacts of sediment by implementing effective mitigation measures.	S
						R.O.W. erosion will increase with removal of vegetation; revegetation will reduce soil, sediment loss.	S, G, E
Ground Water and Water Supplies		No construction impacts expected to ground water, municipal water supplies.				No construction impacts to ground water supplies	K
						Potential is slight for breeching Whidbey Island aquifer.	I
Hydrostatic Testing	Marine/surface water withdrawal and discharge of water for hydrostatic testing of pipe integrity.					Withdrawals may impact aquatic life but mitigation measures will reduce impacts (e.g., timing).	E

AV/L22(A3,24-27)

NORTHERN TIER'S ESTIMATING OF IMPACTS
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Oil Spill Imputs Marine Fauna (Continued)							
Fish and Marine Invertebrates		See Submarine Impacts		Unpredictable sub lethal impacts to organisms due to long-term exposure.	I, SJ, F		
Marine Mammals				Oiling of marine mammal habitat in Strait - Neah Bay, Tatoosh Island, Dungeness, Protection Island, Smith Island. Primary species affected: seals, sea lions - through contamination of food sources. Other species would be able to avoid oil and adjust foraging.	F, SJ, G		

AV/L22(B3,4-7)

NORTHERN TIER'S ESTIMATING OF IMPACTS
ENVIRONMENTAL IMPACTS AND INTERVENOR CONCERNS
(Continued)

Issue/Impact	Description of Impact	Impacts at Port Angeles/Tank Farm	Intervenor Concerns	Impacts on Marine Water and at Submarine Segments	Intervenor Concerns	Overland Impacts on Land, Streams, Air, and Ground Water	Intervenor Concerns
Construction Impacts to Flora and Fauna	Mortality; health effects to species due to noise; direct loss of habitat; sedimentation, nutrient loading.						
Fauna		Impacts to marine mammals and shore birds at tanker unloading facility short term; will affect few individuals.		Construction activities displacing mammals and water birds will be temporary and local.	C	Areas of particular concern: Coastal areas, Keechelus Lake, Yakima River, Columbia Basin, Designated refuges	C
		75 acres of water bird habitat lost at berths.		Marine mammals and water birds may be disturbed by pipelaying trenching, but will avoid areas of high activity as will adult marine fish.	F, T		
		Adult fish will avoid most construction activities.				No need to inventory further sensitive habitats.	S, G
		Unloading pipelines will destroy benthic fauna; mobile species will avoid activity, sedimentation.		Increased turbidities may increase mortality of demersal fish or juveniles in eelgrass areas.	F	No endangered species habitat known along centerline, corridor.	S, G
		Loss of 140 acres of woodland habitat at Green Pt. - No nesting endangered species.		Juvenile salmon could be affected near shorelines.	T	Minimal impact to anadromous fish due to construction induced sedimentation.	T, S, F, G
				Sedentary animals including clams will be destroyed in pathway of trenching.	F	NTPC contends mitigation measures would be effective.	T, S, F, G
				Potential release of toxic substances into water column by dredging.	F	Directional drilling neither necessary nor desirable.	S
Flora		No effect on salt marshes expected.		No major losses.		Removal of riparian vegetation will cause some wildlife displacement. In other cases, edge will be created.	S, G
		Loss of second growth at Green Pt.				Mitigation measures employed will reduce impacts to insignificant levels.	S, T
						No terrestrial wetlands crossed by centerline in W. Washington.	S, K
						No unusual species known to be on centerline in Cascade foothills.	S
						Unusual species may be affected/lost between Colockum and Crescent Bar.	C
						200 acres of farmland lost but only 58 acres removed from production.	S

AV/L22(B3,8-11)

The oil spill problem was an example of a complex pathway type issue in which the steps in the estimation-evaluation process were potentially pyramidal. First, there were a number of important spill questions. One in particular was the hazard of a crude oil tanker accident in the Strait of Juan de Fuca. An initial assumption had to be made about the quality, age, and size mix of tankers making port calls at Port Angeles. One had to be relatively clear on system throughput in order to work backward to tanker traffic. In addition, one had to make assumptions about hookup. For example, would NTPS supply North Puget Sound refiners? This would depend on the ability of NTPC to deliver the type of crude oil and petrochemical compounds needed by the refiners. As the hearings progressed it became clear that neither the application nor EIS confronted directly a host of important questions. There were additional interrelationships that needed to be clarified in the evaluation of tanker oil spill risk and resulting impacts.

- Factors determining accidents. To what degree did existing models specify pertinent variables? (e.g. tanker age, flag, size, port characteristics)

- Data base validity and reliability of prediction logic. To what extent did the Northern Tier project area (spill impact area) differ significantly from other "environments" for which spill models were developed? Were these models statistically valid?

- Relationships between accident events and spill events. NTPC inferred spill volumes in a two-stage process. First it established accident frequencies, then it developed spill size distribution.

- Spill migration and dispersion. Once an event of given characteristics occurs, where will the oil go? How reliable are estimates of migration? What is the range of possible outcomes? Could significant amounts of oil reach central Puget Sound? How does oil migration change between surface and subsurface spills?

- Sensitivity of coastal habitats and flushing potential. How long would the oil persist, given particular geohydraulic conditions? Did the applicant adequately inventory sensitive habitats within the probable range of oil migration?

- Sensitivity of species and trophic networks. To what extent would a spill cause mortalities due to direct lethality and indirect losses from sublethal induction of stress or habitat alteration?

Clearly, the problem was prodigious. The complexity and uncertainty surrounding a host of other environmental issues was at least as problematic.

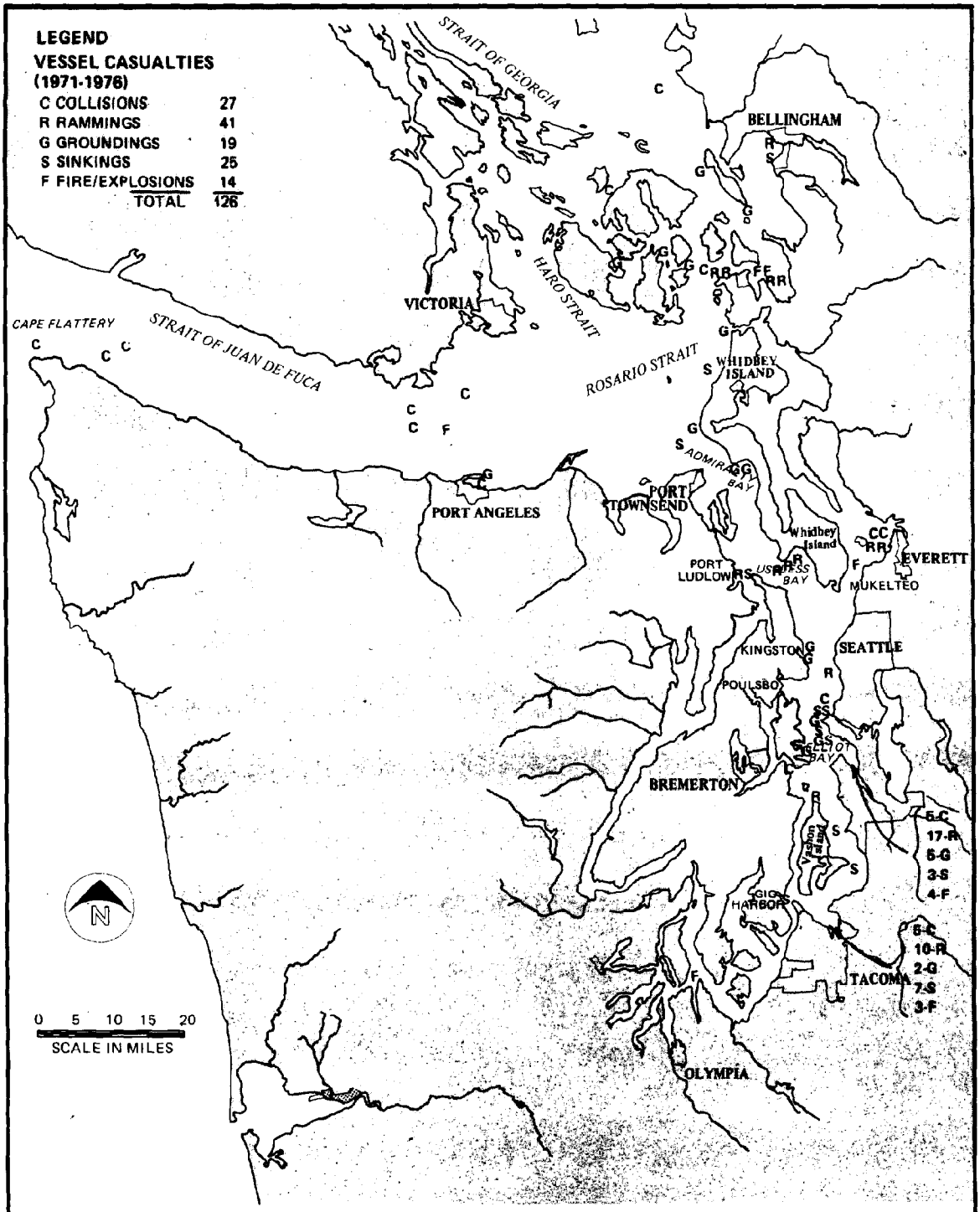


Figure 8.1.1

Cause and Location of All Vessel Casualties. John Bennett, a Clallam County consultant, critiqued OIW-NTPC analysis of tanker accidents in the Strait, using local, national and international data. He asserted that high incidents of fog was a significant factor accounting for vessel accidents.

Hardly less intricate and sensitive linkages were associated with impact estimates for the submarine pipeline (rupture) due to liquefaction, anchor penetration, and submarine landslides.

Terrestrial risks included the possibility that a pipeline could be scoured out of its trench by an extreme flood, or that sediment generated by construction work would be entrapped in salmon spawning gravels and reduce fishery productivity. In each case, defensible assumptions had to be made. Geologic hazards were largely a function of seismic activity, currents, and soil conditions. Were the company's analyses of these factors reliable? Again, the outputs depended upon key assumptions. What were the assumptions about background stresses on fish? How much silt would be generated? What was the capacity of a stream to flush fine materials generated by wet trenching?

Of the environmental impacts evaluated by the company and its consultants, those that drew the greatest concern and eventually manifested the greatest significance in EFSEC findings were

- fire and explosion at Port Angeles
- tanker and submarine pipeline spill risk
- spill migration
- submarine geological hazards
- oil spill impacts on flora and fauna.*

8.2 Fire and Explosion at Port Angeles

Northern Tier relied upon its own consultants, ERT and OIW (Oceanographic Institute of Washington), to arrive at estimates of tanker explosion risk and oil fires in Port Angeles Harbor. Tanker explosions were modeled using assumptions about maximum volumes available for combustion and by making conversions to peak over-pressure at given distances from the source. The company also estimated moderate and severe damages to structures on the waterfront by establishing radial impact zones from a source.

Risk analysis was then performed using historical data. The company concluded that a worst-case tanker explosion would occur once every 45 years. Health impacts would be unlikely because of the distance of the berthing facilities from the waterfront and population centers.

In the event a tanker broke free and grounded in the harbor, deaths might occur to anyone within 940 feet of the blast. Radial distances would be too great to expect waterfront deaths; but nonlethal effects could occur. Northern Tier estimated that the probability of such an event was less then once every 11,500 years.

*Integral to other concerns.

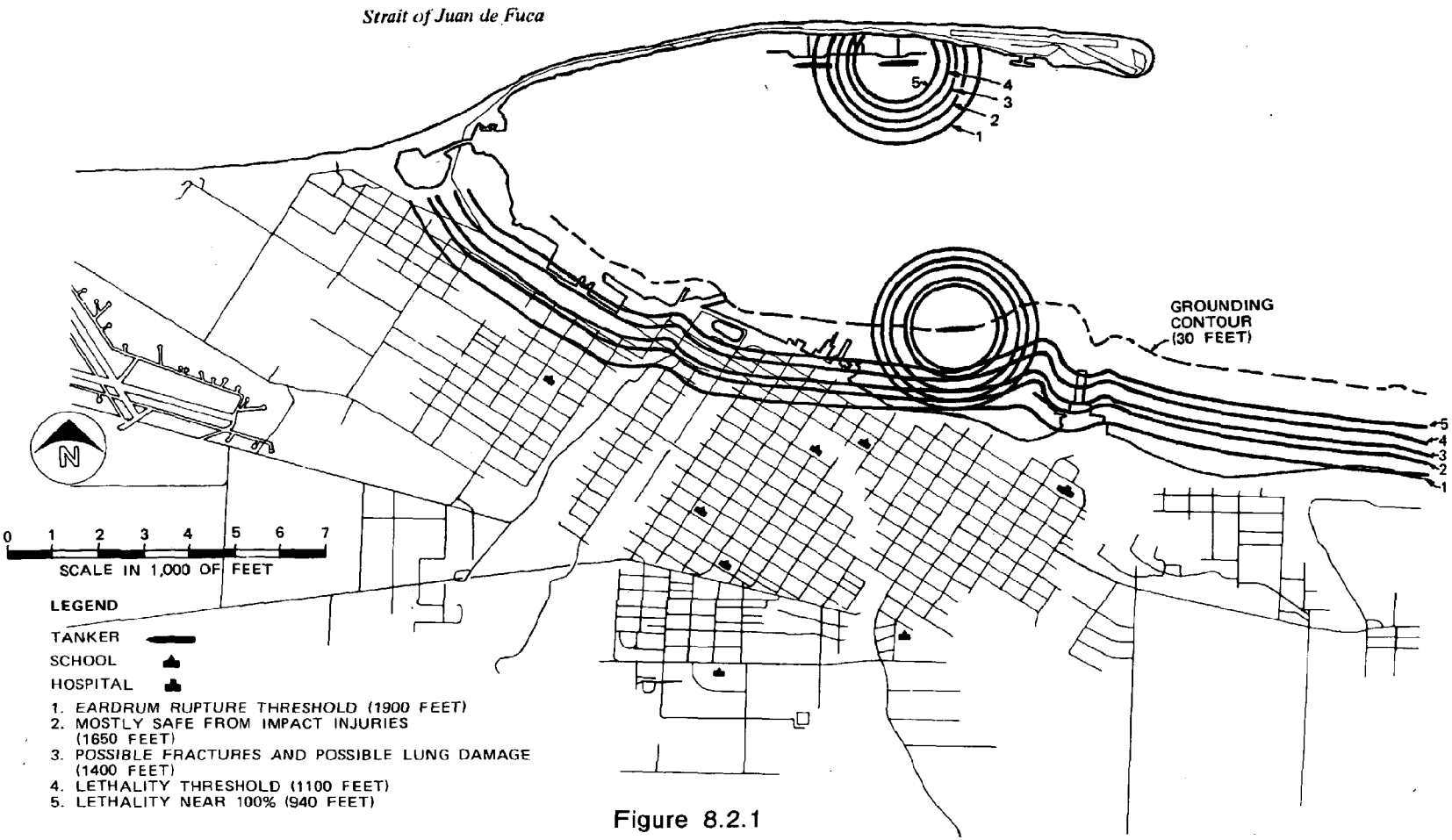


Figure 8.2.1

Potential injuries from Worst Case Tanker Explosion (327,000 dwt).
Source: OIW
The characterization of worst case fires and explosions at Port Angeles was considered inadequate by intervenor witnesses.

With respect to fire, Northern Tier concluded that it had utilized worst case assumptions to arrive at 2.4 percent chance of one or more deaths in any given year. Over a 20-year project life, this would translate into a 39 percent probability.

An important issue in the debate was the validity of NTPC assumptions about such a worst-case event. Northern Tier contended such an event would derive from a scenario in which there was ignition of a spill from all tanks of a 327,000 dwt tanker. The spill would cover a large part of the harbor surface. According to the company, the fire would only be sustained one hour. The probability of such an event was estimated at less than .6 percent over 20 years. Intervenor witnesses countered that such a characterization was too sketchy. At a minimum details needed to be developed on factors affecting both spreading and combustion.

8.3 Tanker and Submarine Pipeline Spill Risk

Northern Tier presented several studies to the council to define the magnitude of the oil spill hazard. The company emphasized that there was currently a 61 percent chance annually of a significant oil spill from existing tanker traffic. This background risk, it argued, resulted in an average annual spill volume of 1,895 barrels.

Table 8.3.1

	Oil Spill Source	Percentage Chance of Occurrence over 20 Years
1.	Oil tanker spill (total loss only; excludes all losses other than total vessel loss)	29%
2.	Submarine pipelines in Port Angeles harbor (unloading lines; all leaks)	17%
3.	Submarine pipeline crossing Admiralty Inlet (all leaks)	30%
4.	Submarine pipeline crossing at Saratoga Passage (all leaks)	8%
5.	Terrestrial pipeline spill (spills of 5,000 barrels or more)	28%
6.	Tank farm (major fire or explosion)	20%

The company asserted it had employed "state of the art" risk estimation methodology. Its analysis was an elaboration on earlier OIW work and made adjustments in predicted values based upon assessment of site specific port characteristics. Northern Tier concluded there was a 50 percent chance of a spill over 10,000 barrels during the project life. This, it asserted, was based upon conservative assumptions.

Submarine pipeline estimates were based upon pipeline experience for the Outer Continental Shelf. Because these lines are often unburied and subjected to other hazards, NTPC contended the Puget Sound crossing would be safer then the predicted values suggested. Its conclusion: a spill of 10,000 barrels or larger could be expected once every 3,200 years. This low appraisal of risk was to be a central issue in contested case hearings.

8.4 Spill Migration

Admitting to the infancy of spill migration prediction methodology, the company provided the council with results of modeling performed by ERT for the Strait of Juan de Fuca. NTPC concluded that for the spills it modeled, movement in any direction was possible, depending upon wind conditions, tidal phase, and strength of mean currents. It submitted that there was a net easterly nearshore current between Port Angeles and Dungeness Spit.

Underwater spills from a submarine line were examined by OIW in earlier studies. NTPC referenced these studies to conclude that the bulk of crude oil from a submarine spill would surface rather than be entrained in the water column and dispersed by subsurface vectors.

An issue of considerable importance in the debate was the potential for a spill at the Admiralty crossing to migrate into inner Puget Sound. Northern Tier concluded that oil spilled at flood tide could move toward inner Puget Sound; but during ebb tide would be pushed into the Strait of Juan de Fuca.

8.5 Submarine Geological Hazards

On the basis of a 500-year design criterion, NTPC posited a .2 g ground acceleration and a Mercalli VII+ design earthquake. Those values were utilized in the design and impact evaluations of both above ground and submarine structures. According to the company, this would correspond to an event having less than 10 percent chance of occurring over a 50-year period. The company concluded that the historical record shows less than 20 earthquakes causing disturbances great enough to be potentially damaging (Mercalli VII or greater). The company also concluded there was no indication of faulting or submarine landslides in the vicinity of the submarine lines.

