Q: *Who are you?*

A: My name is Nancy Sturhan. I work for the Department of Natural Resources in the Forest Practices Division in Olympia, Washington. I am a Natural Resources Scientist 3, and am head of the watershed analysis program.

Q: *What is your educational background?*

A: I have a Bachelor of Science degree (1976) in Forest Management from Iowa State University. I completed all course work for a Masters degree in Watershed Management at Humboldt State University, Arcata, California. I have not completed my thesis.

Q: *What is your work experience relevant to your comments?*

A: I have worked as a watershed scientist for the past eight years for the Department of Natural Resources(DNR). I was actively involved in developing the watershed analysis (WA) methods, co-chairing the Timber/Fish/Wildlife committee that produced the methodology. I have participated as an analyst and/or prescription writer on six WA teams. In addition, I have been the chief troubleshooter, assisting many WA teams and prescription teams when they encountered problems. I was actively involved in developing the training for WA and have participated as instructor for the following classes: Overview of the WA Process, Surface Erosion Lecture and Lab, Monitoring Lab, Peer Review Lecture, Water Supply/Public Works Lecture/Lab, Wrap-up Q/A session, Prescription Overview and Lab, and Synthesis.

Previously, I was employed by the USDA-Forest Service as the West Zone Soil

Scientist on the Olympic National Forest for three years, where the major part of my job was to assess the impacts on resources of forest practices activities, such as road building and timber harvest, in the forested environment. Prior to that I was employed at Redwood National Park three years as a soils technician. I worked as a forester for the USDA-Forest Service on the Six Rivers National Forest six years, was self-employed as a forestry consultant two years, and was employed by timber companies for two years. In the forestry positions I was directly involved in managing forest land.

Q: *What is the nature of the comments you are providing?*

A: I am providing comments on Application No. 96-1 as it relates to watershed analysis. I will provide an overview of the watershed analysis rules and how watershed analysis relates to standard forest practice rules. I will also provide a map of the watersheds with completed or ongoing analyses that are in the path of App. No. 96-1, a brief summary of the resources at risk in those watersheds, and a summary of the prescriptions that guide forest practices in those watersheds.

Q: *What is Watershed Analysis, as you refer to it in Washington?*

A: Watershed Analysis is a process that was developed by forest landowners, Indian Tribes, environmental groups and state natural resource agencies. It was adopted into regulation by the Forest Practices Board in 1992 (Chapter 222-22, WAC). The purpose of the rule is to protect public resources from cumulative effects of forest practices. Where the standard rules were developed to address site-specific concerns, watershed analysis is

designed to uncover the accumulation and interaction effects of many site activities.

Watershed analysis is a biological and physical assessment of a watershed in order to address the cumulative effects of forest practices on specific public resources(fish, water, and capital improvements of the state)(WAC 222-22-010 (1)). A watershed is defined as all the land that drains to a specified water body. In Washington, we have divided the forested land of the state into 800+ Watershed Administrative Units (WAUs) of about 10,000 acres to 50,000 acres in size. Each analysis is conducted by a team of qualified experts from relevant scientific disciplines such as hydrology and fish biology who follow the current version of the Forest Practices Board Manual (Washington Forest Practices Board Manual: Standard Methodology for Conducting Watershed Analysis, version 4.0, Nov., 1997). Each member of a team must meet minimum qualifications, including education, field experience and training in the watershed analysis process (WAC 222-22-030 (1)).

The analysis team defines areas where the standard rules are not sufficient to protect public resources from the cumulative effects of forest practices, and produces Causal Mechanism Reports(CMRs) that detail the specific hazards and resources that are at risk from those hazards, the activity that triggers the situation, and the level of prescription protection required (Standard rules, Minimize, or Prevent/Avoid) (WAC 222-22-050-2(f)). These CMRs are handed off to a field managers team which develops prescriptions designed to address those areas and their specific concerns at the appropriate level of protection(WAC 222-22-070). For example, the analysis team may locate an area where landsliding is likely to occur that will impact water quality and fish

habitat. The prescription team would determine limitations to forest practice activities on that area, and write prescriptions designed to prevent landsliding from being initiated by management activities. These prescriptions become requirements for forest practices applications approved by the DNR (WAC 222-22-090(1)).

