AFFECTED ENVIRONMENT

Chapter 3

THE AFFECTED ENVIRONMENT

This chapter is divided into four major parts. The first broadly describes the environment of the Pacific Northwest. This environment may be affected by the proposals and alternatives due to changes in generating resource operations and development, and changes in power rates and availability to non-DSI customers. The second part, section 3.2, discusses in more detail certain aspects of the Pacific Northwest environment which are of particular concern because of their general relationship to BPA's activities. The third part briefly summarizes information contained in Appendix A concerning the environments affected particularly by the region's 10 aluminum smelters. Finally, section 3.4 describes the environmental regulations which govern the Northwest's aluminum smelters, and which are pertinent to an understanding of how BPA's actions might alter the physical environmental impacts of the smelters.

3.1 THE REGIONAL ENVIRONMENT AND ITS ELECTRIC POWER SYSTEM

The Pacific Northwest region consists primarily of the states of Washington, Oregon, Idaho, and Montana west of the Continental Divide, as shown in Figure 3. The BPA service area extends beyond this area into small parts of California, Nevada, Utah, Wyoming, and Montana east of the Continental Divide. In addition, BPA sells to the Pacific Southwest nonfirm and surplus firm energy not marketable in the Northwest. The region can be divided according to environmental similarity into 16 subareas including Western Montana as shown in Figure 4.

The region's climate is generally mild. West of the Cascades is mild and wet year-round, while the area east of the Cascades typically receives no more than 15 inches of precipitation and temperatures vary more seasonally. The entire region receives less precipitation during the summer than during the rest of the year. Numerous streams, many of which feed the Snake and Columbia Rivers, offer abundant opportunities for transportation, irrigation, commercial fishing, recreation, and the production of electricity.

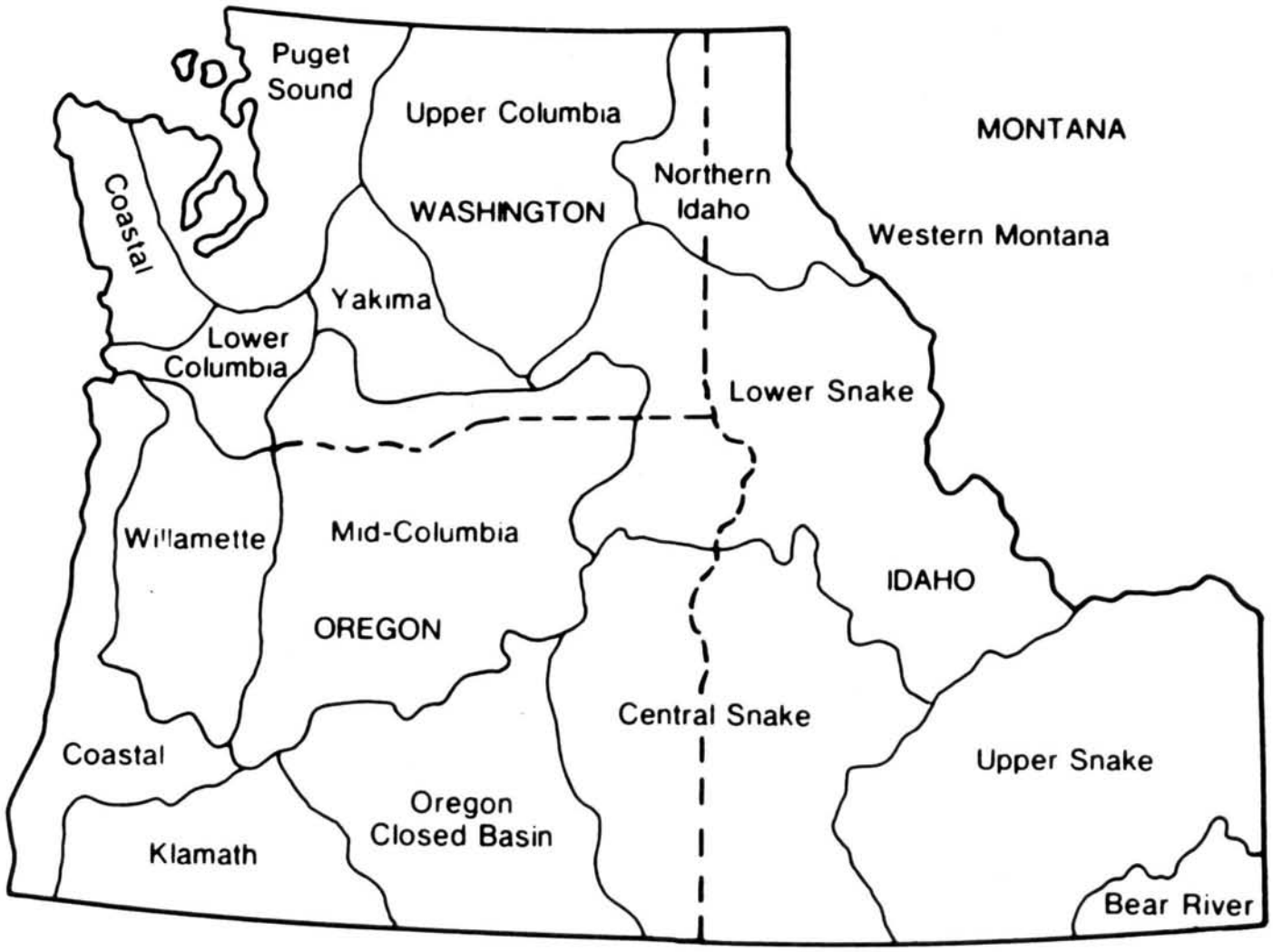
Half of the region is forested. West of the Cascade Range the climate is particularly well suited to trees; three-quarters of this area is covered by forest. Less than one-third of the area east of the Cascades is forested. Range and agricultural land covers the second largest portion of the region. Rangeland occupies large areas in the Snake River and Rocky Mountain subregions. Agricultural lands are located primarily on the Columbia River Plateau, along the Snake River, and in the Willamette Valley.