Liquefaction of soils was deemed a potential problem only in areas having fine grain soils. Approximately one-third of the Port Angeles Harbor crossing was considered in this category; however, more significant percentages were potentially liquefiable on the Admiralty and Saratoga crossings. Liquefaction would occur under extreme ground accelerations in these areas; however, because the submarine lines would be designed to accommodate such stresses, shear failure and pipe bending were determined unlikely. The company concluded that sufficient information had been provided ". . .to determine that the pipeline can be safely constructed at the proposed underwater crossings."

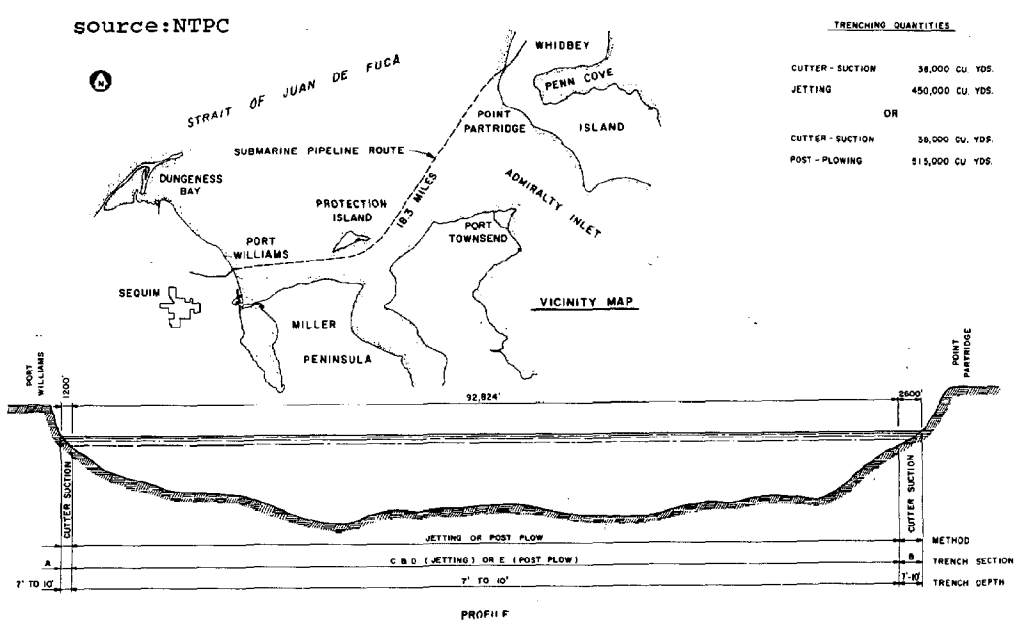


Figure 8.5.1

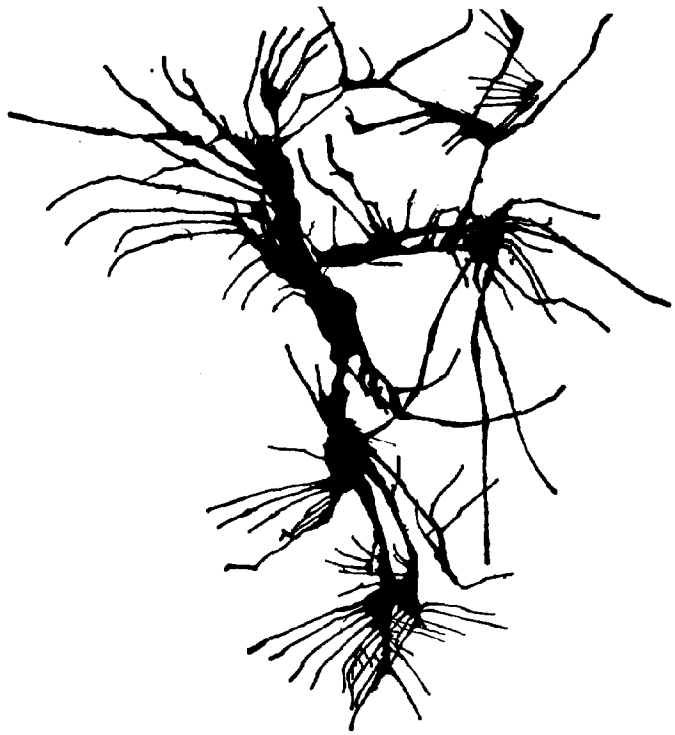
Admiralty Inlet Submarine Crossing Trenching Methods, Route, Quantities Excavated. Source: NTPC application.

8.6 Oil Spill Impacts on Flora and Fauna

As indicated by Table 8.0.1, Northern Tier accepted the possibility of significant damage to coastal and marine habitat in the event of a major spill. Feeding areas for birds could be lost for up to seven years. Mortalities would be greatest among species living on water lost due to oiling. According to the company, a worst-case spill contamination of Dungeness Bay could kill 73,000 birds.

Fisheries and marine impacts would depend upon a myriad of factors and make quantification impossible; however, Northern Tier asserted that several factors were present that would lessen damage potential. An EPA report was cited that indicated high concentrations of microorganisms are present in Puget Sound, and Port Angeles, in particular, which can actively biodegrade crude oil. It argued that a fairly thin layer of crude oil floating on sea water could be completely colonized by bacteria within one or two weeks and decomposed in two to three months.

Another factor attenuating impact would be the dispersion and resulting dilution of hydrocarbon compounds. Concentrations would be determined not only by spill volume, but by the action of wind and tides. A marine spill would be most detrimental to marine invertebrate habitats if spills were confined to embayments such as Freshwater Bay or Crescent Bay that contain mud, sand, and eelgrass.



Direct impacts to fish would be registered through toxicity or physical effects and indirectly through loss of food or habitat. The company contended that most catastrophic open water oil accidents have not resulted in major fish losses. This was partly attributed to oil avoidance mechanisms in adult fish. The company also asserted that concentrations strong enough to cause toxic effects do not persist long after accidents. The company made particular reference to salmon species as having tolerances far in excess of likely oil spill concentrations.

9.0 Intervenor Concerns and Activities

In general, the counties along the route tended to focus on aspects of the application which implied risks or impacts to local resources, especially those over which some regulatory authority had been historically established; and the state agencies concentrated upon areas of statutory functional responsibility (e.g. fisheries, game, water quality).

9.1 Counties

Clallam County

> "The most important questions of life are for the most part only problems of chance."
>
> Leplace

The majority of the local CEIP allocation was passed through to Clallam County because it would be the site of the proposed superport and tank farm.

The major environmental issues presented to Clallam County by the NTPC proposal involved fire and explosion risks within Port Angeles Harbor from normal tanker operations and catastrophic incidents (off-loading, bunkering, lightering, collision); oil spill risk analysis and oil spill cleanup contingencies; tanker manuevering and potential vessel traffic problems; seismic instability, liquefaction and subsidence; pipeline rupture and failure at major stream crossings and scouring; disruption and displacement of recreational activities within Port Angles Harbor (boat launching, salmon fishing, ferry traffic); and the overall economic impacts on the public and private sectors from construction and operation phases of the proposed project.

Hatfield Consultants, Ltd (HCL), of West Vancouver, B.C., was contracted to analyze the NTPC proposal in light of these concerns. HCL's analysis provided the county with an understanding of a wide range of potential impacts and project design deficiencies, and was responsible for developing mitigation measures. A complete description is included in the county's report, An Overview of Environmental Design, Fire, and Explosion Hazards and Oil Spill Contigency Plans of the Northern Tier Pipeline Project. A few of the major findings are noted below:

HCL found insufficient NTPC data or correlative analysis on pipeline floatation in case of liquefaction. HCL concluded that some aspects of the project were in a very preliminary design stage, requiring further detailed analysis. Additional areas of concern identified by the consultant included NTPC's deficiencies in submarine core borings and the absence of block valves along the submerged pipeline (for spill volume reduction).

Lack of sufficient data or investigation by NTPC on the potential for anchor penetration in Port Angeles Harbor. Further investigation indicated it was beyond the capability of normal marine dredging and pipeline trenching equipment to excavate to a depth greater than 11 feet in the deeper portion of the harbor. Modified or specially designed equipment would be required, in light of a potential anchor penetration depth of 29 feet. HCL recommended additional field testing and analysis of this potential problem.

The lack of site specific data on oil spill risks, in conjunction with the utilization of out-of-date and/or faulty data base. HCL recommended preparation of a more comprehensive and updated spill risk analysis.

HCL recommended the design and implementation of a master harbor management plan to address harbor vessel traffic congestion caused by the introduction of supertankers.

HCL concluded that the fire and explosion risk posed by a major oil terminal at Port Angeles warranted far more detail than what was presented in NTPC documents. Furthermore, HCL concluded that the causes of many fire and explosion incidents are uncertain, that a breakthrough in reducing these incidents is unlikely in the near future, and that the occurrence of such incidents often leads to uncontrolled chain events.

HCL demonstrated that river and open water marine spill case histories show spill control techniques to be very ineffectual. Moreover, the NTPC application did not seriously consider the logistics of beach cleanup. The consultant identified a number of elements needed in any oil spill response plan.

Consultants D. M. Johnson and N. H. Rasmussen (J and R) reviewed the NTPL application and DEIS, emphasizing geologic conditions of Clallam County and their relationship to the proposal. Their report, Geologic and Seismic Studies Related to the Construction of the Northern Tier Pipeline in Clallam County, Washington, was used extensively by the county throughout the EFSEC proceeding. Principal conclusions included the following:

Significant potential for elliptical scouring at the Dungeness River crossing: NTPC provided inadequate justification for its scour estimates.

Ediz Hook is not an appropriate location for a major pipeline facility and to liquefaction potential. J and R recommended that NTPC conduct an extensive drilling and soil testing program for Ediz Hook, including dynamic field tests, to substantiate or refute J and R conclusions.

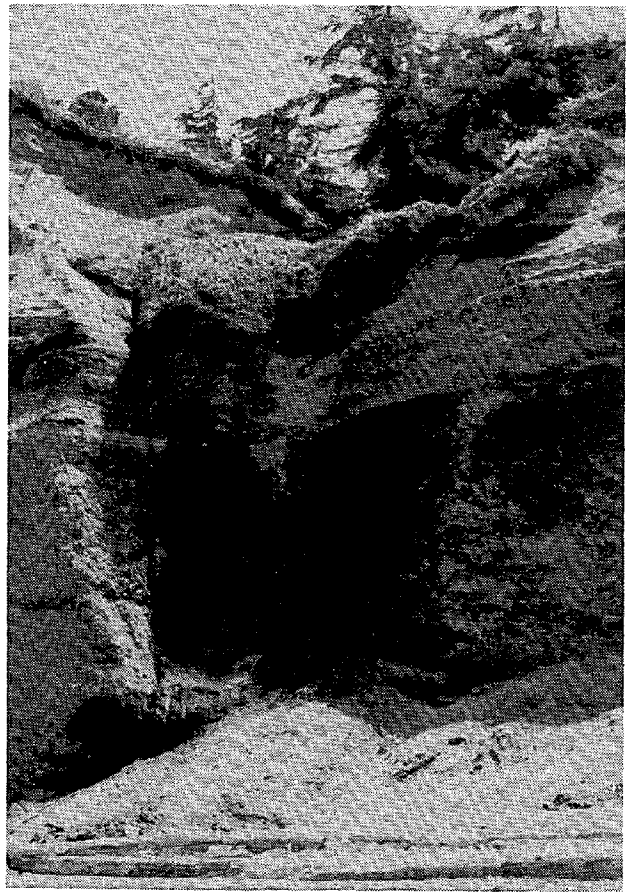


Figure 9.1.1
Green Point Landfall, Clallam County

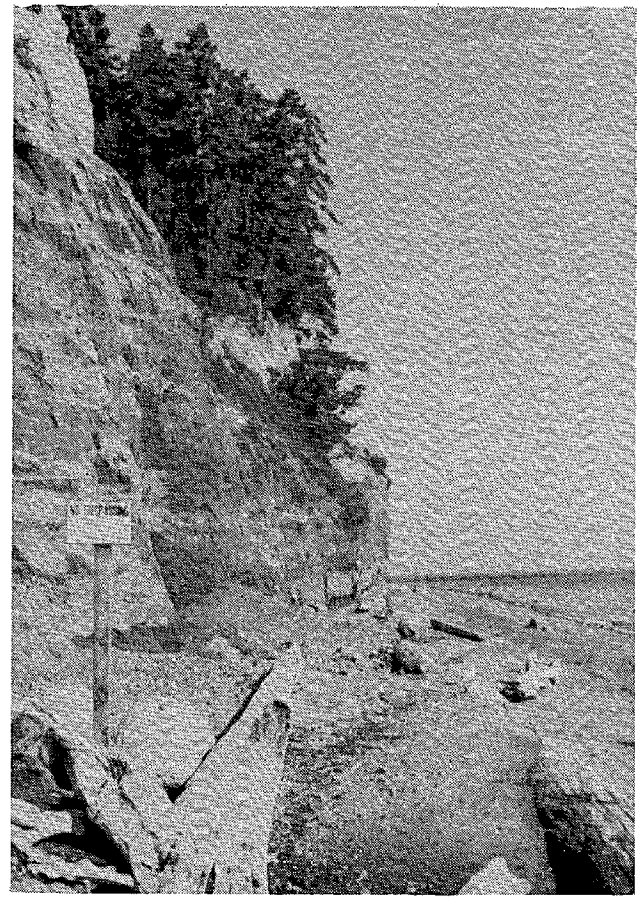


Figure 9.1.2
Port Williams Landfall, Clallam County

CDS/Quest Research, Inc., reviewed and critiqued NTPC's proposed techniques for monitoring design, construction, and operational phases of the proposed facility, including the development of a monitoring process for local and state governments. The report, A Proposed System for Pipeline and Operation Monitoring in Washington State, also provided a comprehensive set of stipulations for pipeline construction, operation. The key elements of the proposed monitoring program were as follows:

- Company reimbursement of monitoring costs.
- Co-authority of disciplines to assure that no interests are overlooked or subordinated.
- Approval of plans prior to construction in order to ensure compliance with the terms and conditions of a site certification agreement.
- Stop-work authority.
- Public access to design plans and company information to ensure company quality control.
- Right-to-perform provisions, whereby the state has the authority to correct or redress.

Applied Economics Associates (AEA) of Seattle was contracted to perform an in-depth economic analysis of the potential impacts on the private economic sector in Clallam County. Upon review of the application, AEA defined nine critical impacts. These included air and water quality, oil spill potential, impacts to fisheries and recreation, conflicts with existing industry (lumber mills), and electric power demand. Measures to mitigate adverse impacts to the local economy were also presented in the report, An Analysis of Impacts of Oil Port Development on the Private Sector in Clallam County.

San Juan County

> "Those who live in the San Juans believe they have found a rare environment which has been virtually destroyed everywhere else."
>
> Alan Merson
> Northwest Lawyer

Lying north of the submarine pipeline, San Juan County would not suffer direct terrestrial impacts but would have been placed at risk by a spill in the strait or at Admiralty Inlet. The county was concerned that NTPC did not provide a reliable assessment of spill risk, spill trajectory, and the sensitivity of marine life to oiling. Among the special concerns were the county's herring and shellfish communities. The county also concluded that NTPC failed to assess rigorously the nonlethal, as well as lethal impacts of oil upon these species and upon benthic communities. A reliable determination of impact would have to evaluate more carefully the resistance time of oil in different sediment communities and the differential recovery rates of species.

In addition, San Juan County expressed deep concern that a key sociological issue was underbid: the general importance of the sound and the San Juan Islands, in particular, to the lifestyle of state residents. The San Juans are viewed, not only by their inhabitants, but by much of the larger population, as the single greatest extant example within the state of an unspoiled, yet reasonably accessible coastal environment. San Juan County assumed responsibility for highlighting the larger context of the issues posed by the project.

General accomplishments under the CEIP grant included review of the EFSEC applications, environmental documents, and related materials, preparation of prefiled testimony, participation in the EFSEC process, and public education.

Jefferson County

Following the review of information provided by the applicant, a list of concerns was developed. The anticipated impacts were divided into three elements: alignment, construction impacts, and operation impacts.

The issue that created the most concern for Jefferson County was liquefaction potential. According to the engineering reports submitted by the applicant, extensive soils between Protection Island and Discovery Bay could be subjected to liquefaction. The integrity of the pipeline was dependent on its ability to withstand the occurrence of such an event. Reflecting these concerns, the county retained an expert, Dr. Mehmet Sherif, to review pertinent NTPC studies. His findings were instrumental in EFSEC determinations that the NTPC liquefaction analysis was not based on "state of the art" techniques. The county also believed that other geological risks evaluated by the applied needed better study. It was concerned that NTPC did not conduct a comprehensive soil sampling and related tests to evaluate the potential for submarine landslides.

Jefferson County, perhaps more than any other local jurisdiction, encompassed sensitive habitat that could be devastated by a catastrophic spill. Such a spill would have an immediate and direct impact on aquaculture activities, the marine birds of Discovery Bay and Protection Island and valuable feeding and spawning grounds. In addition, surrounding shorelines might suffer from oiling, affecting personal property and possibly inhibiting tourism activities. A substantial portion of county testimony was devoted to the definition of these impacts.

Island County

> "The submarine pipeline has been presented to you as something that is engineeringly a piece of cake."
>
> Thom Gunn*

*From public testimony.

Northern Tier's proposal called for approximately 28 miles of pipeline extending through county lands, including an eight-mile submarine crossing. The project called for extensive trenching and modification of both the marine and upland environment. The county's major concerns focused on potential impacts to environmental and recreational resources which could result from both construction and operation of the pipeline.

The county believed that NTPC had not adequately evaluated the hazard posed to island water resources due to construction (e.g. saline intrusion and breaching). A more general concern was the belief that NTPC had not performed reliable routing assessments to minimize recreational and biological impacts. Island County believed NTPC had not properly evaluated the serious aspects of spill risk and the potential for spill migration into sensitive Puget Sound habitats. Moreover, because of recently developed seismic data, it was known that the pipeline was potentially subject to extreme event earthquake stresses. The county believed that NTPC had not rigorously evaluated this hazard.