Q: *Why should the proponents of App. No. 96-1 be concerned with the watershed analysis prescriptions?*

A: The watershed analysis has uncovered potential hazards and resources at risk from those hazards. The prescriptions are designed to protect the resources from impacts from typical forestry activities. If, in implementing App. No. 96-1, the forest practices rules and watershed analysis prescriptions are followed, where they apply, then the public resources of fish habitat, water supplies, and public works should be protected from the pipeline activities that constitute forest practices.

Watershed analysis examines the cumulative effects of forest practices. Let's take a look at the stream crossings and wetland crossings in App. No. 96-1. Generally speaking, a thirty-foot-wide swath across a stream, if done carefully, might have a small impact to water and fish, at the site level. However, when considering cumulative effects, we ask two more questions. (1) Cumulative effects: How many streams in the same WAU are crossed by the pipeline, thus how many small impacts will there be to the water and fish in a particular basin? These impacts tend to aggregate in the low-gradient reaches of the stream systems which are usually important to fish habitat. How many wetlands are crossed by the pipeline? What is the total impact on wetlands of the

pipeline route? (2) Interactions: How important is this thirty-foot-wide swath in relation to the condition of the rest of the WAU? For example, is there ample large woody debris for recruitment into the stream, or is the pipeline project proposing to remove some of the few remaining large trees in the WAU that could supply large woody debris to the stream? How will the pipeline project interact with other activities or conditions, for example, will it undermine existing roads or unstable slopes? How will the pipeline interact with wetlands - will there be increased sedimentation, how will the hydrology of the wetlands be affected?

A detailed plan of location, design, construction, maintenance, mitigation, restoration, and a flagged location on the ground are necessary to fully evaluate the impacts site-by-site, as well as to evaluate the likely cumulative effects from the proposal. Where there are resources likely to be at risk, DNR would make a field visit to ensure that the site is being treated appropriately. This is the level of information DNR requires to issue a forest practice permit. I recommend to the EFSEC that they consider a similar level of information and field review to be provided by qualified experts in order to make a sound decision that incorporates the likely impacts of the project on public resources.

Q: *What aspects of App. No. 96-1 do you see as having impact beyond the forest practices activities, such that the prescriptions might not provide sufficient protection to public resources?*

A: With App. No. 96-1, there are at least three activities that go beyond typical forest

practices: 1) direct impacts to public works such as the John Wayne Trail and the State Parks; 2) the digging and refilling of a trench across, or up and down, many slopes; 3) trenching across stream channels and wetlands. These are activities that DNR would not typically allow because of the likely impacts to public resources. A detailed alternate plan, complete with location, design, construction, maintenance, mitigation, and restoration activities, would be required by DNR to consider allowing such a proposal to be carried out. In order to make a decision about the impacts of the pipeline project, EFSEC should require a similar level of detailed information provided by experts in the impacts of such projects in the forested environment.

Direct Impacts to Public Works

Where the pipeline project uses existing roads and trails for its route, the standard forest practices rules and forestry prescriptions, where they apply, may be sufficient to protect the public resources of fish and water. The impact to capital improvements of the state or its political subdivisions, where the pipeline uses some of those public works as its route, was not a consideration during the analysis and prescription-writing for those WAUs. Those impacts need to be considered over and above standard rules and WA prescriptions. A detailed plan for each site, complete with the mitigation/restoration actions planned there should be required to properly evaluate the effects of App. No. 96-1.

Trenching Across Forest Land

Where the pipeline crosses forest land and trees are to be cleared, following the standard forest practice rules and prescriptions, where they apply, should provide

sufficient protection for fish, water, and capital improvements of the state or its political sub-divisions. The characteristics of the pipeline project that differs significantly from forestry activities involve the disturbance of soil to several feet in depth on a route that may run directly up and down hills. Forest roads disturb soils to several feet in depth, but forest roads cross slopes, and do not run directly up and down slopes. Yarding of logs may go directly up and down slopes, but does not disturb soils at depth.