Figure 3

BONNEVILLE POWER ADMINISTRATION SERVICE AREA

Figure 4

PACIFIC NORTHWEST MAP SHOWING
MAJOR ENVIRONMENTAL SUB-AREAS



About two-thirds of the region's land is publicly owned; half of that is owned by the Federal government. The bulk of the Federal property is managed by the U.S. Forest Service and the Bureau of Land Management. State and local governments own about one-sixth of the region's land; about one-third is privately owned.

The region's total population is about 8 million. The major population centers are Seattle-Tacoma, Portland-Vancouver, Eugene-Springfield, Spokane, and Boise-Nampa-Caldwell. During the past two decades, the region's population growth rate has exceeded the national average. Of the four States, Oregon and Washington have grown most rapidly.

About 3-1/2 million people are employed in the region. During the past 20 years, the cyclical nature of the region's economy has caused the region's unemployment rate to be higher than that of the nation as a whole. Within the region itself, Idaho has had the lowest unemployment rate, while western Montana has had the highest.

About two-thirds of the region's labor force is employed in the areas of retail and wholesale trade, services, government, and transportation. Transportation activities are especially important to the region's economy and involve an interstate highway system, coastal and inland water traffic, railroad lines from the regional centers to the major ports, and air transportation between the major cities.

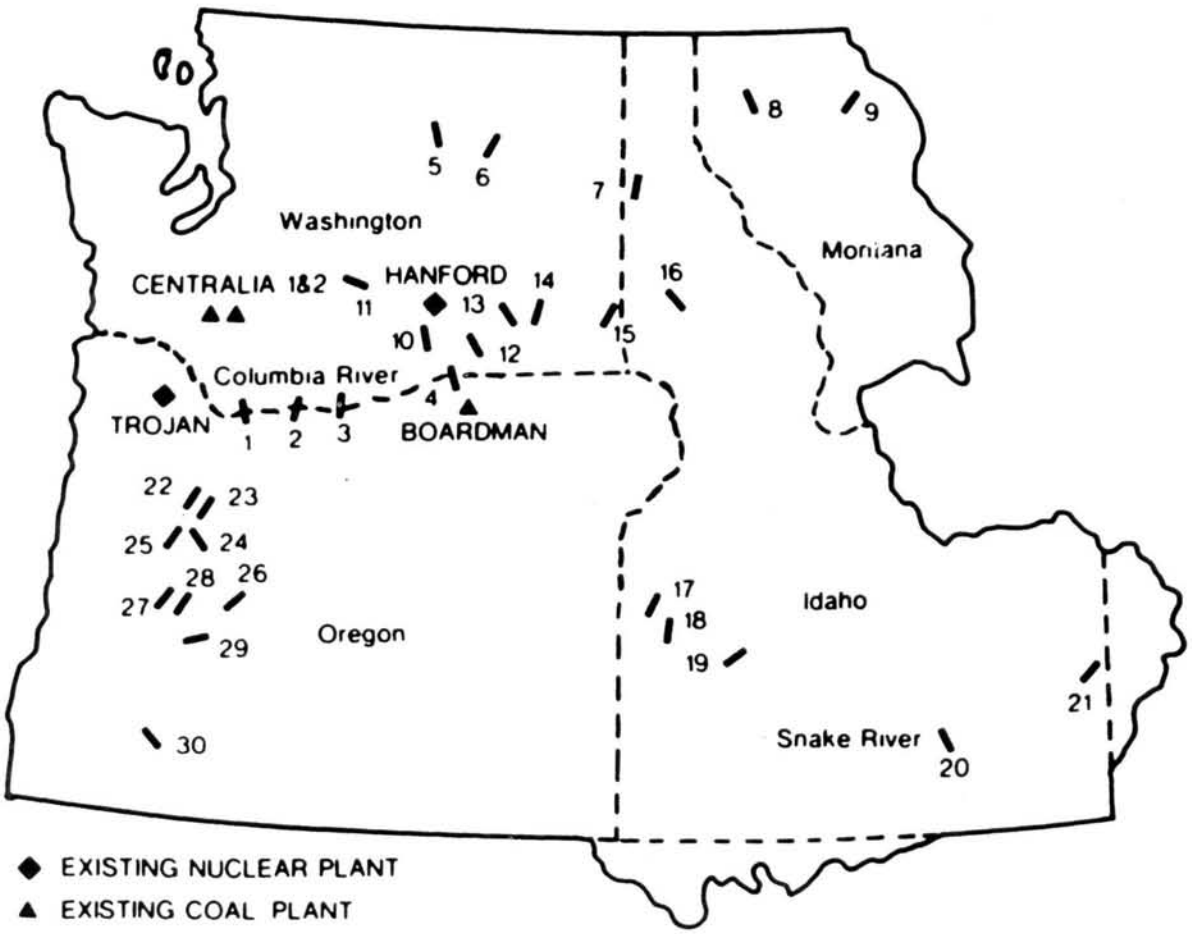
One-fourth of the regional labor force is employed in manufacturing and construction. The largest manufacturing employers are the lumber and wood products, transportation equipment, and electronics industries, although the relative importance of these and other manufacturing industries varies considerably among the States. Inexpensive electricity has been an important factor in the growth of certain industries in the region, particularly chemical and primary metal (including aluminum) production. The remaining labor force is employed in agriculture, forestry, commercial fishing, and mining. Agriculture employs the greater percentage of workers. (See section 3.2.3 for additional information on the major economic sectors in the region.)