In order to ferret out the major issues and develop appropriate mitigation measures, Island County retained experts to prepare reports and later submit information to EFSEC. Northwest Environmental Consultants (NEC), in their report entitled Assessment of Effects on Island County, Wa., Resources and Economics, of the Proposed Northern Oil Tier Pipeline, identified oil spillage from the submarine crossing as the more significant potential impact. The report documented a high probability that any spill in the Admiralty Inlet crossing could affect much of the western shore of Whidbey Island. Such a spill would result in impaired ecosystem functions and decrease overall productivity of marine habitats. The desirability of shoreline property would be degraded; and the county's commercial and recreational base would be adversely impacted. The potential for a spill/pipeline rupture was considered high due to pipeline malfunction, stress caused by currents, geologic conditions, anchor dragging, or by seismic activity.

The NEC report also concluded that oil leakage or rupture of the overland pipeline on Whidbey or Camano islands could cause ground water contaminaton if not detected quickly. This potential impact would be heightened by the fact that Island County residents depend heavily upon ground water sources for drinking water.

Two other reports were prepared under the CEIP grant. The first, entitled Oil Spill Risk from the Proposed Northern Tier Pipeline System, A Critique by Christopher H. Achen, Assistant Professor at the University of California at Berkeley, provided the county and EFSEC with an evaluation of the oil spill risk analysis prepared for Northern Tier by the Oceanographic Institute of Washington. In summary, the report showed that the OIW analysis had underestimated the risk of oil spills by systematically ignoring central factors likely to cause large spills (i.e. tanker size).

The second report, entitled The Seismic Hazards to the Proposed Northern Tier Pipeline in the Northern Puget Lowland, Washington. Geological Sciences provided the county and EFSEC with an analysis of the known and potential faults and historical earthquake activity. It also provided the agencies with a critique of the seismic analysis presented by Northern Tier's consultants.

In addition to the oil spill/pipeline rupture issues, other major potential impacts to environmental and recreational resources which Island County identified included: (1) the alteration and destruction of underwater, beach, and bluff areas as a result of construction of pipeline landfalls; (2) the alteration and destruction of upland habitats and land uses as a result of clearing and grading for the terrestrial portion of the pipeline; (3) increased traffic on roads and ferries from construction activities; and (4) impacts on the historic character of the Ebey's Landing National Historic Reserve.

Mitigation measures suggested by Island County focused on alternative routing, pipeline construction techniques, and spill prevention plans and contingencies. More study was suggested to better establish current patterns, spill trajectories, geologic hazards, and critical marine habitats. The county proposed several general mitigation measures pertaining to the submarine crossing. The pipeline, it asserted, should be located so as to avoid steep marine areas that would stress the pipe. Ballasting of the pipe should be sufficient to account for high velocity bottom currents. In addition, areas of bottom scouring should be defined and avoided; and sediments should be replaced in the trench to minimize pipe stress and interference from foreign objects.

Other specific mitigation measures included the selection of proper soils to underlie the terrestrial portion of the pipeline, thus reducing or avoiding impacts to ground water sources from a pipeline leak of rupture. Bentonite clay could possibly be used below the pipeline as a [illegible] for the bottom of the trench. Further, the impacts at landfall locations could be mitigated by burying the pipeline at the nearshore area at a depth that would prevent scouring. Contoured disturbed ground to the preexisting topography was recommended to prevent interference with longshore drift.

With respect to contingency plans, Island County argued that NTPC should prepare a spill prevention and containment plan specifically addressing submarine leaks or pipeline ruptures. And, similarly, it should develop a contingency plan aimed at rapid detection and cleanup of spills affecting the county's important ground water resource.

Snohomish County

"If there's magic on this planet, it is contained in water."*

*Julia Gibb, Snohomish County Deputy Prosecutor referencing prose of Loren Eisley in opening statement.

Primary concerns identified by Snohomish County related to potential impacts associated with river crossings and penetration of wetland areas. The Northern Tier proposal called for crossing of 39 rivers and streams in the county.

Snohomish County reviewed the application and EIS and found NTPC had provided only superficial treatment of stream crossing impacts. The route appeared to have been based on a nonrigorously employed selection criteria and reconnaissance. The centerline, it found, crossed highly productive fish and wildlife areas unreported by the applicant. Moreover, NTPC appeared to be utilizing a suspect approach for determining river scour and channel migration potential.

A further concern was the efficacy of NTPC erosion control measures. A review of the application indicated the proposed measures were far from comprehensive and that construction impacts would include large inputs of right-of-way sediment into waterways.

Impacts to wetlands had been a problem of increasing magnitude to Snohomish County. A review of the application and EIS further indicated that NTPC had erroneously concluded that no wetlands would be crossed or impacted by the pipeline. A review of relevant literature indicated that wetland degradation had commonly been associated with pipelines in other parts of the United States and similar impacts appeared likely, in Snohomish given NTPC construction plans.

Considerable effort was also expended, by both in-house staff and consultants, in a site-by-site evaluation of both wetland and stream crossings. A major finding of the county was the discovery of previously undisclosed physical and biological conditions at the crossings relevant to potential impact. Consultants were retained to examine stream crossing methods, evaluate channel migration at major crossings, and determine accurate scour depths. They determined that NTPC's river scour estimates and crossing techniques were unreliable due to methodological weaknesses and use of inaccurate data. Channel migration estimates at Davis Slough and the south and north forks of the Stillaquamish River were found unduly conservative.

To avoid or mitigate potential impacts to rivers, streamways, and aquatic and riparian resources, the county developed several preferred measures. A superior method for computing maximum flood scour was developed and recommended. "Fish windows" were also developed for 27 streams while alternative crossing techniques were developed for 20 others. Performance standards for erosion and sediment control and fish and wildlife protection were also developed. This information was presented to EFSEC by both county staff and consultants.

With respect to wetland impacts, Snohomish County determined a potential loss of habitat in 20 county wetlands crossed by the proposed pipeline. The county found that these potentially damaged wetlands provide habitat for as many as 11 rare, threatened, or endangered species (bald eagle, peregrine falcon, and plant species).

To mitigate impacts associated with wetland intrusions, the county suggested a variety of planning, construction, and operations measures. These included rerouting (15 specific wetland areas were identified); fencing, patrolling, posting, directional drilling, reduced right-of-way widths and, a variety of measures to limit human access.

9.2 State Agencies

Concerns of state agencies were developed through a coordinated review of the application, DEIS, and supporting materials. In many cases, agencies collaborated in project assessments, including sponsorship of review studies.

Fisheries Department

Washington State Department of Fisheries' (WDF) concerns largely revolved around oil spill impacts to marine resources. In particular, the department believed it important to establish a reliable inventory of salmonid, ground fish and shellfish resources jeopardized by oil spills. The Fisheries Department also believed the impacts of the project would depend heavily upon the effectiveness of both monitoring and quality control system established by the applicant and by EFSEC. No system comparable to the Trans Alaska Pipeline Systems (TAPS) pipeline office or a joint fish and wildlife monitoring team was defined and described in the application. Fisheries believed that reference to the experience on TAPS would provide useful direction in the establishment of such an oversight body.

Fisheries was particularly concerned about marine and coastal habitat degradation due to oil spills. Its impact assessment was based upon a review of major international spill incidents and local oceanographic surveys.

Drift card studies of Puget Sound indicated that spill associated with the Northern Tier project could oil significant areas of the Strait of Juan de Fuca, Puget Sound, the San Juan Islands, and the Washington coast. A spill in Puget Sound would be particularly devastating because of the oceanographic characteristics of the sound: extensive tidal excursions, slow flushing of certain restricted water bodies, high turbulence and mixing in channels, and the long length of convoluted shoreline comprising a variety of valuable intertidal and subtidal habitats.

On the basis of this review, the department sponsored witnesses on specific oil spill and construction impacts and performed in-house resource analyses. Major attention was focused on lethal and sublethal impacts of oil to shellfish, salmonid, ground fish, and macrobenthic organisms.

With respect to mitigation, WDF efforts focused on development of construction provisions and related monitoring procedures in the event the proposal was certified. WDF, through the use of CEIP funds, drew on expertise from people involved in monitoring and

control of previous pipeline projects in Washington State and experts familiar with the Trans Alaska Pipeline System construction.

WDF found no techniques available to prevent construction and operation impacts; however, timing of the construction operation and the use of certain construction techniques were recommended to reduce impacts on salmon, marine fish, and shellfish.

For stream crossings, WDF recommended directional drilling and/or boring, aerial crossings, two-staged ("flip-flop") crossings, and culverting. Wet treching was considered the least acceptable method. Construction timing periods ("windows") were proposed to avoid periods of higher salmon abundance and life phases when salmon would be especially vulnerable to environmental changes.

Performance standards were recommended to aid in minimizing the effects of pipeline construction on instream and marine resources. Categories included centerline selection, terrestrial construction, streamside staging areas and construction approaches, instream work, control of toxic substances, oil wastes and solid wastes, and rehabilitation and revegetation of distrubed areas.

In conjunction with other state agencies, WDF also suggested the creation of a state pipeline office. The office would have a technical and field surveillance staff responsible for ensuring implementation of performance standards.

Department of Game

The Washington State Department of Game (WDG) focused upon the determination of impacts to sports fish and game species. An emphasis was placed on the definition of mitigation measures for stream impacts.

WDG believed that a fuller accounting was necessary of marine birds in the strait that could be affected by oil spills. Because of the Davis Slough-West Pass wetland crossing and the proximity of the Skagit estuary to the Saratoga crossing, Game believed several wetland and terrestrial habitat inventories were also necessary.

Game staff, and its retained experts, presented testimony to the siting council on five major topics: 1) Western Washington terrestrial fauna and habitat; 2) marine fauna; 3) freshwater fauna; 4) Eastern Washington terrestrial fauna and habitat; and 5) mitigation. Several examples of Game's analytical results follow.

WDG experts documented the significance of the Skagit-Port Susan waterfowl area, bisected by the proposed pipeline route. This area is one of the most important coastal waterfowl habitats in the Pacific Northwest. Significant impacts from the Northern Tier pipeline on some waterfowl habitat were determined likely. The department also documented 13 known bald eagle nests within or near the pipeline corridor. Disruption of breeding and possibly nest abandonment would be risked by construction activities.

With respect to fish, WDG verified the presence of cutthroat trout, rainbow trout, steelhead, and mountain whitefish in the many streams crossed by the proposed route. Construction activities, as well as operational oil spills, could cause egg or larvae mortality, damage to spawning beds and habitat, and blockage of migration routes.

Game testimony also identified marine mammals and marine birds within or near the proposed pipeline corridor. Protection Island, Jamestown, Cape Flattery, and Smith-Minor islands contain large numbers of marine birds. Harbor seals, sea lions, and killer whales frequently use the Strait of Juan de Fuca. Water birds were identified as species particularly vulnerable to oil spills. Operation of the proposed tanker unloading facility was evaluated for potential losses of birds in the Port Angeles Harbor and the Strait of Juan de Fuca.

In order to reduce instream construction impacts to the freshwater fish, Game, like Fisheries, also recommended "fish windows."

Department of Ecology

The Department of Ecology concerns focused on a number of important statewide interests. These encompassed the adequacy of the applicant's oil spill and trajectory analyses, electrical supply system impacts resulting from the 37,800 mwh annual draw to operate the system, and the ozone and hydrocarbon air quality impacts resulting from oil port and tank farm operation. Ecology also shared the interest of other intervenors in effective project monitoring.

An additional interest was to develop further data on the economic impacts of the project. What economic impacts would be visited upon the state by a catastrophic oil spill? What petroleum price effects would obtain from hookup to the Washington State refineries?

Ecology, like Fisheries and Game, was also interested in site specific and species specific impacts resulting from oil spills. Ecology believed there was a need to develop more information than was presented by the applicant on the vulnerability of various beach environments to oil coating. A related issue investigated was the natural recovery rates of coastal habitats from oiling.

Ecology's work under the CEIP grant consisted of an in-house analysis of the Northern Tier proposal, combined with technical assistance from consultants. In-house staff was responsible for the review of the siting application, draft environmental impact statement, and other reports prepared by or for the project sponsor. In addition, staff administered the contracts for consultant services pertaining to the technical analyses of the Northern Tier proposal, and coordinated the flow of information between agency staff, consultants, and EFSEC.

Consultant efforts were as follows:

- Review of the proposed construction and operations procedures of submarine crossings with reference to oceanographic and geologic conditions. (Hatfield/Thurber)

- Analysis of the risk factor associated with tanker traffic and the proposed pipeline and a review of possible spill trajectories from various points in the Strait of Juan de Fuca and Puget Sound. (Thomas Reid/Phani Raj)

- Identification of marine bird populations in the Strait of Juan de Fuca and Puget Sound and the possible adverse impacts to these resources from oiling. (Speich/Wahl)

- Identification, by seasonal abundance and distribution, of marine mammals in the Strait of Juan de Fuca, and northern Puget Sound. A description of the physiological effects of oil on marine mammals was also included. (Everett)

- Census of waterfowl populations in the Skagit Bay and Port Susan Bay areas, including the assessment of recreational and economic value of these areas due to waterfowl usage. The possible impacts of oil spills on this resource was discussed. (Jeffrey)

- Hypothetical characterization of the biological damage to marine fish and invertebrates from large spills in the Strait of Juan de Fuca and northern Puget Sound. Biochemical and physiological responses of organisms to oil were discussed, as well as economic impacts to fisheries. (Cardwell)

- Oil spill sensitivity indexing of shorelines of northern Puget Sound and the Strait of Juan de Fuca. A quantitative index was developed measuring sensitivity of coastal habitats. The index was applied to coastal areas potentially impacted by an NTPS related spill. (Research Planning Institute)

- Analysis of the potential economic impact of oil spills on commercial and sports fisheries in Puget Sound. The study focused on the types of economic losses caused in oil spills; methodologies used to assign economic values to sport fishery and other uses of the marine environment; and an estimate of of economic damage to fisheries in Puget Sound. (Sorensen)

- Evaluation of the potential ozone concentrations in the Port Angeles area from hydrocarbon emissions, as attested by tanker unloading, purging and ballasting, and tank farm operations. (Northwest Environmental Consultants)

- Analysis of the impacts on electric rates due to Northern Tier's electric demand. Methods to reduce the impact to existing consumers and rate payers were identified. (Power)

- Analysis of the costs and benefits of transporting crude oil to the northern Puget Sound refineries via a spur line. (Mead/Sorensen)

- Development of a program for surveillance and including monitoring environmental and technical stipulations for quality control. This product contained a description of a state pipeline construction review office and indicated methods of program financing. (Champion/Parker)

10.0 EFSEC Findings--Determinations of Impact

"It was an intelligence of satisfactory shape and lines and reflections, an agreeable confusion of these things."

Thomas McMahon
McKay's Bees

"The cuttle fish confuses its pursuers by the ejection of ink."

C. Parkinson

In August 1981, Judge John von Reis prepared a report of findings based upon the EFSEC record of 43,153 pages that had accumulated since January 1980. The report emphasized three main problems: 1) lack of environmental safeguards on the submarine line; 2) fire and explosion hazards at the Port Angeles terminal; 3) the lack of demonstrated project need. The findings largely reflected testimony of intervenor witnesses and contradicted conclusions reached by Northern Tier. During the next three months, EFSEC deliberated on both the record and the Judge von Reis report and issued findings of its own. These largely concurred with the Judge von Reis report. On October 16,1981, at a full meeting of the council and before a room full of reporters and the general public, a vote was taken on the application and the draft EFSEC findings. With 22 in favor, four opposed, EFSEC recommended denial of the application. With minor changes, the draft EFSEC report was forwarded to the Governor.

On April 8, 1982, Governor Spellman issued an order rejecting the application, accepting the council findings. The Governor found that the proposed submarine route "constituted a very real threat to Puget Sound, which is a natural treasure." The operational safeguards to protect the pipeline from leak or rupture were determined insufficient. In addition, he cited problems with the marine terminal location. This location, he stated, jeopardized the lives and safety of the people of Port Angeles in the event of a tanker explosion or fire.

The Governor made reference to the council's Findings of Fact and Conclusions of Law, the 495-page document which treated the specific elements of the application. Known as the "findings," this report reflects the effective use of CEIP monies (see Appendix 11.2). Witnesses sponsored by such funds provided critical testimony in the three issue areas on which the council expressed its greatest concern, as well as a number of other elements on which the council's recommendation for denial was based.

A discussion of significant EFSEC findings is provided below. Reference is made to important questions addressed by the council and the testimony of witnesses cited in the council findings.

10.1 Project Need

Northern Tier never offered persuasive rebuttal to the testimony of witnesses Tussing, Mead, and Sorenson that the serious supply problem intended to be solved by the project was really illusory. Mead and Sorenson were CEIP witnesses sponsored by Clallam County and the Department of Ecology. Their testimony, demonstrated that "ANS surpluses" on the West Coast were being absorbed and that the marketplace had a self-correcting capacity to respond to regional supply-demand disequilibria. Moreover, Mead and Sorenson made a careful study of the recession in Midwest demand. The evidence was clear that the anticipated shortage was not materializing.

The company's own witness, Pugliaresi, proved damaging. Under cross-examination from WDOE Attorney Lean, he offered the observation that market conditions could only justify a pipeline having 167,000 bpd throughput. This concurred with Sorenson and Meade's finding that neither the smaller Trans Mountain project, nor Northern Tier would be built if market conditions were relied upon for the determination of need.

The fact that the federal government had not come to Northern Tier's side also eroded the company's contention of need. The council findings emphasize that in March 1978 Chairman Lewis requested federal confirmation of national need; yet no response was received.

Prefile Testimony of Walter J. Mead

Q. *Is there a West Coast surplus?*

A. There is a West Coast surplus. However, due to the market distortions of price controls (which expire on October 1, 1981), and excess profit taxes (which expire about 1980-1982), a quantification of the West Coast surplus based on Panama Canal shipments is not valid. Further, the price control and tax distortions lead to artificially high crude imports, adding to the West Coast crude oil problem. A more complete explanation of the West Coast surplus can be found on pages 38 through 51 of Appendix B.

Q. Is the so-called "West Coast surplus" large enough to justify a pipeline such as the one proposed by NTPC?

A. No. In the absence of Prudhoe Bay size crude oil discoveries in the Beaufort Sea, and continued high level imports of foreign crude into the West Coast, the West Coast surplus is too small to justify construction of the Northern Tier Pipeline.

10.2 Fire and Explosion

It became apparent during the cross-examination of Northern Tier witnesses by both the intervenors and the council that the company was proposing a fire protection system designed primarily to protect berthing facilities and not for fighting crude oil fires on tankers and in the Port Angeles Harbor. The testimony of Fire Chief Hansen of the Seattle Fire Department was particularly influential. Northern Tier had not adequately established a design fire for planning purposes. Such a fire should be described by a

number of variables, including rate of spreading, area of tanker deck space involved, and petroleum constituents, as well as volume. Moreover, serious questions were raised about secondary fires and fire reaction sequences. Northern Tier had admitted to the possibility that most of the harbor and open harbor anchorage would be within the radius of a worst-case pool fire, but did not address the possibility that the Standard Oil dock, and highly flammable log storage areas, might become involved. Cross-examination established the failure of company consultants to consider carefully the flammable structures on the waterfront.