In general, the combination of soil disturbance to depth and the pathway in places being up and down slope contributes two additional potential impacts, beyond the ordinary forest practices. 1) Disturbance of the soil destroys the structure that holds soil together, thereby greatly increasing the erodibility of the soil. When this disturbance track runs downhill to a creek, there is a strong opportunity for the disturbed soil to erode and be deposited in the stream, affecting water quality and potentially fish habitat and water supplies. A disturbance of this type could destabilize slopes, creating large landslides (see comments regarding slope stability in Susan Shaw's report, SCS-T). 2) Interruption of subsurface flow by the trench can redirect the subsurface flow down the trench, contributing to erosion of the trench material. The concentrated flow can potentially destabilize slopes, and with sufficient volume contributed to small drainages, can cause downcutting and streambank erosion in the stream.

The approaches to streams and wetlands are the critical sites for these concerns. Careful location and management of the construction and maintenance of the pipeline will be necessary to prevent impacts to the streams and downstream resources from these sites. The proposed project does not clearly state the mitigation or restoration measures

that would be used at each stream or wetland crossing to ensure the protection of public resources. Where the pipeline crosses unstable slopes, DNR would require detailed plans for location, design, construction, maintenance, mitigation and restoration, including flagged location on the ground, and site review by an interdisciplinary team. EFSEC should consider requiring the same level information, provided by a qualified expert on impacts in the forested environment, and of review, also by a qualified expert, for all stream and wetland crossings.

Trenching Across Stream Channels and Wetlands

Trenching across channels or wetlands or drilling under them would require permission from Washington Department of Fish and Wildlife, in the form of an HPA, a Hydraulic Project Approval. DNR's jurisdiction would be over the near-stream, riparian zone or wetland protection zone. There are standard rules and watershed prescriptions regarding limitations to activities in riparian and wetland areas. If a proponent were to want to operate outside the rules and prescriptions that apply to a specific location, the proponent would be required to provide detailed plans for location, design, construction, maintenance, mitigation and restoration, including flagged location on the ground, and site review, all produced by qualified experts in impacts to the forested environment.

Q: *Which watersheds with analyses either completed or in progress are in the path of the proposed pipeline project?*

A: See Map Exhibit NS-1. West of the Cascade Crest, the Tolt River and the Griffen/Tokul Watershed Administrative Units(WAU's) have completed analyses with a prescription

package (Tolt Watershed Analysis Report(WAR), Weyerhaeuser Company, 1993, Tolt five-year review draft prescriptions, and Griffen/Tokul Watershed Analysis Report, Weyerhaeuser Company, 1994). The prescriptions for the pipeline route in the Tolt and Griffen/Tokul are included as exhibits (NS-2 and NS-3 respectively) with this testimony.

East of the Cascade Crest, Keechelus, Mosquito Creek, Cabin Creek and Big Creek have ongoing analyses (Keechelus/Mosquito Draft Watershed Analysis Report, Plum Creek Timber Company, 1998, Big Creek Draft Watershed Analysis Report, Plum Creek Timber Company, 1998, Cabin Creek Draft Watershed Analysis Report, Plum Creek Timber Company, 1998). The Big Creek WAU has draft prescriptions that DNR is currently using with forest practice applications. The Cabin Creek WAU has an incomplete prescriptions package, and the Keechelus and Mosquito Creek WAUs do not have draft prescriptions. Where draft prescriptions exist, they are used in conjunction with forest practice applications. Where there are no draft prescriptions as yet, there are Causal Mechanism Reports (see Keechelus/Mosquito CMRs, Exhibit NS-4) which define the locations of concern and the public resource at risk. From these reports, the project proponent can easily see the resources to be protected and the issues of concern. The status and reports on the East-side WAUs can be obtained from DNR's Ellensberg office (phone Charlie McKinney, 509-925-8510).