Regional electricity consumption varies geographically and seasonally. The Puget Sound-Willamette Valley subregion, which accounts for two-thirds of the region's population, uses the greatest amount of electricity. Electric energy consumption of this subregion is highest during the winter when space heating needs are greatest. East of the Cascades, electric energy use is highest during the summer because of irrigation pumping and air conditioning loads. Historically, the region's large supply of inexpensive hydroelectricity and limited local supplies of gas and oil have resulted in a much greater reliance by homes and businesses on electricity for space heating than is true for the rest of the nation.

The region possesses one-third of the nation's hydroelectric potential. However, the most economically feasible sites have already been developed. There are 58 major hydroelectric dams in the region, of which 30 are Federally owned (see Figure 5). The Federal dams produce about half of the region's

Figure 5

PACIFIC NORTHWEST REGION AND LOCATION OF MAJOR THERMAL PLANTS AND FEDERAL DAMS



FEDERAL DAMS

1 BONNEVILLE	16 DWORSHAK
2 THE DALLES	17 BLACK CANYON
3 JOHN DAY	18 BOISE DIVERSION
4 MCNARY	19 ANDERSON RANCH
5 CHIEF JOSEPH	20 MINIDOKA
6 GRAND COULEE	21 PALISADES
7 ALBENI FALLS	22 BIG CLIFF
8 LIBBY	23 DETROIT
9 HUNGRY HORSE	24 GREEN PETER
10 CHANDLER	25 FOSTER
11 ROZA	26 COUGAR
12 ICE HARBOR	27 DEXTER
13 LOWER MONUMENTAL	28 LOOKOUT POINT
14 LITTLE GOOSE	29 HILLS CREEK
15 LOWER GRANITE	30 LOST CREEK

THERMAL PLANTS

BOARDMAN	HANFORD
CENTRALIA 1&2	TROJAN
WNP-2	

electricity. Regional needs are also met by 3 nuclear plants and 14 coal-fired generating units. Eleven of the latter are outside of the BPA service area. Table 4 lists the major hydroelectric and thermal generating plants in the Northwest that are in operation or are under construction.