Even had this damaging information not surfaced, the fire issue had to be considered extremely serious. The company had presented the council with the results of several studies to establish fire risks. One of these, an OIW report, estimated that the Northern Tier facilities would increase the Port Angeles fire risk by 16 times.

The testimony of Chief Hansen was again instrumental in establishing reservations of the council about the ability of the company to mitigate or reduce risks of such a catastrophe. There was much discussion of the effectiveness of inert gas systems proposed by the company to attenuate the probability of tanker explosion, and, in his respect, the company's position was sustained; however, damaging testimony accumulated that a fully involved fire would be difficult, if not impossible, to contain. The council's finding on mitigation reflected the chief's position--no fire system, including Northern Tier's, is capable of extinguishing a fully involved fire.

Prefile Testimony of Chief B.L. Hansen

Q. To your knowledge, has Northern Tier determined a certain level of fire and then designed a fire protection system to respond to that size of fire?

A. No. To my knowledge neither Northern Tier nor the City of Port Angeles has made any determination with regard to the size of fire for which they wish the system to be designed. To the best of my knowledge the system design has been based upon an examination of what similar facilities have been installed in the way of fire protection equipment. While there is some merit in examining what has been installed in other terminal facilities there is also an inherent danger in designing a facility based on what others are doing. Simply put, the progress in improving designs of fire systems may come very slowly. If I am going to build a car and I look over to see how you are building a car in order to design my own, it is going to be a long time before we have better cars on the road. I believe the appropriate way to design a system is to make that first, difficult decision of how big a fire you wish to plan for.

I believe the problem of deciding the level of fire needs to be faced head on and it must be recognized that if a fire occurs which is larger than that planned for, it may not be extinguished.

Q. Do you believe the proposed Northern Tier fire protection system could put out a fire on a fully involved tanker?

A. No. In my opinion, a fully involved tanker of the size proposed to be handled at this facility could probably not be put out with the fire system proposed even including the fireboat. I should also point out that I am not aware of any fire protection system or agency which could be relied upon to do so.

Q. Do you agree with Northern Tier's conclusion that the shore-based fire protection system is adequate to handle all eventualities of onboard ship fires?

A. No, I do not. I don't believe there is any fire protection system in the world which is designed to handle all eventualities. Once again, I should point out that the basic decision which has to be made first is how large of a fire do you wish to design the system to handle? Until you have answered that question, it is simply academic to discuss what types of fires the system could not handle.

CEIP-sponsored testimony of witness Bennett (Clallam County and City of Port Angeles) was also referenced in the council findings. Bennett established that the site selection of Port Angeles was ill-considered. It was an exception to the contemporary practice of locating super ports away from residential and urban settings.

10.3 Oil Spill Risk--Tanker Accidents

Substantial uncertainty of catastrophic spills was the most Northern Tier was able to offer in its arguments regarding tanker accident hazards. The company presented the council with two somewhat inconsistent studies assessing the potential for tanker collisions, groundings, and resultant oil spills. The council refused to offer its own judgment on the likelihood of particular tanker-related spills, reflecting its dissatisfaction with the reliability and rigor of the presented evidence.

Several CEIP-funded witnesses had done damage to the Northern Tier position that it had provided the council with a reasonable and sufficient treatment of the problem. The council relied heavily on the testimony of CCPA witness Stewart who asserted that the quantitative risk analyses provided by the applicant had a number of significant defects. These not only stemmed from the limitations of the data base from which statistical coefficients were estimated, but from serious methodological problems. The submitted studies were based upon dubious models in which key variables were excluded.

Moreover, the company had made unwarranted assumptions about the statistical distribution of spill events. Stewart testified that the conclusions derived from various models were therefore unreliable. A lengthy cross-examination by Northern Tier lawyer, Dan Syrdal, followed during which Stewart was forced to further detail his conclusions. At end, Stewart's testimony was unshaken.

Robert J. Stewart on Oil Spill Risk

Q. What is your general opinion of OIW's oil spill incidence analysis?

A. I find their work very hypothetical and I question the reliability of many of their estimates. I also find that the conceptual framework of their studies is unsuitable for making the best use of the uncertain information they have developed from the data. For example, I find that their ranking of alternative sites in their 1978 report is not credible. This ranking was based on an estimated annual oil spill volume that is statistically unreliable (cf. the comparative risk portions of OIW's "Oil Spill Risk Analysis," Chapter II and Appendix E). In their more recent work for Northern Tier, I find their comparison to be flawed by a similar, questionable use of the available statistics. They appear to be making quantitative predictions, but the factual basis for their estimates is not developed.

Q. Do you agree with OIW's assertions that their use of "distance travelled per port call" as an exposure variable is substantiated by the "strong" correlation they obtained for the eight major U.S. ports and that their casualty rate is "statistically significant?"

A. *No. The use of "distance travelled per port call" as an exposure variable* is not substantiated by the data and the analysis they present. In my view, their exposure variate selection procedure is simply a hypothetical speculation regarding a suitable parameter. The use of this variate is not under any circumstances well enough supported to warrant its inclusion in a quantitative model, where I am again using "quantitative" in the sense I developed initially.

The statistical test OIW used determined that if their model was like a standard least squares model then it was very unlikely (1 chance in 20) that the slope of the actual line was zero. Since the Poisson process doesn't satisfy these statistical conditions imposed by the least squares model, OIW's conclusion of a "strong" correlation is not valid to begin with. Secondly, with only eight samples, you cannot develop a "strong" correlation. OIW has simply shown that if a mechanism different from the one they hypothesized generated the data, then it probably has a nonzero slope parameter.

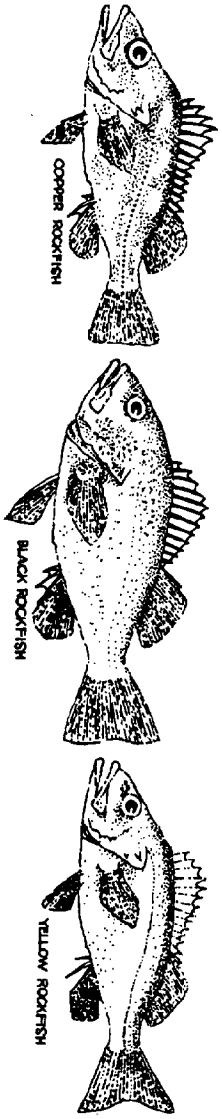
Other CEIP witnesses on tanker spill risk included Achen, Bennett, Storie, and Armstrong. Bennett, in particular, was cited by the council as it concluded that OIW understated the tanker spill risk and that probability estimates were unreliable.

10.4 Resources at Risk--Marine

The Washington State Department of Fisheries, the Department of Game, and the Department of Ecology provided a traffic of witnesses and exhibits that substantiated the marine resources endangered by a major oil spill. The council made only selective reference to the volume of information that was provided; but throughout the findings is a tone that harmonizes with the testimony of such witnesses. The Department of Fisheries established the economic significance of jeopardized marine resources. A major accident in the Strait of Juan de Fuca or surrounding waters could cause economic damages in excess of $200 million.

The maps provided by Fisheries located a number of the critical areas that would be affected by both pipeline construction and operational spills. For example, WDF witnesses located the presence of banks near Protection Island critical to the breeding of Puget Sound codfish. These were proximate to the Admiralty Crossing.

In other instances, witnesses expanded upon the Northern Tier resource assessments and the data presented in the EIS. Resources were more completely characterized by seasonal distribution, numbers, variety, limiting habitat factors (e.g. critical areas), and food chain interactions. The result was a clearer apprehension of habitat sensitivity. Several CEIP sponsored witnesses made important contributions, including Jeffrey, Cardwell, Speich, Wahl, and Long.



10.5 Oil Spill Risk--Spill Migration

The council's findings largely bore out the intervenor testimony of Ebbesmeyer, Raj, Stewart, Storie, and Long that no trajectory analysis could reliably predict the dispersion and migration of spilled oil. This, as stated above, was also admitted to by NTPC. The fate of underwater spills, such as those originating from a break in the submarine lines, was considered particularly indeterminate. Stewart testified that Northern Tier had, in fact, utilized the best available trajectory model; but still this could provide no reliable determination of the potential problem. He provided the council with an analysis demonstrating that the outputs of such a model were highly sensitive to assumptions regarding winds. If the variable winds of the Sound were to change only slightly in direction or force, the behavior of a slick would change drastically.

Late in the proceedings, after intervenor witnesses had been cross-examined, the council called its own witnesses. One of these, a NOAA scientist, Dr. Holbrook, had originally testified at the request of the Department of Ecology. Holbrook established the extreme variability of current depending upon depth, location, time of year, and tide cycles. Among the most problematic sites for modeling, he testified, was the Admiralty Inlet submarine crossing site. His testimony amplified the testimony of earlier witnesses that downwelling at the Admiralty sill could cause spilled oil to be retained at depth or transported into inner Puget Sound.

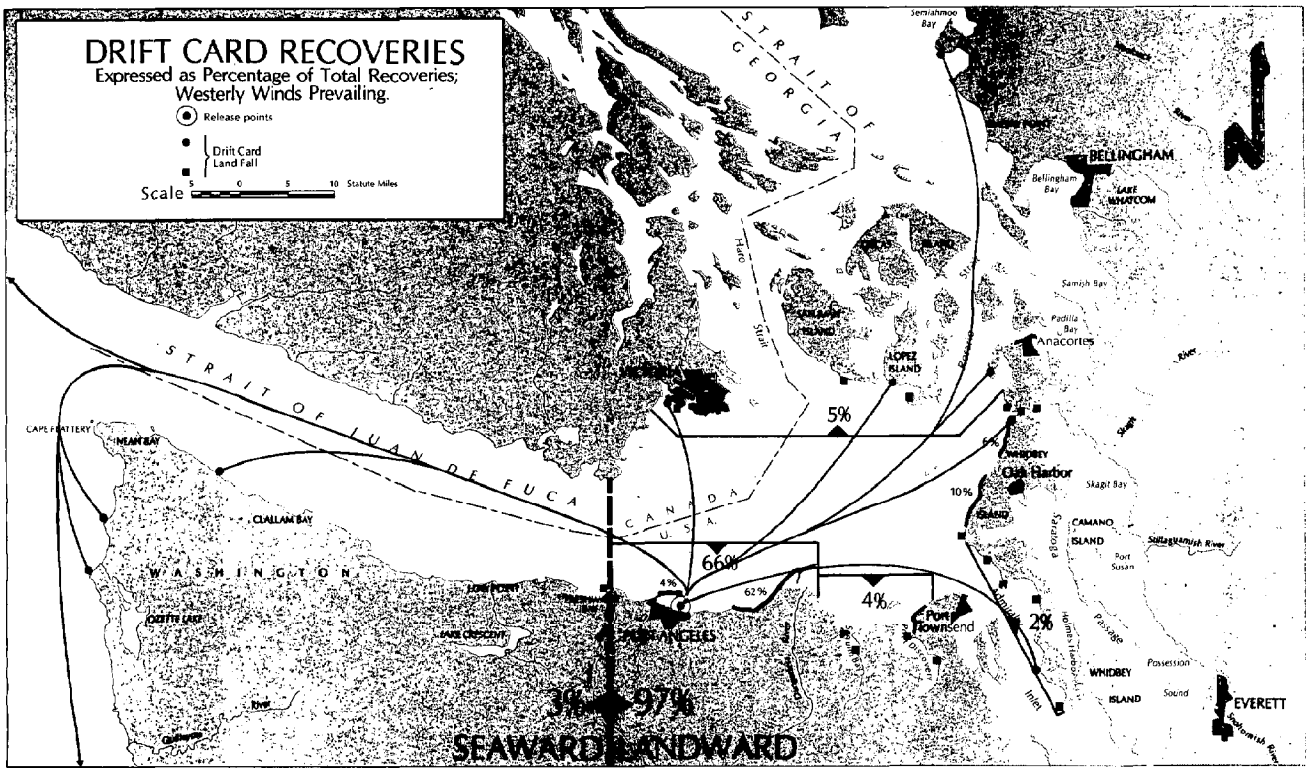


Figure 10.5.1

Drift Card Recoveries. (see original). Both Northern Tier and intervenor witnesses referred to drift card studies in the argument over oil spill migration. (P. 2-12)
Source: BLM EIS

10.6 Oil Spill Risks--Submarine Lines

Alia tentanda via est*

One of the several important issues evaluated by the council was the hazard to the line posed by high currents. Northern Tier had assumed a 6 fps design current. The council found this too low, "perhaps 50 percent too low." The testimony of Winter and Holbrook was heavily referenced by the council. Winter argued that the applicant's metering period was far too short to justify its conclusions; moreover, the company employed a methodology that included unjustified extrapolations and factor reductions. Winter testified that velocities of over 7 fps had actually been recorded in the Admiralty sill area and that stronger currents, on the order of 9 fps, could occur.

The council's concern regarding currents was paradoxically heightened by the testimony of NTPC witness, John Eaton. Eaton elaborated on the potential of pipeline rupture, the result of what is called vortex shedding (alternately known as pipe flutter). This phenomenon had been experienced in Alaska at Cook Inlet. The faster the current moves over a pipe, the more likely is scouring and pipe flutter, especially if adequate weighting is not provided. The cross-examination of NTPC witness, Timmermans, established the difficulty of both adequately weighting a line to prevent floatation and flutter and protecting it from the hazards of liquefaction. This was at variance with a contention Northern Tier had earlier made in evaluating geologically induced stresses.

Witnesses Sherif and Johnson, both CEIP-funded, were relied upon heavily in findings regarding liquefaction. Johnson testified that liquefaction may occur in an area four times more extensive than that identified by the applicant. Both Sherif and Johnson testified that the full extent of potential soil liquefaction could not be determined from the information provided by the applicant.

*Another way should be tried

Dr. Donald Winter on Submarine Geology

Q. What is your opinion as to the adequacy of the soil sampling which has been performed by Northern Tier on the Admiralty Sill crossing?

A. In my opinion, the summary Shannon & Wilson profiles cannot be regarded as anything more than a preliminary estimate of general soil conditions along the route because of the sparse sampling frequency. An examination of the soil samples shows that bottom material parameters vary widely over the entire route and adjacent soil parameter sets are poorly correlated.

The bottom samples were acquired at locations separated by distances too great for an estimate to be made of a horizontal scale of the soil type and density variation.

Q. In your opinion, can the soil sampling program be relied upon to make judgments about the properties of the soils along the pipeline route?

A. No, it cannot. The distance between samples averages almost 1 mile. In the area northeast of Protection Island where the route has been revised as part of the October, 1980 testimony, there is a distance along the route of approximately 5 miles where no soil samples have been taken. Even on those portions of the route where samples have been taken, there is an insufficient number of samples to determine the horizontal scale of variations in density and other properties.

Q. In your opinion, do the geophysical surveys undertaken by Shannon & Wilson on the Admiralty Sill crossing rule out the presence of boulders along the route?

A. No.

Several other geological hazards to the integrity of the submarine lines were considered understated by the applicant. The sand wave issue was important, not only because it represented a potential threat to line integrity, but because it reflected upon the commitment of Northern Tier to undertake analysis necessary to minimize risk. "Northern Tier was aware of the presence of sand waves in early 1979," stated the council, "but performed no geotechnical work to assess them." The council concluded that the existing analysis was inadequate to ensure that the submarine pipeline would remain buried after installation. The potential for marine current scour was testified to by Sternberg.

The council also found that "The presence of scattered boulders represents a potential hazard to the submarine pipeline." The company's geotechnical studies could not detect scattered boulders less than a meter in diameter.

The comprehensiveness of NTPC geotechnical studies was a major council concern. An order of August 19, 1980, required the company to conduct further design studies of the submarine route. Specific sampling procedures were detailed including acoustical profiling, current metering, side scan sonar, and borings. Northern Tier returned with only part of the data. Excluded were the borings. In addition, the number of sampling points was significantly less than the council specified and the quality of the data collected, extremely poor.

Richard Sternberg Submarine Hazards

Q. In your opinion, do the geophysical surveys undertaken by Shannon & Wilson on the Admiralty Sill crossing rule out the presence of boulders along the route?

A. No.

Q. What are your conclusions as to the possibility of boulders and rock in the vicinity of the proposed Admiralty Sill crossing?

A. I think that there is a high likelihood that boulders of a foot or more in diameter are a feature of the sea floor and the region just below the sea bottom. Various forms of glacial deposits are found throughout this area and many of the deposits contain cobbles and boulders of a wide range of sizes. Admiralty Sill is an example of such a deposit where large parts of the seabed is covered with these coarse materials. Although a photographic survey of the proposed Northern Tier crossing has not been made, the total geologic composition of the Strait, the Sill and Admiralty Inlet indicates that if boulders are encountered in regions on either side of the proposed crossing, there is a strong likelihood that they will be encountered at the crossing itself. The Shannon & Wilson soil samples show the presence of glacial deposits very near the surface. We know that glacial deposits in the surrounding region do contain cobble and boulders.

Q. What is the material on the Admiralty Sill crossing shown on Exhibit 279 and described as "irregular bottom (barchan-shaped) sand and gravel"?

A. This portion of the route shows a very irregular bottom with wave-like features extending over a mile in distance. The profiles show the amplitude of the largest of these wave-shaped features is of the order of 20 feet. The depth of this material is unknown. The surficial sediment composition is described by Shannon and Wilson as "sand and gravel."

Q. What is the significance of barchan-shaped sand waves?

A. This suggests that this portion of the route may be unstable. Sand waves are formed with moving sediment and indeed the strength of the bottom currents in the area, as discussed by W.J. Timmermans, strongly suggests that sediment movement is a common occurrence. If these are sand waves, their configuration may vary over time and they may also be migrating in a particular direction. If they are migrating or shifting substantially, it is possible that the submarine pipeline buried in these features could become exposed at some future date.

10.7 River Crossing Hazards

Although the council concluded that river crossings and floodplain problems were "solvable" through certification conditions, a number of findings were made and testimony referenced to support the conclusion ". . .that the applicant's approach to crossing many of the state's streams is inadequate."

The council relied heavily on the testimony of Snohomish County witnesses, Veldman and Norman, and Ecology witness, Garland. Both Veldman and Norman had prepared CEIP-sponsored studies of river scour, channel migration, and river crossing techniques. Norman also evaluated construction-induced siltation. Garland's analysis was conducted independently but, in part, because of CEIP sponsored coordination, was keyed to the points discussed.