Q: *What can be expected from analyses in WAUs in the proposed project path that have not yet been analyzed?*

A: Our experience has shown us that as we carry out WA on other WAUs in the vicinity of the proposed pipeline project, areas will be discovered that require protection beyond the standard rules for forest practices(Lester WAR, Naches Pass WAR, Quartz Mountain WAR). For the WAUs that have been analyzed, hazards have been mapped and prescriptions written regarding landslides, erosion, lack of shade for streams, and lack of future large woody debris for streams. Fish habitat, water supplies, and public works have been identified in each completed WAU in the area that require protection from the hazards identified. Where geology, climate, soils, vegetation, and past practices are similar across neighboring WAUs, as future analyses are carried out, similar findings can be expected in neighboring WAUs. Similar prescriptions can be expected in WAUs adjacent to those with existing analyses that are crossed by the pipeline.

Q: *What are the resources of concern and the prescriptions written to protect them in the watersheds where WA has been carried out on the pipeline route?*

A: Copies of the prescriptions for the Tolt and Griffen/Tokul watersheds have been provided to the Olympic Pipeline Company in 1996 (Dave Weiss' testimony). I will summarize them here. See the attached actual prescriptions that apply to the pipeline route. Note that the Tolt prescriptions have been updated, and the Draft five-year review prescriptions are now in effect in the Tolt WAU.

TOLT WAU - Resources Summary (from Tolt WAR)

Fish Habitat

The lower Tolt River, including the area downstream of the pipeline crossing, is used as spawning and rearing habitat for coho, fall chinook, summer steelhead, winter steelhead, chum, pink, sea run cutthroat, resident cutthroat, and perhaps other trout species. The lower Tolt is a migration corridor for summer steelhead and other trout species. The fish habitat in this area is especially sensitive to coarse sediment and scour due to increased peak flows.

Public Works

County roads, levees, and bridges occur within the 100 year flood plain. These facilities are vulnerable to peak flow increases and coarse sediment deposits.

TOLT WAU- Prescriptions Summary

Detailed maps of where the prescriptions apply can be found with the final report, available from the DNR South Puget Sound Region office in Enumclaw. The Tolt watershed analysis has recently gone through a five-year review, and prescriptions have been adjusted based on new information. These draft prescriptions are now in effect (See Exhibit NS-2, Tolt 5-year review draft prescriptions). The prescriptions are considered "draft" until they have gone through the State Environmental Policy Act public review process, expected to occur later in 1999 for the Tolt.

For the Tolt WAU, there are prescriptions for preventing mass wasting (the pipeline crosses two landslides). Prescriptions for these sites require further site investigation prior to DNR approval for forest practices. There is a prescription to

address the high erosion rating, and prescriptions addressing shade and future large woody debris that all restrict forest activities along the river.

DNR would not allow activity such as the pipeline to cross the landslides, or the mass wasting map units in which they occur, without a clear plan showing how the activity would protect public resources. Detailed design and location drawings, on-the-ground location flagging, field review, and adequate mitigation measures would be required by DNR to approve such an activity. Only when DNR is convinced that public resources are adequately protected would the activity be allowed.

GRIFFEN/TOKUL WAU - Resources Summary (from Griffen/Tokul WAR)

Fish Habitat

The Snoqualmie River, in the area of the confluences of Griffen and Tokul Creeks has many anadromous fish species including coho, winter steelhead, fall chinook salmon, odd-year pink salmon, fall chum salmon, and sea-run coastal cut throat trout. Non-anadromous species include mountain whitefish, resident coastal cut throat trout, and numerous non-salmonid species.

Griffen Creek provides the highest escapement of coho in the entire Snoqualmie River basin. Steelhead and cut throat trout are also widespread in the Griffen Creek basin. The lowest mile of Griffen Creek, downstream of the pipeline crossing, provides habitat for pink, chum, and chinook salmon. The lowest mile of Tokul Creek provides habitat for coho and chinook salmon and steelhead.

Water Quality

The Griffen and Tokul Creeks are rated Class A waters (excellent) by the Washington Department of Ecology. Water quality parameters exhibiting the potential to exceed state standards include temperature, dissolved oxygen, sedimentation, and turbidity.