Norman and Garland assessed the methods used by the company's witness, Koloski, to evaluate scour and deemed them less precise than other techniques. The testimony of Garland was particularly significant. Under cross-examination after an erosion of Norman's prefile testimony, Garland established the limitations of NTPC's scour methodology and the greater reliability of other approaches. Underestimation of channel migration potential was also asserted by both Veldman and Norman, based upon studies of the Stillaguamish River. The company had made the unsupported assumption that existing land protection would remain intact during flooding. As a result, pipe overbends and sagbends could be subject to scour and exposure--so concluded the council.

Figure 10.7.1

North Fork Stillaguamish crossing location. A CEIP funded study made by Snohomish County demonstrated that the crossing site was experiencing severe bank erosion and was laterally unstable. This site was referenced in the county challenge to Northern Tier's centerline selection procedures.

10.8 Fishery Impacts--Siltation

In large measure, the council findings on siltation were drawn from the testimony of David Somers, Tulalip Tribes witness. General support came from several Department of Game and Fisheries witnesses. Somers and Norman had collaborated with Snohomish County in an analysis of small streams siltation. This analysis concluded that a typical small stream crossing in Snohomish County would likely be sedimented with large amounts of fine materials. Moreover, the silt could not be expected to be flushed quickly from important spawning beds by runoff. The council concluded that silt generated by construction would cause substantial fish losses. The council accepted Armstrong Creek (the stream analyzed by Norman, Somers, and Snohomish County) as an example of fishery impact that might be low compared to other streams crossed by the line in Western Washington.

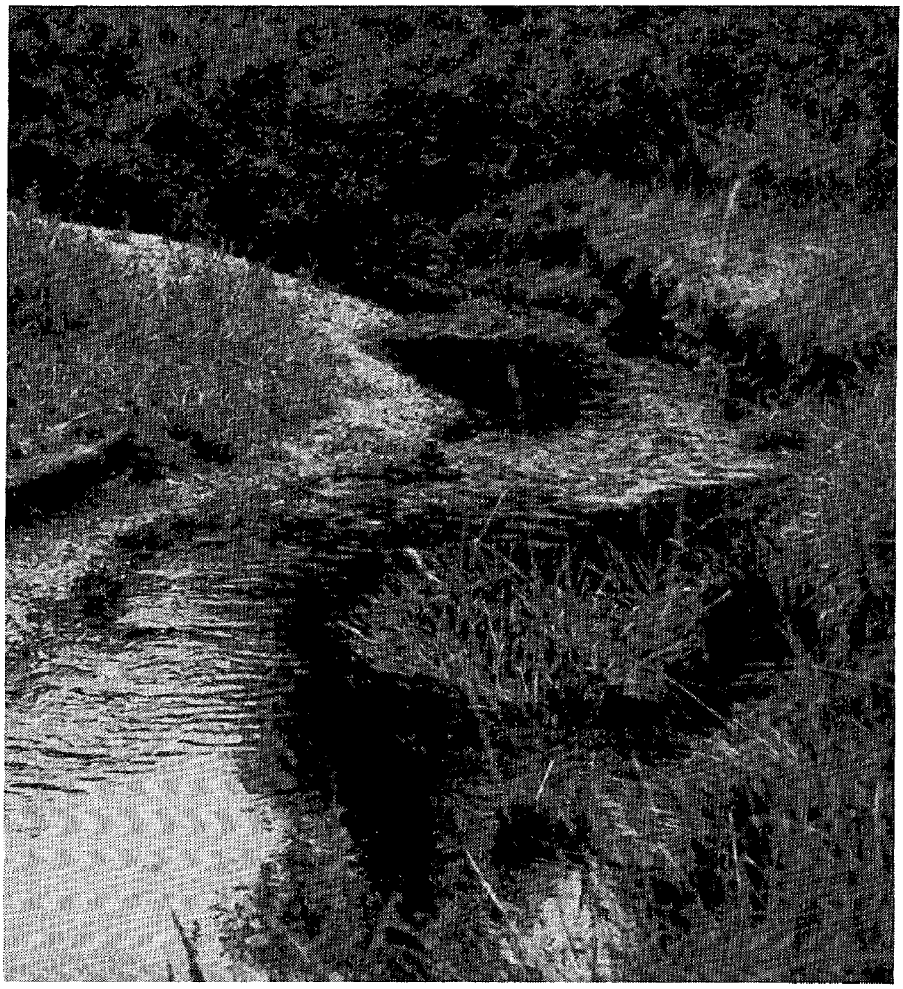


Figure 10.8.1

Armstrong Creek, one of thirty-nine stream crossings in Snohomish County. The crossing would have occurred at an important spawning site. CEIP funds were used to evaluate the impact of pipeline induced sedimentation on fish productivity at this site and demonstrated in-stream construction would cause significant losses.

In general, the applicant treated smaller streams lightly. This was evidenced in a number of council findings. The council concluded the company had provided inadequate site specific information of fishery resources and had failed to provide design criteria that would ensure minimal fisheries impacts. The council again cited Somers in concluding that the company had not determined that the small stream crossings (of which there would be 56 in the Snohomish Basin) could be accomplished within the proposed 90-day fish window.

10.9 Sensitive Terrestrial Habitat and Wetlands

Northern Tier had failed to conduct a careful inventory of sensitive habitat in the corridor and, as a result, had proposed a centerline which would have crossed and impacted a large number of wetlands, endangered species habitat, and biologically productive upland.

Department of Game witness, Perry, testified that of 103 rare, threatened, or endangered plant species in Washington State, 61 had been found in the Colockum Habitat Management Area that would be crossed by NTPS.

Citing the testimony of Snohomish County witnesses, Hirschi and Currie, the council concluded, "Northern Tier underestimated the impact of this project on wetlands." Snohomish County had undertaken a detailed mapping effort and inventory of the corridor and established the fact that the centerline crossed or was tangent to 20 wetlands. Within the corridor, 11 endangered, threatened or rare species had been documented. This CEIP sponsored effort was supported by a detailed slide show that included a site by site discussion of habitat impacts, recommended mitigation measures, and suggested alignment changes.

The more general implication of the Snohomish County wetland work was that the applicant's claim of having carefully considered wetlands in route selection in other areas was rendered dubious. The testimony of Department of Game witnesses, Stendahl, Leschner, and Jeffrey, supported the conclusion that important habitat would be unnecessarily lost if the pipeline were built where proposed, as proposed. Jeffrey, for example, in his CEIP funded report on the Skagit/West Pass crossing, had established that the centerline would pass through the most productive part of the Skagit waterfowl area. He testified that the area is one of the most important coastal waterfowl habitats in the Northwest.

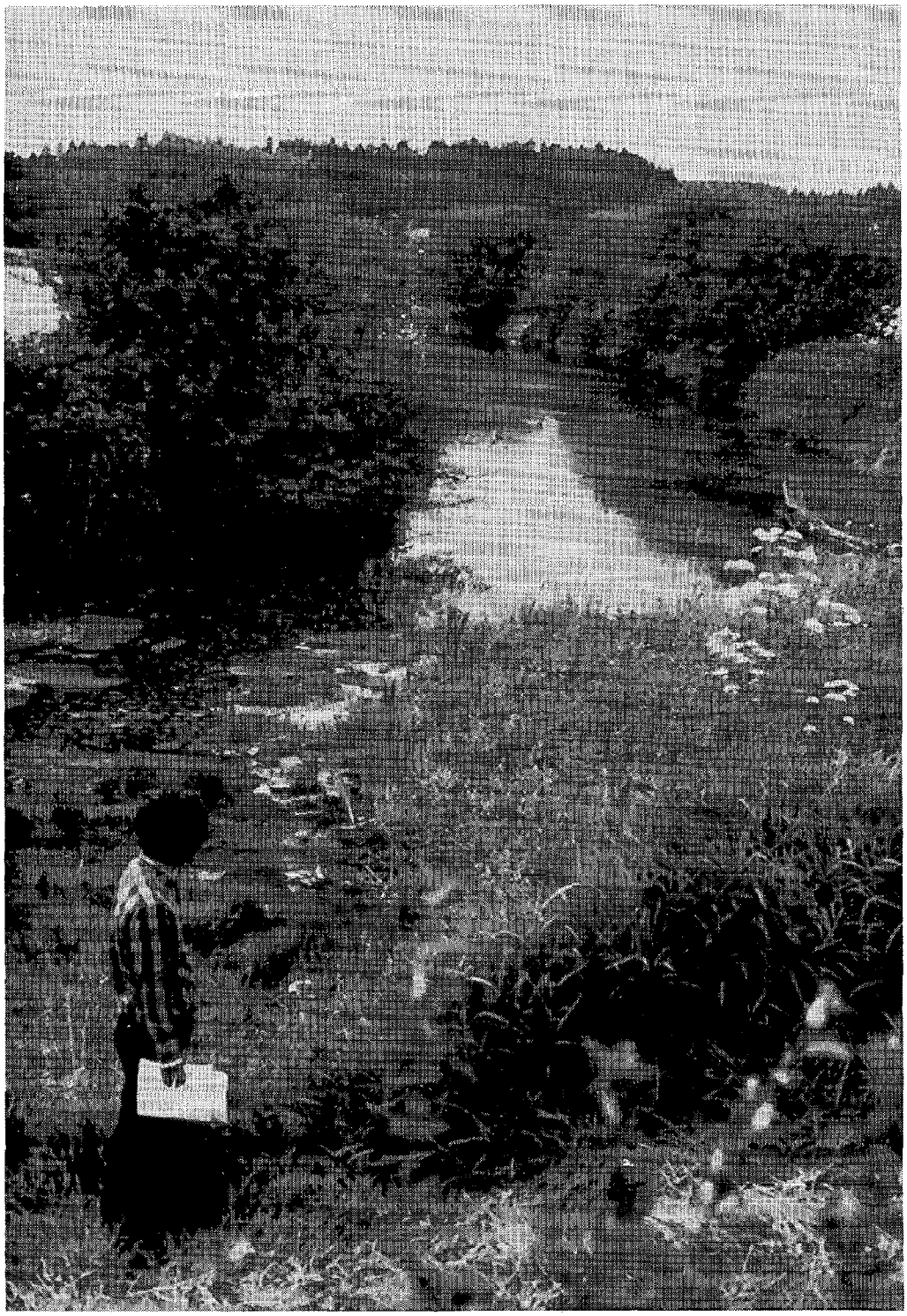


Figure 10.9.1

Davis Slough-West Pass wetland complex crossed by the Northern Tier centerline near Stanwood. Snohomish County witnesses testified that if this crossing could not be avoided, impacts should be reduced by use of directional drilling. This would be a novel approach to wetland impact mitigation. Witness Veldman testified that directional drilling would be competitive with alternative methods.

10.10 Mitigation

Because EFSEC recommended against certification, it did not develop a comprehensive set of mitigation measures. However, a considerable portion of the hearings was devoted to this issue and a considerable amount of the CEIP effort. CEIP mitigation products included 1) stipulated agreements between intervenors and the company (see Appendix 4), and 2) testimony provided by the intervenors and attached exhibits detailing general and site specific measures.

A state pipeline office was proposed by Clallam County, the Department of Fisheries, the Department of Ecology, and Snohomish County based upon testimony by CDS Quest, Charles Kay, and Charles Champion. CDS Quest provided a valuable review of mitigation measures employed, not only on the Alaska Pipeline, but on other comparable high pressure, large diameter lines. In addition, the authors drafted a management structure for a proposed monitoring office that would be empowered to oversee various aspects of construction to ensure that performance standards and mitigation measures required by EFSEC were actually employed.

The plan contained detailed communication channels and identified field responsibilities. It also examined potential conflicts between environmental inspectors and project engineers and recommended structures and rules for conflict resolution.

Snohomish County supplemented this proposal by developing guidelines for site specific plans after certification and prior to construction. These guidelines covered the following submittals to the hypothetical state pipeline office:

- Drainage erosion control plans
- Revegetation plans
- Design stage general construction plans
- Habitat evaluation analysis
- River crossing scour analysis
- Fisheries analysis of select crossings
- Channel migration analysis of select crossings
- Siltation analysis of select crossings

Under the county's proposal, the NTPC would be required to submit such plans before construction in specific locations along the route. Sites in Snohomish County were pinpointed based upon the company's centerline and as a result of reconnaissance performed by Snohomish County and the Tulalip Tribes.

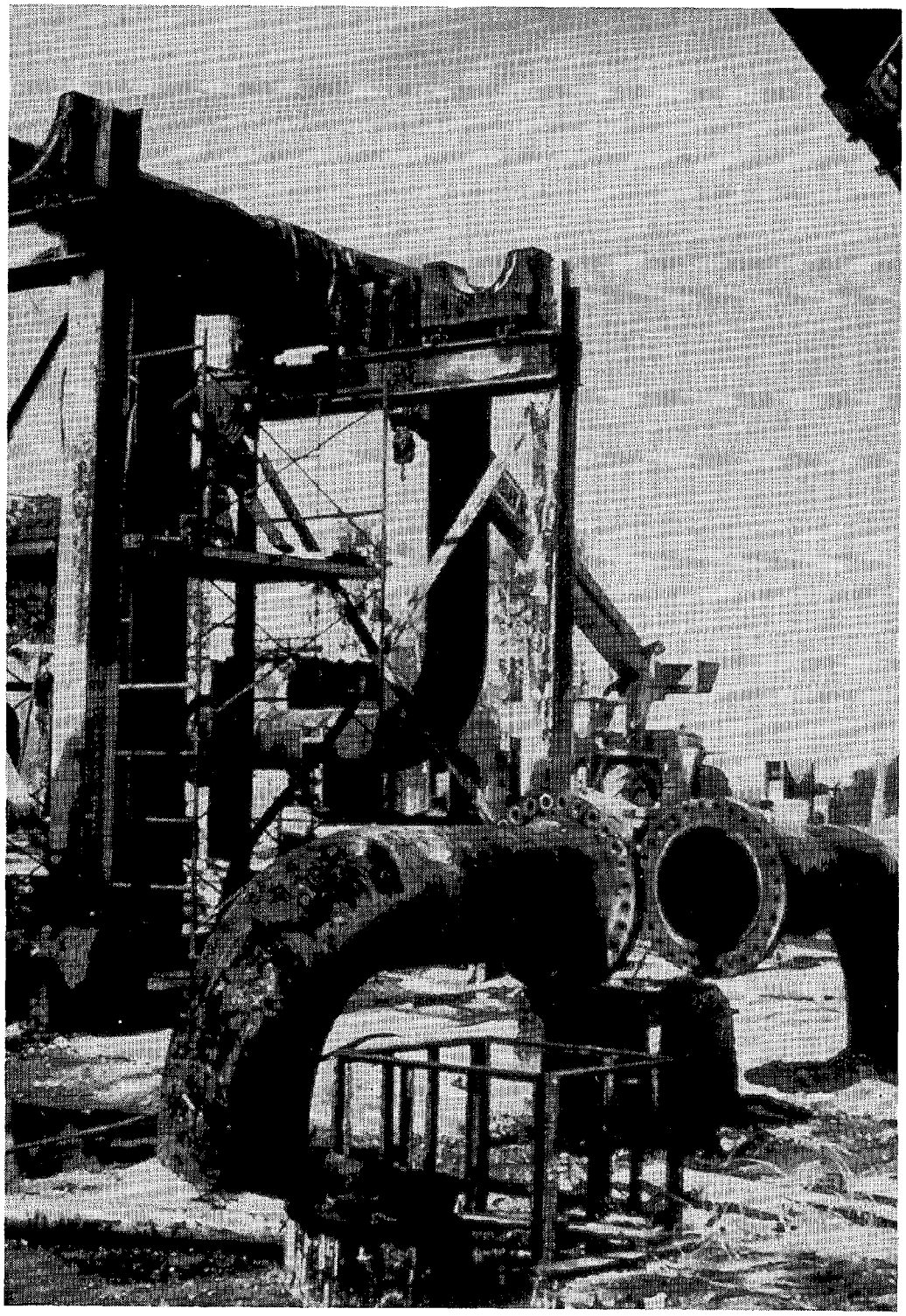
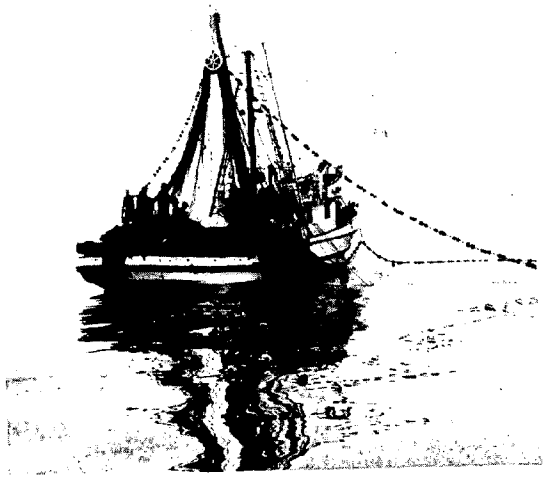


Figure 10.2.1

The Trans-Alaska Pipeline provided a referent to the array of impacts that might result from construction and operation of the Northern Tier Pipeline. Shown here are the scorched remains of pump station No. 8 shortly after a fire and explosion in 1977. Testimony regarding the relevance of TAPS to the Northern Tier case was offered by biologist Charles Kay.

Other intervenors developed both general and site specific mitigation measures. A complete listing is beyond the scope of this report; however, categories include the following:

. General terrestrial construction.	Fisheries, Game, Snohomish County.
. Submarine seismic surveys and mitigation measures	Clallam Co., Jefferson Co.
. Streamside staging areas	Fisheries, Snohomish County, Dept. of Game
. Instream work	Fisheries, Snohomish County, Dept. of Game
. Control of toxic substances	Fisheries, Dept. of Game, Dept. of Ecology
. Ground water surveys and ground water protection	King County, Island County
. Scour and channel mitigation	Snohomish County, Dept. of Ecology
. Sensitive terrestrial habitat and wetlands, including revegetation	Game, Snohomish County, King County
. Liability	Fisheries, Clallam County, Snohomish County
. Oil spill response	Jefferson County, Clallam Co., Dept. of Fisheries, Dept. of Game
. Socioeconomic impact mitigation	Clallam County, Snohomish County, Island County
. Marine terminal - fire and explosion	Clallam County
. Air quality	Clallam County
. Water quality	Ecology, Clallam County, Dept. of Game



11.1 Route Description and Project Characteristics

From the tank farm at Green Point, the centerline follows the Milwaukee Road right-of-way approximately two miles, then proceeds generally due east across relatively level agricultural lands to the vicinity of Port Williams. There, the route leaves the Olympic Peninsula to a point southeast of Protection Island, then northeastward, crossing north of Admiralty Inlet to a point near Point Partridge on Whidbey Island.