Water Supplies/Public Works

The Tokul Fish Hatchery is located in the lower mile of Tokul Creek, and is especially vulnerable to coarse and fine sediment and changes in the base flow.

GRIFFEN/TOKUL WAU - Prescriptions Summary

Detailed maps of where the prescriptions apply can be found with the final report, available from the DNR South Puget Sound Region office in Enumclaw. The Griffen/Tokul prescriptions can be found in Exhibit NS-3.

The pipeline route crosses some unstable slopes and landslides which have prescriptions that restrict road building. There are erosion-prone slopes with prescriptions designed to prevent erosion and delivery to the stream. The stream crossings involve areas with shade and future large woody debris prescriptions that restrict tree removal from a buffer area along the streams.

KEECHELUS/MOSQUITO CREEK WAUs - Resources at risk (from Draft WAR)

Fish Resources

Spring Chinook salmon and steelhead (SASSI status for both: Depressed) use the Yakima River within these WAUs up to the base of Keechelus Lake where upstream migration is blocked by Keechelus Dam. These populations are currently sustained solely by natural reproduction. Bull trout are also confirmed to exist in the Yakima River, Keechelus Lake, and Gold Creek (SASSI status: Critical). Cutthroat and rainbow trout inhabit many of the tributary channels as well as the Yakima River. Kokanee salmon, burbot, mountain whitefish and pygmy whitefish inhabit Lake Keechelus.

Water Supplies

Sixteen permitted surface water rights in these two WAUs are on file with Ecology's Water Rights Information System. The largest of these is an irrigation diversion at Lake Easton, and associated canal, for the Kittitas Reclamation District (KRD) which supplies water to approximately 60,000 acres of land in the Kittitas Valley. The remaining diversions are primarily used for domestic multiple consumption.

Public Works

John Wayne Pioneer Trail (Iron Horse State Park)

Lake Easton State Park

Keechelus Dam and Reservoir	Easton Dam and Reservoir
Interstate 90	Kittitas Reclamation District Canal

KEECHELUS and MOSQUITO CREEK WAUs - CMRs Summary

Detailed maps of where the prescriptions apply will be produced along with the final report, and will be available from the DNR SE Region office in Ellensberg, later in 1999. Causal Mechanism Reports that apply to the pipeline route are included as Exhibit NS-4.

The route crosses three mass wasting units, and Mass Wasting CMRs 1, 2, and 7 present the situation, resources at risk, triggers, and standards for prescriptions (Minimize to Prevent/Avoid) for the mass wasting units. Hillslope Erosion CMR 1 presents the situation, resources at risk, triggers, and where prescription standards of "standard rules" and "prevent/avoid" apply. Several large woody debris CMRs apply (R6, R7, R8, and R9), requiring "prevent/avoid" prescription standards. Shade CMRs R11 and R12 also require "prevent/avoid" prescription standards.

CABIN CREEK - Resources at Risk (from Draft Cabin Creek WAR)

Fish Resources

Spring chinook salmon and steelhead utilize the lower approximately 2.5 miles of Cabin Creek below where a landslide-related barrier impedes fish passage. Chinook salmon, steelhead, and bull trout are found in the Yakima River above and below the Cabin Creek confluence. Cutthroat and rainbow trout are common in tributaries in the WAU.

Water Supplies/Public Works

John Wayne Trail

Downstream: Easton Dam and reservoir

KRD diversion and canal

CABIN CREEK - Prescription Summary

Detailed maps of where the prescriptions apply will be produced along with the final report, and will be available from the DNR SE Region office in Ellensberg, later in 1999.

The proposed route crosses no areas designated as special landslide hazard or erosion hazard sites in this WAU. The route crosses the lower extreme of the WAU, just above the confluence of Cabin Creek into the Yakima River. There is a High hazard rating for shade and for large woody debris recruitment on the proposed route. Causal Mechanism Reports and prescriptions have not yet been written for the riparian concerns on Cabin Creek, but it can be expected that restrictions on removal of shade and potential future large woody debris will be included in the prescriptions.