The route crosses Saratoga Passage from north of Polnell Point on Whidbey Island to an approach south of Brown Point on Camano Island. It proceeds along the northeast coast of Camano Island, crossing West Pass to the mainland just west of Stanwood.

The route parallels existing railroad rights-of-way around Stanwood, then proceeds eastward across rolling woods and pasture land to a natural gas pipeline corridor north of Arlington. From Arlington, the route follows the natural gas pipeline corridor south to Monroe, then parallels an existing high-voltage transmission line corridor south eastward to a point southeast of North Bend. East of North Bend, the route parallels the Bonneville Power Administration (BPA) right-of-way and an American Telephone and Telegraph cable right-of-way for several miles, crossing the Cascade Mountains at the King-Kittitas County line near the Hyak ski area.

The route then continues south eastward down the east slope of the Cascades, paralleling the Chicago, Milwaukee, St. Paul, and Pacific Railroad (Milwaukee Railroad) along the southwest side of Keechelus Lake. This section is fairly mountainous terrain, mostly forested, with some portions within national forest land.

Near Easton, the centerline merges with the BPA corridor and traverses Kittitas County, crossing I-90 and the Yakima River southeast of Cle Elum. This section is rolling-to-hilly timberland. East of the Yakima River crossing, the route continues to parallel the BPA right-of-way over rolling grazing land to a point a few miles west of the Columbia River.

The pipeline crosses the Columbia River six miles west of Quincy and passes north of the Quincy Irrigation District to the vicinity of the Ephrata Airport. It then continues due east along the Lincoln-Adams County line across rolling farm and grazing lands to Sprague. At Sprague, the route runs eastward across rolling farm and grazing lands, crossing various small creeks and exiting Washington southeast of Fairfield.

Characteristics of Proposed Facilities

The system would consist of tanker unloading facilities, onshore storage facilities, and the overland pipeline, including pump and pressure reducing stations, delivery facilities, and support facilities. The combination of the tanker unloading facilities and onshore storage facilities, both located in the Port Angeles area, is referred to as the marine terminal.

Marine Terminal - Tanker Unloading Facilities

NTPC proposed to construct the tanker unloading facilities within the natural, Port Angeles harbor. Fixed tanker berths would be constructed in 100 feet of water, with connecting trestles to the south shore of Ediz Hook. The tanker berths would be located to provide a water depth of 100 feet and would be capable of simultaneously unloading two crude oil tankers, ranging in size from the 18,000 dead weight tons (DWT) to 300,000 DWT, at rates of up to 100,000 barrels per hour (bph) per berth. Two tanker unloading berths would be constructed for the initial design capacity, with provision for a third if oil were eventually delivered to Washington State refineries. Tanker-carried oil would initially be pumped through two unloading pipelines to the onshore storage facilities located at Green Point, approximately 6.5 miles to the east. The lines would extend from the east end of Ediz Hook to the Green Point bluff and woud cross beneath Port Angeles Harbor. Figure 11.1.1 provides an artist's concept of the marine terminal.

Booster pumps would be provided to assist ships' cargo unloading pumps in transferring crude oil to the onshore storage facilities. These pumps would be located on a separate booster pump platform serving both berths. Two electric motor driven pumps, 8,000 horsepower (HP) to 10,000 hp each, would be installed. Flow monitoring of unloaded crude would be measured by meters, located on the booster pump platform.

Each of the tanker unloading pipelines would be 48 inches or 52 inches in diameter and designed to provide a maximum flow rate of 100,000 bph. A computer-assisted leak detection and shutdown system with a comparative accuracy of 0.5 percent of the pipeline throughout would be installed on each unloading pipeline. The system would consist of four subsystems measuring pressure and flow deviation, flow rate balance, and line volume balance.

Tanker unloading operations would be controlled from a main control center at the onshore storage facilities. Communications between stations and facilities would include high frequency marine radio, direct and conventional telephone circuits, UHF radio, and portable/ mobile units. It was anticipated that electrical power for the tanker unloading facilities would be supplied by the City of Port Angeles Lighting Department. The overall power requirements of the terminal unloading system would be 3,600,000 kwh at ultimate capacity.

NTPC committed to provide various services for the tankers using the facilities. These included potable water supply, line handling launches, and bunker fuel supply. Other support services, such as tugging, would be secured from local companies in the Puget Sound area. NTPC would also install facilities to allow tankers to receive bunker fuel from a permanently moored storage barge. Bunker fuel would be supplied primarily by tanker from California refineries.

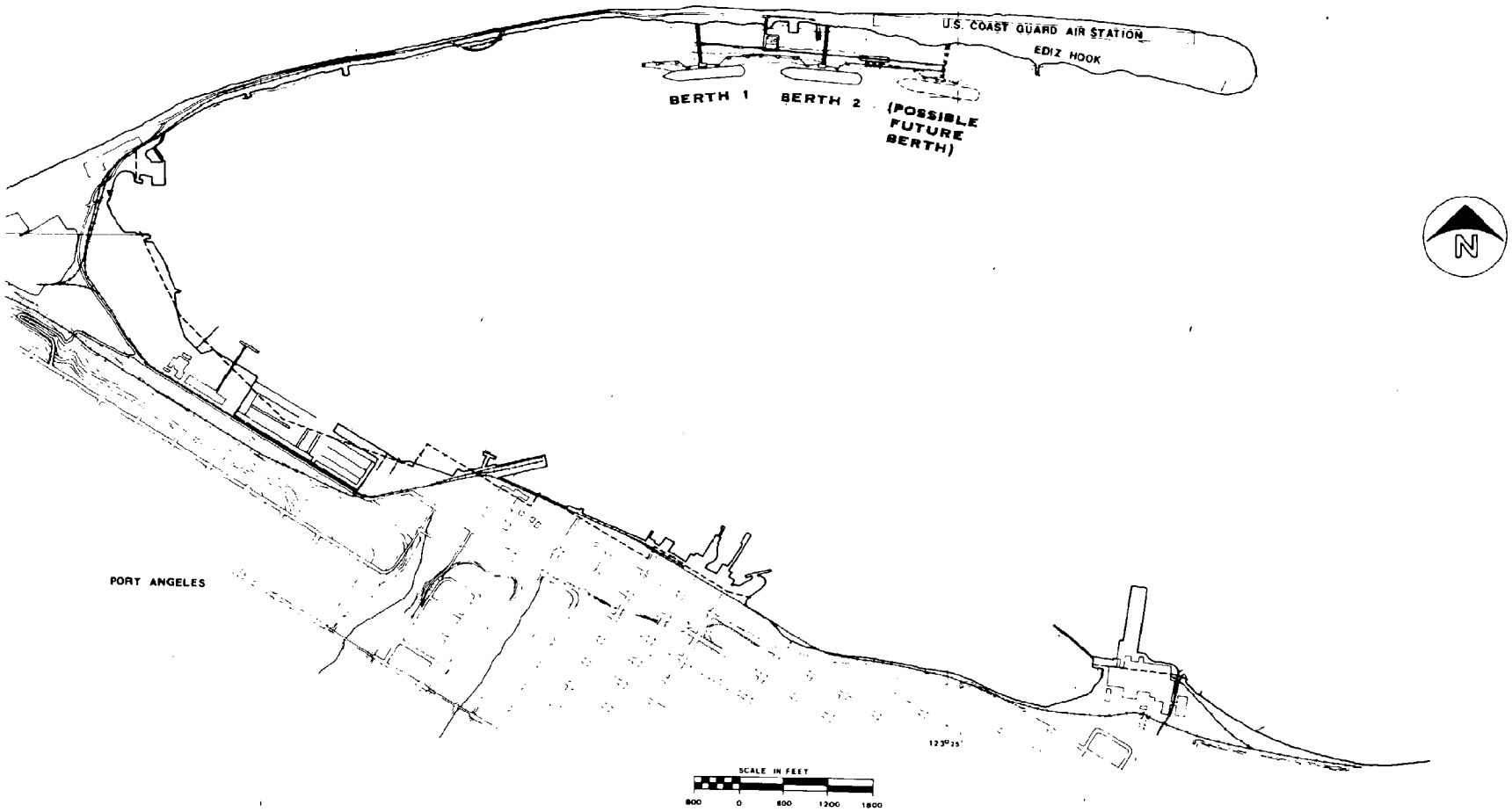


Figure 11.1.1
Tanker Berths in Port Angeles Harbor.

Source: NTPC application

A detailed firefighting plan was not provided in the application; however, NTPC committed to construct and implement facilities and procedures developed jointly by the Port Angeles and Seattle fire departments and the U.S. Coast Guard (USCG). One specified measure was a sea water and foam fire protection system installed on the tanker berths and associated structures. A fully equipped and manned fireboat would also be provided.

NTPC proposed to make available an oil spill recovery vessel to respond to accidents and also identified several specific procedures that would be followed in the event of spills. Oil spill containment booms would be deployed around the tankers prior to oil transfer from tankers. Semipermanent containment booms would remain in place between the berths and the shore of Ediz Hook at all times. Oil from small spills would be recovered using a floating oil skimmer deployed from the berthing platform or skimming equipment installed on the oil spill recovery vessel.

Marine Terminal - Onshore Storage Facilities

A 242-acre tank farm would be developed at Green Point to store oil from the submarine lines and deliver it to pump stations before line batching. The facilities would initially occupy approximately 140 acres of this 242-acre site. Onshore storage facilities would be developed in stages as dictated by pipeline system demand. Storage capacity for six million barrels would be provided initially.

For the initial design capacity of 709,000 bpd, eleven 545,000-barrel floating-roof type tanks (285 feet in diameter and 56 feet high) would be constructed. To minimize vapor emissions from the storage tanks, floating roofs would be installed with primary and secondary seals between the roof and the shell of each tank. As the system capacity reached the ultimate design rate of 933,000 bpd, seven additional 545,000-barrel tanks would be added, augmenting capacity to 38 million barrels.

The control center for the NTPS would be located at Green Point. It was anticipated that electrical power to drive the pumps and service NTPS facilities would be supplied by the Clallam County Public Utility District.

Firefighting systems at the onshore storage facilities would include both water and halon inert gas, the latter for protection of control and instrument areas. NTPC also committed to a tanker foam system and a fully equipped fire truck. The company indicated that firefighting procedures would be developed in cooperation with the Port Angeles Fire Department and other regional firefighting groups.

To prevent escape of oil in the event of leakage, the company proposed diking all tank areas. Diked areas would be designed to drain discharges into holding basins, where any oil present would be skimmed from the surface. In order to comply with federal, state, and local discharge standards, effluent from these basins

would be processed before disposal by gravity separation and coalescing filter-type oil-water separators. Oil from the separators would be reclaimed, and water effluent from the separators discharged into the Strait of Juan de Fuca or Siebert Creek, which bounds the property on the northeast.

Pipeline system

Total System - Submarine and Overland Systems

NTPC proposed to construct the submarine and overland pipeline system concurrently with the marine terminal. The pipeline route included two major submarine crossing: approximately 18 miles across the Strait of Juan de Fuca and 4 miles across Saratoga Passage in the Puget Sound region.

To develop the initial design capacity of 709,000 bpd, 17 pump stations and one pressure reducing station would be required along the length of the pipeline. Increasing the pipeline capacity to the ultimate design capacity of 933,000 bpd would necessitate three additional pump stations and additional pump units at the initial pump stations. Seven pump stations and the one pressure reducing station in Washington would be needed for initial system capacity system operation.

NTPC proposed to construct delivery facilities at Clearbrook, Minnesota. Here, provisions would be made to deliver oil to the existing Lakehead and Minnesota Pipeline systems. NTPC would also construct certain unspecified facilities to deliver oil to the Glacier and Western Crude Oil Pipelines in Montana and to the Amoco Pipeline in North Dakota.

Overland Sections

The company's routing was based upon a "corridor concept." A corridor, first two miles in width, then narrowed after EFSEC order to 1/2 mile, contained a centerline which represented the tentative route. Deviations would be made from the centerline, as dictated by post certification studies, but only within the 1/2-mile limit. At river crossings the discretionary width was limited to 200 feet.

The centerline followed a course which paralleled or followed existing utility lines across much of the state (141 miles). This routing scheme was intended to reduce impacts and minimize land use inconsistency. However, no assurances were provided that the pipeline would actually be constructed within these rights-of-way. According to the company, co-location would depend upon the willingness of the other utilities to accept such a proposal. In order to develop such agreements, a number of engineering and liability considerations would have to be worked out, including induced corrosion hazards, security, and protection to in-place transmission lines and pipe.

TYPICAL PIPELINE CONSTRUCTION SPREAD

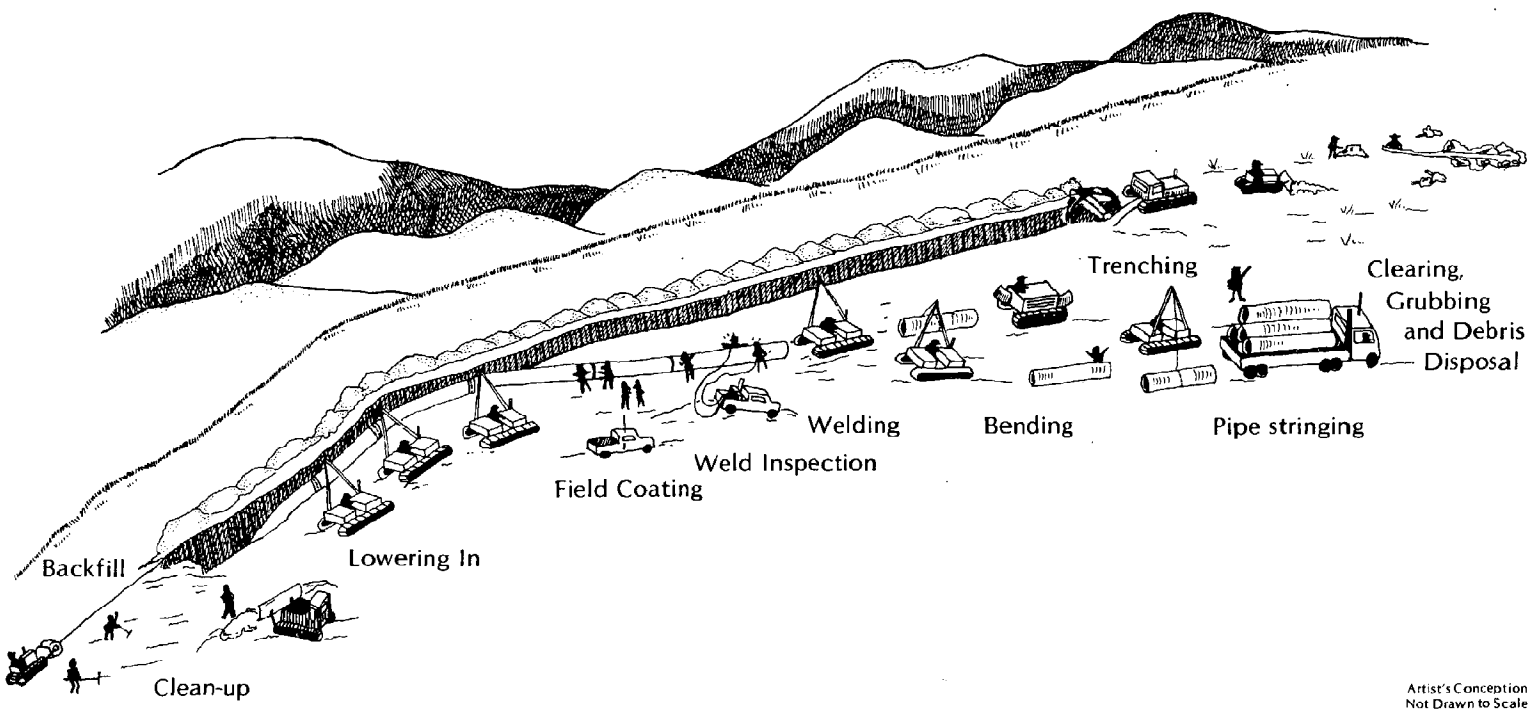


Figure 1.2-6

Artist's Conception
Not Drawn to Scale

Source: Northern Tier Pipeline Company

Figure 11.1.2
Pipeline Construction Spread

Source: NTPC

Without such agreement, the pipeline overland route would necessitate the clearing of a construction swath 90 feet wide. Seventy-five feet would remain cleared of trees and woody vegetation during pipeline operation. There would be a need for even larger construction width for certain construction phase staging operations, particularly at river and stream crossings. Both the location and dimensions of these cleared areas would be determined as would the exact location of sites following certification by the council.

The overland pipeline was divided into 10 sections for construction purposes. Three of the sections would be located in Washington, as shown on Figure 4.1.1. Construction of terrestrial pipeline would generally proceed west to east and would occur simultaneously within each construction section. Construction activity within a section would range in length from 8 to 16 miles, depending on the terrain and working conditions. An artist's concept of a typical pipeline construction spread is shown on Figure 11.1.2. Except at river crossings and special areas, the pipeline would be buried with a minimum cover of 36 inches.

The overall operation of the pipeline system would be controlled and monitored by a supervisory council and data acquisition (SCADA) system from the main control center at the Green Point storage facilities. All pump stations would be designed for remote operation. The communications system for the pipeline would be a combination of land lines and microwave transmission. Telephone and mobile UHF or VHF systems would be used for voice communications.

A Westinghouse automatic leak detection and shutdown system with a comparative accuracy of 0.5 percent of the pipeline throughput would be used on the pipeline system. NTPC contended that this represented state-of-the-art hardware (see tanker unloading pipelines above).

Operations and maintenance personnel would be located at the marine terminal and at strategic points along the pipeline route. One hundred twenty-four personnel would be employed at Port Angeles to operate the line at the initial design capacity of 709,000 bpd. Construction stage personnel would number 1,600, of which 600 were expected to be engaged in construction near Port Angeles and 1,000 in all of Washington State.

During construction, NTPC would segregate and replace any topsoil removed. After pipe burial, disturbed areas would be graded to blend with the existing contours. The right-of-way would then be reseeded with native vegetation where possible, and above ground facilities would be landscaped to reduce the visual impact of the system.

NTPC proposed the using of wet trenching techniques for the crossing of streams and rivers. Using this method, the line would be laid a minimum of 4 feet below the estimated scour depth of a 100-year flood. Trenching equipment would work directly in the streams. Spoil material from the trench would be stockpiled on the banks along the nonerodible backfill. The latter would be deposited into the trench after pipelaying.

Hydrostatic Testing

The entire pipeline would be tested for weld integrity through a conventional hydrostatic procedure. Thirty-four test sections were identified. Each section would be filled with water withdrawn from local sources and then monitored for pressure, temperature change, and other signs of leakage. Northern Tier would conform to state water quality and state water withdrawal guidelines in both the withdrawal and discharge of water.