BIG CREEK - Resources Summary (from Draft Big Creek WAR)

Fish Resources

Historically, spring chinook salmon, coho salmon, and steelhead spawned and reared in Big and Little Creeks. Dewatering from irrigation diversions has all but eliminated current utilization, however, recent water right transfers is expected to once again make these tributaries available for anadromous fish use. Cutthroat, rainbow, and brook trout are common in tributaries throughout \the WAU. Bull trout are known to

inhabit the Yakima River above and below the Big and Little Creek confluences.

Water Supplies

Near the confluence of Big Creek and the Yakima River, a diversion from a spring-fed wetland is used for fish propagation by the Washington Department of Fish and Wildlife. Twenty-three other water rights are on file for domestic supply, irrigation, and/or stock watering.

Public Works

KRD canal John Wayne Trail

Bridges: Big and Little Creeks

BIG CREEK - Prescriptions Summary

Detailed maps of where the prescriptions apply will be produced along with the final report, and will be available from the DNR SE Region office in Ellensberg, later in 1999.

The proposed pipeline route does not cross any areas designated as special landslide or erosion hazards in this WAU. Causal Mechanism reports for shade and large woody debris are being prepared. Prescriptions restricting harvest and disturbance near Big Creek in the vicinity of the pipeline crossing can be expected.

Q: *What does DNR recommend the pipeline company do in response to the watershed*

analysis prescriptions?

A: The pipeline company should include the watershed analysis prescriptions where they exist, and incorporate future WA prescriptions as they become available, with its application. The DNR Forest Practices Division is charged with protecting public resources, as mandated by the legislature. The proponent of App. No. 96-1 should participate in protecting these resources - just as any landowner in each WAU is expected to do - by following the prescriptions.

The watershed analysis was conducted by qualified experts who assessed potential hazards, assessed condition and vulnerability of public resources, and produced CMRs detailing the hazard situations, the triggering activities, and the level of prescriptions protection required. The analysis report for each module was peer reviewed for adherence to methods and adequacy of the assessment. The prescriptions were written by qualified prescriptions writers, addressing specific hazards to protect specific public resources at risk. All participants followed the accepted Standard Methodology for Conducting Watershed Analysis. This structured approach, incorporated into the forest practices rules of the State of Washington, provides thorough, expert assessment and recommendations for forestry activities. The prescriptions, based on best scientific knowledge, should be followed, where available.

Where watershed analysis has yielded CMRs, they should be used to develop plans that protect the public resources at risk to the degree required (Prevent/Avoid, Minimize, or Standard Rules). Where watershed analysis has not yet been carried out, a similar degree of analysis, considering potential hazards and public resources at risk,

should be conducted to develop a plan for activities.

EFSEC should require the proponent of App. No. 96-1 to use watershed analysis prescriptions where they exist, and to provide a similar level of analysis and detailed planning as DNR would require for forest activities in order to protect public resources.

LITERATURE CITED

Lester Watershed Analysis Report, Plum Creek Timber Company, 1998, available through the DNR South Puget Sound Regional Office, phone (360)825-1631.

Naches Pass Watershed Analysis Report, Plum Creek Timber Company, 1997, available through the DNR Southeast Regional Office at Ellensberg, phone (509)925-8510.

Quartz Mountain Watershed Analysis Report, Plum Creek Timber Company, 1994 available through the DNR Southeast Regional Office at Ellensberg, phone (509)925-8510..

Tolt Watershed Analysis Report, Weyerhaeuser Timber Company, 1993, available through the DNR South Puget Sound Regional Office in Enumclaw, phone (360)825-1631.

Washington Forest Practices Board Manual: Standard Methodology for Conducting Watershed Analysis, version 4.0, 1997.

LIST OF EXHIBITS

NS-1 Map of pipeline routes and WAUs crossed by route

NS-2 Tolt 5-year review draft prescriptions

NS-3 Griffen/Tokul prescriptions

NS-4 Keechelus/Mosquito Causal Mechanism Reports

I certify and declare under penalty of perjury under the laws of the state of Washington

that the foregoing is true and correct to the best of my knowledge and belief.

SIGNED AT _____, Washington this _____day of February, 1999.

_____

Nancy K. Sturhan