Radiographic Testing

Radiographic inspection of field welds would be performed by an independent contractor. All submarine crossing welds would be inspected by X-ray or gamma ray analysis before application of corrosion coating. The company would otherwise comply with USDOT pipeline welding standards.

Appendix 11.2

CEIP-SPONSORED PROFILE TESTIMONY AND REPORTS - NORTHERN TIER PIPELINE

Air Quality Impacts

Analysis of Hydrocarbon and Ozone Levels Resulting from Proposed Oil Port Facilities, Port Angeles, prepared for Clallam County/Port Angeles, March 1980, by Northwest Environmental Consultants, Inc.

Contains information on existing air quality conditions in Port Angeles area, analysis of tanker and shore based emission sources, analysis of hydrocarbon emissions; modeling methodology; review of other air quality reports, effects on human health and plants and wildlife; mitigation measures.

Electrical Energy Impacts

The Impact of the Northern Tier Pipeline on Electrical Rates in the State of Washington. Thomas M. Power for the State Department of Ecology, October 1980. Testifies that NTPS will aggravate supply shortfalls for Washington utility and will increase demand for new generation facilities; rates paid by existing customers will rise to cover increased average cost. Asserts $10 and $54 million of annual costs of serving NTPS would be paid by other customers, amounting to a subsidy of $18.60 to $30.70 per year.

Fire and Explosion

An Overview of Environmental Design, Fire and Explosion Hazards and Oil Spill Contingency Plans of the Northern Tier Pipeline Project in Clallam County, Washington, prepared by Hatfield Consultants, Ltd.

Assesses the Northern Tier Pipeline proposal with respect to engineering and design; fire and explosion hazards; and oil spill containment and cleanup. Specific topics include: submarine corssing (emphasizing Port Angeles Harbor area); river crossings; terminal facilities; tanker design and offloading operations; transit and maneuvering of vessels; vessel hazards, tank farm hazards; oil spill cleanup. Measures to improve the facilities, mitigate impacts, or correct deficiencies in the NTPC proposal are included. Authors conclude: 1) risks of fire and explosion warrant more detail than provided by applicant, 2) tanker accident spill estimates were underestimated, 3) submarine geological investigations were superficial.

Fiscal Impacts

Construction and Operation Impacts of the Northern Tier Pipeline System on Local Governments in Clallam County, Washington. Prepared for Clallam County and the Department of Ecology.

Identifies fiscal impacts on general purpose government and special purpose districts within Clallam County. Includes statistics on population changes, personal income, property values, property taxes, road fund, etc. Includes suggested mitigation measures.

General and Miscellaneous

Assessment of Effects on Island County, WA Resources and Economics of the Proposed Northern Tier Oil Pipeline. Prepared for Island County by Northwest Environmental Consultants, Inc., March 1980. Documents probability that an Admiralty spill would oil west shore of Whidbey affecting habitat productivity. Also evaluates geological hazards at crossing, concluding there exists high risk due to active geological processes, high currents.

Northern Tier Pipeline System, Analysis of Facilities and Effects, prepared by Jefferson County, June 1980.

Includes a description of Jefferson County environment and potential impacts to the county which could result from construction and operation of the NTPC project. Details possible mitigation measures with respect to route selection, construction, noise and glare, trenching, oil spills, liquefaction, and other issues. Includes maps of resources and prefiled testimony by Dr. Mehmet Sherif with respect to liquefaction.

Combined Right-of-Way Use by the Proposed Northern Tier Pipeline in Snohomish County, Washington, prepared for Snohomish County by Jones Associates, Inc., May 1980.

Investigates the possibility of using existing utility easements or rights-of-way in Snohomish County as an impact mitigation measure. Potential problems associated with joint use are identified.

Geological Hazards

The Seismic Hazards to the Proposed Northern Tier Pipeline in the Northern Puget Lowland, Washington, Eric Cheney (for Island Co.), June 1980.

Reviews seismic data pertinent to pipeline rupture and concludes that the applicant's geological analysis was superficial, particularly with respect to the existence of faults. Report concludes the NTPC design stresses would be erroneous.

Geologic and Seismic Studies Related to Construction of the Northern Tier Pipeline in Clallam County, Washington. Prepared for Clallam County by Douglas M. Johnson and Norman H. Rasmussen, June 1980.

Contains information resulting from the review of the NTPC proposal with respect to geologic and geophysical conditions in Clallam County. Reviews seismic conditions, liquefaction potential, scour depth at Dungeness River crossing, depth of anchor penetration, and effects on local water table. Utilizing the Northern Tier sponsored reports, the authors conclude that Ediz Hook is an inappropriate location for a major pipeline facility.

Marine Resources

Summary of Recent Information on Marine Mammals in Northern Puget Sound and the Strait of Juan de Fuca, prepared for the Department of Game and Department of Ecology by Robert Everitt.

Describes the seasonal distribution and abundance of marine mammals, identifying important biological areas. Also indicates the relative seasonal vulnerability of species to oil spills.

Local Harvest and Estuarine Values of Shellfish, Bait Fish Bottomfish, and Salmon Resources Summarized from the WDF Sponsored Testimonies in the Northern Tier Case, Frances Solomon and Mary Lou Mills, February 1982.

Report estimates dollar values for commercially important species, provides details of geographic distributions. This report provides a reference that can be used to evaluate impacts of future energy projects in the Puget Sound coastal zone.

Oil Spill Risk Estimation and Trajectory

Oil Spill Risk from the Proposed Northern Tier Pipeline System, A Critique, August 1980. Christopher H. Achen, prepared for Island County August 1980.

This report argues that NTPC ignored many factors likely to explain the occurrence and size of oil spills from tankers. Author also argues that this has probably resulted in spill probabilities that are too low.

Prefiled testimony of Dr. Phani K. Raj. Oil spill trajectories. Prepared for the Department of Ecology. Testifies that oil spill migration is a function of several interactive factors and cannot be modeled accurately. Especially problematic is the prediction of underwater oil migration. Raj asserts that applicant's testimony (OIW information) was speculative and qualitative, providing no quantitative basis on which a decision maker could take action. In this regard, there was no attempt to quantify the amount of oil that would surface from an underwater spill, that might attach to silt, or evaporate.

Prefile testimony of Thomas S. Reid. Oil spill risk. Prepared for the Department of Ecology. Assesses limitations reliability of risk data and models presented to EFSEC. Concludes that the volume or crude oil handled will lead to numerous small operational spills and that the use of large crude carriers will significantly increase the likelihood of a catastrophic oil spill.

Oil Spill Impacts

Prefiled testimony of Dr. Rick Cardwell. Prepared for the Department of Ecology. Biological impact of spills in marine waters. Testifies on specific effects to organisms of oiling and exposure at various concentration levels. Among conclusions: (1) mortalities should be higher intertidally than subtidally, 2) the most vulnerable intertidal food fish and shellfis are clams, oysters, and mussels and incubating spawn of Pacific herring and surf smelt, 3) oil spill impacts are likely to be greatest in the protected low energy environments, 4) even if salmon juveniles were not impacted directly, mortalities would arise from food source loss, 5) oil reaching Puget Sound habitats is unlikely to be "weathered," thus increasing toxicity.

Operational Oil Spills as Related to the Proposed Northern Tier Pipeline, by Charles E. Kay.

Discusses oil spills resulting from the Trans Alaska Pipeline System (TAPS). Reviews NTPS proposed oil spill contingency plan; discusses the applicability of TAPS experience to NTPS; and recommends stipulations to reduce the occurrence of oil spills and lessen adverse impacts to the state's resources.

Sensitivity of Coastal Environments to Spilled Oil With Respect to Proposed Northern Tier Pipeline Routes, Strait of Juan de Fuca and Northern Puget Sound, prepared for the Department of Ecology by Research Planning Institute, Inc. (Miles Hayes), March 1980.

This report characterizes beach morphology in the study area and depicts shoreline sensitivity to oil spills. An index combining oil residence time with anticipated biological impacts is included, together with a description of regional shoreline types. The appendix contains excerpts from the consultant's draft report to NOAA on critical species and habitats. Oil impacts to shoreline types are discussed and appropriate cleanup activities are recommended.

Preliminary Report on Marine Birds in Juan de Fuca Strait and Northern Puget Sound in 1978-1979, prepared for the Department of Game and Department of Ecology by Terrance Wahl and Steven Speich, March 1980. Report documents populations and breeding biology of marine birds in the subject area; elaborates upon population concentrations by time of year and place and evaluates implications, given the occurrence of a major spill.

An Economic Evaluation of the Proposed Northern Tier Pipeline. Walter J. Mead, July 25, 1980. Prepared for the Washington State Department of Ecology. Concludes that NTPS is a highly questionable solution to the current oil disequilibrium; forecasts that the surpluses will disappear; and that regional oil supplies need to be reforecast based upon likely self-correcting market mechanisms. From a transportation cost standpoint, NTPC would be rejected by the market in favor of Trans Mountain. Moreover, because of the uncertainty of west cost surpluses, smaller short-term projects are more reasonable. On the basis of probable crude oil prices, neither NTPS or Trans Mountain are probably viable.

Economic Evaluation of Fisheries and Recreational Losses from Oil Spills in the Marine Environment, Philip Sorensen, prepared for the Washington State Department of Fisheries, January 25, 1981. Report provides foundation for prefile testimony. Places Washington State potential losses in international context by referring to other major spills. Report estimates economic damage will range from $5.00-$19.60 per gallon of oil spilled and result in as much as $638,000 in annual losses.

An Economic Evaluation of a Hookup System Linking the Proposed Northern Tier Pipeline in the Northern Puget Refineries. Walter J. Mead and Philip E. Sorenson, April 1981. Prepared for the Department of Ecology. The evaluation concludes that north Puget Sound refineries will be refitted to refine ANS crude, that the refineries are strongly opposed

to hookup because it would result in transportation cost increases; moreover, a distinct possibility exists that mandated hookup could produce a shutdown of one of the four refineries.

Project Monitoring

Northern Tier Testimony Before the Energy Facilities Siting Evaluation Council. (Project monitoring) Charles Champion and Walter B. Parker. Prepared for the Washington State Department of Ecology, March 1981. Proposes technical and environmental stipulations to be attached to the certification agreement.

A Proposed System for Pipeline Construction and Operation Monitoring in Washington State. Prepared by CDS/Quest Research Inc., May 1980 for Clallam County.

Includes description of a proposed monitoring process for construction and operation of a major pipeline in Washington State. Also provides an exhaustive set of stipulations based on (TAPS).

River Crossings and Sensitive Areas

Prefiled testimony of Jim D. Currie. Prepared for Snohomish County Planning Department. Aquatic and wetland impacts, mitigation measures. Testimony criticizes NTPC for errors, oversights, and inconsistency in habitat analysis, mapping, and impact evaluation. Together with Somers, Currie evaluates habitat at 39 stream crossings and concludes NTPC evaluations were inaccurate; with Hirschi remaps and evaluates impacts of 20 wetlands crossed by the centerline. A wide ranging set of mitigation measures is also provided for terrestrial impacts. These include the use of directional drilling to avoid wetland impacts. Testimony also details proposals for post certification plans and reports.

Prefile testimony of Tony Eldred. Game fish impacts, aquatic habitat impacts. Prepared for Department of Game. Eldred provides an aggressive critique of NTPC assessment of Eastern Washington habitat and potential for siltation impacts; quantification of fishery losses based on extrapolation for Alaska Salcha River experience. Also argues that NTPC mitigation measures are incomplete and habitat assessments error-ridden.

Major River Crossings, Minor Stream Crossings and Floodplain Construction as Related to the Proposed Northern Tier Pipeline, prepared for Snohomish County by Charles E. Kay.

Report evaluates alternative construction methods employed in river crossings. Discusses methods used on the Trans Alaska Pipeline System (TAPS) describing adverse impacts to water quality, fisheries, and habitat. Also addresses minor stream crossings and proposes mitigation measures.

Review of Northern Tier Pipeline Stream Crossings in Snohomish County, Washington. Prepared for Snohomish County Planning Department and Tulalip Tribes by John Norman Associates. Provide analysis of techniques used by applicant and alternatives for computation of river scour,

channel migration, and siltation. Concludes: 1) NTPC underestimated sediment loads due to construction, 2) NTPC underestimated channel setbacks necessary to protect pipe at the two crossings studied, 3) NTPC's scour depth analysis is inadequate to ensure pipe integrity. Norman suggests a superior procedure for computing scour that includes estimation of critical shear stresses.

Review of River Crossing Construction Techniques for the Northern Tier Pipeline Company in County of Snohomish, Washington. Prepared for Snohomish County by Hydrocon Engineering (Wm. Veldman). April 15, 1981. Concludes that burial depths at river crossings have not been demonstrated as "conservative," and that sagbend locations were not adequately analyzed to account for potential bank migration. Veldman's analysis demonstrates the feasibility of directional drilling as a construction technique for crossing Davis Slough, West Pass, and as a potential method of construction in wetlands that would minimize impact. Shore approaches are also potential applications and were neglected by NTPC. Veldman also assesses other alternative methods for all major river crossings and argues in favor of fluming small streams.

Sensitive Areas

Prefile testimony of Jerry D. Benson. Habitat impacts and revegetation measures. Prepared for Department of Game. Critique of NTPC revegetation measures, focusing on site inventories and suitable revegetation species by site classes.

Prefiled testimony of Chuck Perry. Critique of NTPC's habitat assessment methodology, prepared for the Department of Game. Criticizes NTPC habitat analysis and sampling procedure; assesses impacts on wildlife due to vegetation loss, oil spill degradation of wetlands; disputes NTPC contention that right-of-way should be considered "edge" creation.

Prefiled testimony of Ron Hirschi. Biological impacts wetlands. Prepared for Snohomish County. Documents regional, national, and international wetland losses and establishes habitat value of wetlands crossed by NTPS. Hirschi notes failure of NTPC to map wetlands and to evaluate impacts of construction activities. With Currie provides map of 20 wetlands crossed by centerline as well as a slide show with narrative assessing resource values and impacts. Hirschi documents the presence of endangered species and presence of significant wetland values in contradiction to NTPC testimony. Suggested mitigation measures include application of USFWS HEP analysis to establish compensation for wetland losses.

An Evaluaton of the Waterfowl of Skagit and Port Susan Bays With Regard to a Proposed Oil Pipeline, prepared for the Department of Game and Department of Ecology by Robert Jeffrey, April 1980. Describes biological resources of a particularly important waterfowl area and its vulnerability to oil pipeline impacts.

Prefiled testimony of Doug Pinio. Prepared for the Department of Game. Potential impacts on wildlife and wildlife oriented recreation, focusing on Spokane County. Disputes adequacy of NTPC survey of wildlife and wildlife habitat in corridor.

Submarine Geology

An Overview of Proposed Northern Tier Submarine Pipeline Construction and Operation Methods in Relation to Features of the Puget Sound Strait of Juan de Fuca Oceanographic and Geologic Environment. Hatfield Consultants Ltd., Thurber Consultants Ltd. Prepared for the Department of Ecology, March 1981. Review of NTPC submarine crossing data. Author notes that there is considerable evidence of submarine slumping and landslide activity which needs further examination. Moreover, faulting appears to be more recent then suggested; and the potential liquefaction hazards greater. The report also draws attention to the presence of barchan shaped sand dunes which reflect an active current driven geological process. Mitigating measures are suggested for several of the geological hazards discussed, including the laying of dual lines, realignments across slope lines, relocation of to avoid landslide hazard areas, etc.

Soil Liquefaction Study for Jefferson County. Mehmet Sherif. February 1981. Prepared for Jefferson County. Review of application concludes inadequate testing of soils by applicant to ascertain liquefaction hazard on submarine segment.

Appendix 11.3

EFSEC Findings - Reference Matrix

Topic	Finding	Intervenor	CEIP Funded	Source
Need-Demand	. Identification and quantification of the demand for the Northern Tier proposal are not readily ascertainable.			no citation
	. Prudhoe Bay production not absorbed on the west coast is moving readily to secondary markets by existing means.			no citation
	. The ability of west coast refineries to process Alaska oil is increasing.			no citation
	. Northern Tier has not demonstrated producers or refiners are ready to use its facilities.			no citation
	. The west coast surplus exists only at Valdez.			no citation
	. Of the original economic rationales, the only that remains is the greater system flexibility that might result.			no citation
	. No need has been demonstrated for a super-port capable of accommodating 327,000 DWT tankers.			no citation
	. No supply induced shortages of petroleum in eastern Washington have been shown.			no citation
Marine terminal facilities	. Northern Tier did not give serious consideration to any site other than Port Angeles.			no citation
	. Northern Tier does not propose a project capable of shipping all crude types now produced or received in Puget Sound.			no citation
Submarine line--general	The Admiralty crossing includes 3 miles of potentially liquefiable soils and encounters 1½ miles of sand waves. The	CCPA	X	Sternberg

Topic	Finding	Intervenor	CEIP Funded	Source
	crossing also shows evidence of submarine landslides and seismic faults.			
currents	. High bottom currents at the Admiralty crossing could approach a critical point at which it is not possible to weight the pipe for both current protection and liquefaction potential.			cross exam. of Timmerman
	. Northern Tier did not conduct design studies necessary for assessing the affects of currents. The applicants sampling and analysis of currents was unreliable. The applicant's design current of 6 ft per second may be 50% too low.	CCPA DOE	X	Winter Holbrook
Submarine line boulders	. Boulders can be expected at least once every 150 feet along the submarine segment segment.	CCPA/DOE CCPA	 X	Holbrook Sternberg
	. The presence of boulders represents a potential hazard. Damaging stresses could result if the pipe were spanned between boulders.	CCPA	X	Winter
	. The applicant designed the pipeline to deal with less liquefaction induced sinking than could be expected under extreme conditions along submarine segments.	CCPA	X	Sternberg
	. The full extent of potential soil liquefaction cannot be determined from the information provided by the applicant.	Jefferson CCPA	X X	Sherif Johnson
liquefaction	. The applicant did not use state of the art analytical techniques.	Jefferson	X	Sherif
	. The actual potential for liquefaction may occur in an area 4 times more extensive than that identified by the applicant.	CCPA	X	Johnson

Topic	Finding	Intervenor	CEIP Funded	Source
	. The applicant did not sufficiently study the geology of Admiralty Inlet.	CCPA	X	Johnson
	. Ground acceleration from large earthquakes could cause slope instability and landslides on the Admiralty crossing.	CCPA		Johnson
	. The occurrence of landslides could subject the pipeline to severe pressures.	CCPA	X	Johnson
	. The applicant did not study the possibility of landslides caused by liquefaction.	WDOE		Buck
sandwaves	. Northern Tier was aware of the presence of sand waves in early 1979, but performed no subsequent technical work to assess them. The existing analysis is inadequate to demonstrate that the pipeline will remain buried if installed.	CCPA	X	Sternberg
scouring	. Scouring by currents could cause the submarine pipeline to be suspended off the bottom if the pipe were supported by rocks or fill.	CCPA	X	Sternberg
pipeline engineering difficulties	. Should there be any increase in submerged weight requirements of the line (dictated by geological hazards) standard equipment capabilities might be exceeded.			no citation
Marine terminal geologic risks	. The type A sediments in the marine terminal area are potentially liquefiable under less than design earthquake conditions.			no citation
Vessel traffic	. If NTPS were used to supply north Puget Sound refineries an additional 110-230 calls would be required at Port Angeles.			no citation

Topic	Finding	Intervenor	CEIP Funded	Source
Fire and explosion	. To site the NTPS terminal at Port Angeles would be an exception to the contemporary practice of siting superports away from residential and urban settings.	CCPA	X	Bennett
	. The tanker data base used by NTPC does not include experience with large tankers and is out of date. A second analysis referenced by the company is invalid.			no citation
	. NTPC proposed the use of inert gas systems to reduce tanker explosion risk. If properly designated and operated, such a system could prevent some explosions.	CCPA	X	Bennett
	. Most of the harbor and the open harbor anchorage would be within the fire radius of a worst case pool fire; and such a fire would damage much of Port Angeles.			NTPC
	. In assessing potential structural damage resulting from tanker explosions, no consideration was given to the types of buildings in Port Angeles.			cross exam. of NTPC
	. Northern Tier has not considered secondary or chain reaction fire sequences.	CCPA		Beatteay
	. The Northern Tier facility would increase Port Angeles fire risk by 16 times.			NTPC
	. Northern Tier's proposed fire protection system is designed primarily to protect berthing facilities and not for fighting crude oil fires on tankers or on water.	CCPA		cross exam. Beatteay
	. No fire system including Northern Tier's is capable of extinguishing a fully involved tanker fire.	CCPA		Hansen

Topic	Finding	Intervenor	CEIP Funded	Source
	. A crude oil fire on a tanker or a fire spreading over the water of the harbor could threaten additional vessels and waterfront facilities.	CCPA		Beatteay
	. Northern Tier did not consider the risk or consequences of fire or the level of fire protection that could be provided when it selected Port Angeles as its terminal.			cross exam. of NTPC
	. The fire protection system would be ineffective in combatting a fire spreading across the harbor or a major fire aboard a vessel.			no citation
Oil spill risk	. NTPS would significantly increase oil spill risk both due to numerous small operational spills and large spills (tankers and the submarine line).			no citation
	. NTPC would more than double the risks of tanker related spills by virtue of the fact it would add 395 vessel calls to the existing tanker traffic.			no citation
	. NTPC presented an assessment of spill risk that was significantly inaccurate. It understated worst case volumes and located events in non-worst case sites.			no citation
	. A clean break of the Saratoga segment would produce a maximum spill of 10,000 barrels and at Admiralty Inlet 40,000 bbl.			no citation
	. The quantitative risk analyses provided by the applicant had a number of significant defects that stem from data base problems, the exclusion of important variables, and analytical mistakes.	CCPA		Stewart Armstrong

Topic	Finding	Intervenor	CEIP Funded	Source
	. The OIW study referred to by the applicant understates spills from tankers. Probability estimates provided are of questionable reliability.	CCPA		Stewart Bennett
Spill migration	. No methodology currently exists which can accurately predict the dispersion and migration of an oil spill.	WDOE	X	Raj
	. Downwelling over sill zones (i.e. at Admiralty Inlet) could cause spilled oil to be retained at depth or transported into inner Puget Sound waters.			no citation
	. Although Northern Tier utilized the best available trajectory model, the designers of the model are not certain of critical model assumptions. A small change in model assumptions regarding the influence of winds would dramatically alter the predicted location of an oil slick.	CCPA		Stewart
	. In general, state of the art analyses indicate that spill migration in any direction is conceivable. Oil spilled within the strait could affect the entire Strait, the San Juans, Whidbey, and some Pacific shores.	CCPA		Long
	. A spill in Port Angeles Harbor, as well as the main basin of Puget Sound, could spread to Dungeness Spit, Sequim and Discovery bays; however, spreading cannot be easily predicted.	I/KC CCPA	X	Storie Long
	. The chances of a spill adversely affecting the most susceptible biological communities increases as the assumed spill point is moved eastward.	I/KC		Long

Topic	Finding	Intervenor	CEIP Funded	Source
Anchor penetration	. NTPC underestimated the potential for anchor penetration of soil in Port Angeles Harbor. According to NTPC, the line would be buried no more than 4 feet below the surface. Anchors could penetrate more than 19 feet.			cross exam. of NTPC
	. It may not be possible to achieve more from 11 feet of cover over the submarine line.			cross exam. of NTPC
Terrestrial pipeline route selection	. Route selection across major rivers other than the Columbia was made by an engineer who was permitted to work a maximum of 100-300 feet on either side of the original centerline.			no citation
	. Though information was available, Northern Tier route selection failed to discover the Skagit, Gloyd seeps and Colockum wildlife refuge areas.			cross exam. of NTPC
	. There is no support in the record for the proposition that the choice of the terrestrial centerline was based upon analysis which included environmental characteristics within the corridor. Minor river crossings were not examined at all.	Snohomish Co.	X	Currie
Geological and seismic risks	. The largest possible earthquake which may take place along the western Washington segment is a 7.5 R event. A 7.3 R event occurred in Vancouver Island in 1946. NTPC used a design earthquake of 6.0 R and a ground acceleration of .20 g. During the 1949 southern Puget Sound event, a .31 g peak acceleration was recorded.	CCPA	X	Rasmussen
	. Design earthquakes of 7.1-7.5 R and .31-0.35 g. acceleration should be used for designing critical facilities.	CCPA	X	Rasmussen

Topic	Finding	Intervenor	CEIP Funded	Source
	. NTPC failed to provide needed data on ground motion.	CCPA	X	Rasmussen
	. Leakage from the terrestrial pipeline could reach the water table through different migrational pathways.			cross exam.
Resources at risk--oil spills	. A major tanker accident inside the Strait of Juan de Fuca or surrounding waters could cause economic damages in excess of $200 m. NTPC only proposes to carry $35 m. in spill liability insurance.			no citation app.
	. Shellfish are especially vulnerable to spilled oil because of sporadic recruitment; recovery may take several years.			no citation
	. Dabob Bay produces the majority of oyster seed used on the west coast. It could be subject to pipeline related oiling.			no citation
	. Risk to salmon from oil would depend upon life stage duration of exposure and other variables. An oil spill would not ordinarily be lethal to adults; however, populations could be affected by food chain disruption.			no citation
	. The increased threat of oil spills associated with the project could hamper investment and development of the aquaculture industry.			no citation
	. Diving birds found in the Jamestown/Protection Island area are known to be highly susceptible to the effects of spilled oil.	I/KC		Long

Topic	Finding	Intervenor	CEIP Funded	Source
	. Observations from historic oil spills suggest that serious long-term effects could be expected in the unique biological regions of Puget Sound due to oiling. In part, these would be a function of species sensitivity and the long persistence of toxic oil compounds in certain coastal environments.	CCPA	X	Hatfield
	. An oil spill could upset fisheries and harvest management strategies. At present treaties prohibit Indian tribes from moving from one fish run to another.	Tulalip Tribes		Somers
	. A large spill in one of the major rivers could block adult migrations. A spill in a small stream could prevent use of significant habitats downstream or upstream.	Tulalip Tribes		Somers
	. The occurrence of construction related oil spills can be expected.	Snohomish County	X	Kay
	. Oil spills could affect any of the important water bird areas in the Strait.			no citation
	. Present equipment and technology will not provide the capability to recover significant amounts of oil spilled at the superport or in marine waters. Wind and sea states are critical limiting factors.	CCPA		Bennett Hatfield
	. The success of diversion booming in rivers is dependent upon low current speeds. Therefore, no substantial containment can be expected.			Foget cross no citation
	. U.S. law requires tankers to carry oil spill liability insurance at a rate of $.75 per gal. However, coastal cleanup expenses have averaged well over $26 per gallon.	CCPA CCPA CCPA	X X X	Hatfield Sorenson Bennett

Topic	Finding	Intervenor	CEIP Funded	Source
Water quality ground water	. Because of the importance of ground water, a ground water inventory is necessary. Insufficient information has been provided to reach firm conclusions concerning ground water impacts in eastern Washington.			no citation
	. The applicant did not sufficiently describe and inventory the ground water geology of Island County.	IC		Thorsen
	. There is a potential for breaching artesian aquifers at the Whidbey landfalls. Ground water would be immediately contacted by pipeline oil spills on portions of Whidbey Island. Island counties problem is compounded by the fact that there is no readily and economically available alternative supply of freshwater.	Council for Environment Island Co. Island County/ CE		Foxworthy Goldsmith
	. Pipeline trench construction through floodplains is likely to encounter shallow ground water.	King County		Fulmer
	. Insufficient information has been provided to assess risks of aquifer pollution and measures to prevent such risks.	King County		cross of NTPC, Fulmer
Fish and game impacts	. Of 103 rare, threatened or endangered plant species in Washington State, 61 are found in the Columbia HMA crossed by the NTPS.	Game	X	Perry
Terrestrial habitat impacts	. Construction stage equipment operation will destroy vegetation and compact soil. Only partial replacement will occur during project life.	Game	X	Pinio
Aquatic fisheries impacts	. The greatest sediment impacts can be expected in smaller streams.	Game		Pfeifer

Topic	Finding	Intervenor	CEIP Funded	Source
	. The NTPS would pass through the most productive part of the Skagit waterfowl area; and this area is one of the most important coastal waterfowl habitats in the northwest.	Game	X	Jeffrey
Wetlands	. The applicant did not sufficiently map or otherwise identify wetlands and riparian habitats and water dependent species on the centerline and in the corridor.	Snohomish County	X X	Currie Hirschi
	. Northern Tier underestimated the impacts of this project on wetlands.	Snohomish Co.	X	Currie
	. Realignment feasibility studies for all wetlands crossed or immediately adjacent to the ceterline should be undertaken. Northern Tier's centerline location would cause a direct loss of wetland vegetation and associated riparian habitats.	Snohomish Co. Snohomish Co.	X X	Currie Hirschi
	. Wetland habitats of 11 rare, threatened, or endangered species have been documented in the Snohomish County corridor.	Snohomish Co. Snohomish Co.	X X	Currie Hirschi
Fisheries impacts	. The applicant has not determined that it is feasible to accomplish all of the small stream crossings during the proposed fish windows. (A 90-day period; 56 streams in Snohomish and King counties).	Tulalip Tribes		Somers
	. NTPS would likely disrupt fish migration and thereby reduce productivity of runs.	Tulalip Tribes		Somers

Topic	Finding	Intervenor	CEIP Funded	Source
	. The applicant has an obligation to generally describe physical and biological circumstances across the width of the corridor. The applicant did not meet this obligation, and failed to describe impacts reasonably anticipated from contruction (fishery habitat and sediment impacts).	Tulalip Tribes		Somers
	. Northern Tier would introduce substantial amounts of sediment into small streams which would cause substantial damage to fishery habitat and fish which use such streams.	Tulalip Tribes/ Snohomish County Snohomish	X X	Somers Norman
	. Northern Tier used an inferior method for calculating river scour potential.	WDOE Snohomish Co.	X	Garland Veldman
	. Northern Tier offered no design criteria to assure that stream crossings would be least impacting to fisheries or least likely to create erosion problems.	Snohomish Co.	X	Currie
	. The applicant significantly underestimated the actual sediment loads that will be produced at the major river crossings. All river and stream crossings in King County except the South Fork Snoqualmie potentially have high sensitivity to sedimentation.	Snohomish Co. King Co.	X	Norman Fulmer
Public service impacts	. Construction of the terminal will create substantial land transportation impacts on the City of Port Angeles.	CCPA		Pittis
	. Whidbey Island lacks sufficient housing for the expected influx of pipeline workers.	Island Co.		Madsen
	. NTPC would have substantial impacts on water, sewer and solid waste related services in Clallam County.			no citation

Topic	Finding	Intervenor	CEIP Funded	Source
Energy	. Forecasts predict a 99% certainty that supplies in the region would be unable to meet the anticipated project load.			no citation
	. Because NTPC would be a "priority user," the expected energy deficits would first be suffered by nonpriority customers.			no citation
	. Neither NTPC nor anyone else has indicated how the project's energy requirements could be met. Eight separate utilities would be relied upon to meet NTPC needs.			no citation
	. Based on historic spill costs which include cleanup and recreational losses, an oil spill could cost between $5.00 and $20.00 per gallon spilled.	WDF/WDOE	X	Sorenson
Economics	. NTPS would require relocation of the Coast Guard facility at Ediz Hook. Relocation outside Clallam County would cause major local economic impact. NTPC did not evaluate this issue.			no citation
	. If NTPS is constructed, petroleum related development in Clallam County is more likely with its attendant impacts. None of the barriers to petrochemical or refinery development would be insurmountable.	CCPA		Conradus
Cultural impacts	. NTPC's inventory of cultural and archaeological resources within the corridor is substantially incomplete.	King Co. Office of Historic Preservation		Onat, Howry
Recreation	. Construction will temporarily disrupt access to beaches, parks, and recreational areas throughout the route.	CCPA CCPA		Gillespie Frizell Jacobs

Topic	Finding	Intervenor	CEIP Funded	Source
Pollutant discharges	. NTPC failed to provide the council with sufficient information to allow review of withdrawal and discharges for hydrostatic testing.			no citation
Water quality impacts	. Existing state and federal water quality criteria would be exceeded by construction activities in streams and rivers.			no citation
	. NTPC made unwarranted assumptions regarding the channel migration potential of rivers it would cross.	WDOE Snohomish Co.	 X	Garland Norman
Hookup provisions	. NTPC failed to apply to EFSEC for hookup. During the hearings it advanced arguments conditional upon hookup (oil spill risk) and made promises a hookup application would be forthcoming. NTPC failed to perform engineering and environmental studies necessary to make such an application.			no citation
	. No reduction in tanker traffic would result from hookup. Reductions asserted by NTPC are unsupported. The existing refineries reject the idea of using larger tankers.	CCPA CCPA CCPA		Formway Ferguson Malseed
	. About 50% of the crude used by Shell and Texaco refineries could not be moved through the pipeline.	CCPA CCPA		Malseed Ferguson
	. Hookup would substantially increase per barrel costs for north Puget Sound refineries.	CCPA CCPA CCPA		Formway Malseed Ferguson
Consideration of alternatives	. An alternate port site west of Port Angeles would be preferable to the site proposed by NTPC.			no citation
	. NTPC's selection of Port Angeles was based on a study that emphasized nonenvironmental factors (e.g. operations concerns).			no citation

Topic	Finding	Intervenor	CEIP Funded	Source
	. The NTPC proposal poses a greater oil spill risk than the alternatives discussed in the hearings.			no citation
	. Approval of NTPS could preempt future options for east-west oil transshipment (e.g. oil exchanges).	CCPA/Island Co. CCPA/Island Co.		Philipps Tussing

Appendix 11.4

Stipulated Agreements between Northern Tier and Intervenors

The applicant entered into a number of stipulations with state agencies, local governments, and private parties in an effort to mitigate the adverse impacts of the proposed project.

a. Stipulation between Northern Tier and Washington State Department of Transportation (undated)

b. Stipulations between Northern Tier and the City of Port Angeles:

   1. Negotiating Guidelines and Procedures (April 15, 1980)

   2. Amendment to Negotiating Guidelines (June 24, 1980)

   3. Payment by Northern Tier for review, analysis, and other activities by City of Port Angeles (May 27, 1980)

   4. Housing Survey and Plan (May 27, 1980)

   5. Water, Sewer, and Solid Waste (June 24, 1980)

   6. Policy of Preferring Qualified Local Workers (September 2, 1980)

   7. Transportation (February 17, 1981)

   8. Oil Spill Contingency (June 16, 1981)

c. Stipulation between Northern Tier and Lincoln County (September 2, 1980)

d. Stipulation between Northern Tier and Spokane County (September 18, 1980)

e. Stipulation between Northern Tier and Adams County (October 6, 1980)

f. Stipulation between Northern Tier and Port of Port Angeles:

   1. Regarding Seamen's Center (November 24, 1980)

   2. Regarding Construction Inventory (November 24, 1980)

g. Stipulation between Northern Tier and the East Columbia Basin Irrigation District (August 6, 1980)

h. Stipulation between Northern Tier and the Quincy Irrigation District and the East Columbia Basin Irrigation District (December 3, 1980)

i. Stipulation between Northern Tier and Grant County (December 15, 1980)

j. Stipulations between Northern Tier and Washington State Department of Natural Resources:

   1. Regulatory (January 9, 1980)

   2. Proprietary (January 9, 1980)

k. Agreement and Stipulation re Port Angeles Harbor Facilities (entered into by Port of Port Angeles, ITT Rayonier, Inc., Crown Zellerbach Corporation, Foss Launch and Tug Company, Puget Sound Pilots Association, Port Angeles Salmon Club, and Northern Tier) (March 24, 1981)

l. Stipulation between Northern Tier and King County (May 6, 1981)

m. Stipulation between Northern Tier and Kittitas County (May 19, 1981)

n. Stipulation between Northern Tier and Department of Ecology (June 23, 1981)

o. Stipulation between Northern Tier and Clallam County Fire Protection District No. 3 (June 24, 1981)

p. Amendment to Stipulation between Northern Tier and Lincoln County (July 2, 1981)

q. Amendment to Stipulation between Northern Tier and Adams County (August 26, 1981)

r. Stipulation between Northern Tier and Clallam County (July 27, 1981)

s. Stipulation between Northern Tier and City of Seattle (July 29, 1981)

Draft agreements were developed between Northern Tier and Jefferson and Snohomish counties but were not signed.

Unresolved issues discussed in the mitigation findings included:

- Oil spill risk caused by vessel casualty or submarine pipeline failures;

- Fire and explosion risk in Port Angeles Harbor;

- Timing of river crossing construction;

- Construction in sensitive areas, except Three Forks Park;

- Socio-economic impacts as follows:

- Law enforcement in Port Angeles, Clallam and Island counties;
- Recreation facilities in Port Angeles;
- Fire protection in Port Angeles;
- Educational services in Port Angeles;
- Risk posed to medical facilities in Port Angeles-Olympic Memorial Hospital;
- In Clallam County, housing, fishing and tourism losses, electrical energy impacts, ground water contamination, and secondary petroleum-related development.

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