While much (72 percent) of the electricity produced in the Pacific Northwest is from hydroelectric facilities, which use renewable resources, the nearly all the other electricity is produced by facilities that consume nonrenewable resources. These facilities include oil- and gas-fired combustion turbines and coal and nuclear thermal plants.

Coal reserves in the West are estimated by the U.S. Bureau of Mines (U.S. Department of Interior, 1974) at over 178 billion short tons. Much of the low sulfur coal reserve (approximately 82 percent) is contained in the Northern Great Plains region of Montana, Wyoming, and North Dakota. Approximately 30,000 tons of coal are consumed daily in the production of electricity for the Pacific Northwest. Each year about 75 tons of nuclear fuel are used in the Trojan plant and Washington Nuclear Project No. 2 in the Pacific Northwest to produce nuclear generated electricity. The Hanford Generating Project uses waste energy from a plutonium production reactor.

Natural gas and oil in substantial quantities are not indigenous to the region. Small quantities of these resources are used for combustion turbines and other peaking units. Because of the historically higher cost of these fuels, electric utilities in the Pacific Northwest have not used and do not anticipate using these nonrenewable resources for baseload generation.

BPA owns and manages approximately three-fourths of the region's high-voltage transmission system. The system includes interties with the Pacific Southwest, British Columbia, and Montana, which allow for exchanges and power sales to entities outside the region.

The region's electricity consumers are served by either publicly owned or investor-owned utilities (IOUs). Publicly owned utilities include public utility districts, municipalities, and cooperatives. Typically, rural areas are served by publicly owned utilities while, with a few exceptions (most notably the cities of Seattle, Tacoma, and Eugene), urban areas are served by IOUs. Publicly owned utilities dominate in Washington; there are comparatively few in Oregon, Idaho, and Montana.

The publicly owned utilities are BPA's largest customer class, both in number (117) and in quantity of energy purchased. Many of these customers depend on BPA for their entire power supply, while a few own their own generation and supplement with purchases from BPA. Consistent with the "Preference Clause" provision of the Bonneville Project Act of 1937, BPA gives the publicly owned utilities priority access to power from the Federal base system. The Pacific Northwest Power Act continues this preference policy and commits BPA to meeting the power requirements of the publicly owned utilities.

Table 4

MAJOR NORTHWEST HYDROELECTRIC AND THERMAL POWER PLANTS

Plant	Location 1/	Total Name Plate Capacity (MW) 2/
Hydro in Operation		
Wells	Columbia, WA	774.3
Bonneville	Columbia, OR-WA	1,050
Chief Joseph	Columbia, WA	2,069
John Day	Columbia, OR-WA	2,160
Libby	Kootenai, MT	525
McNary	Columbia, OR-WA	980
The Dalles	Columbia, OR-WA	1,780
Grand Coulee	Columbia, WA	6,180
Rock Island	Columbia, WA	623.3
Rocky Reach	Columbia, WA	1,213.15
Boundary	Pend Oreille, WA	633.65
Brownlee	Snake, ID-OR	675
Ice Harbor	Snake, WA	603
Priest Rapids	Columbia, WA	788.5
Wanapum	Columbia, WA	831.25
Lower Granite	Snake, WA	810
Little Goose	Snake, WA	810
Lower Monumental	Snake, WA	810
Dworshak	North Fork, Clearwater, ID	400
Albeni Falls	Pend Oreille, ID	42.6
Hungry Horse	South Fork, Flathead, MT	285
Hells Canyon	Snake, ID - OR	450
Additional Hydro Units Authorized for Construction		
John Day	Columbia, OR-WA	540
Libby	Kootenai, MT	315
Nuclear in Operation		
Hanford	Richland, WA	860
Trojan	Rainier, OR	1,216
WNP-2	Richland, WA	1,100
Nuclear in State of Preservation for Possible completion		
WNP-1	Richland, WA	1,250
WNP-3	Satsop, WA	1,240

1/ Locations for hydro projects are the river and state. Locations for nuclear, coal, and combustion turbine resource are the nearest municipality.

2/ Capacities of hydroelectric projects were taken from Project Data and Operating Limits, Columbia River and Tributaries Review Study, U.S. Corps of Engineers, North Pacific Division, May 1985.

Table 4 (continued)

Plant	Location 1/	Total Nameplate Capacity (MW)
Coal in Operation		
Colstrip Nos. 1, 2, 3, & 4	Colstrip, MT	2,060
Jim Bridger, Nos. 1, 2, 3, & 4	Rock Springs, WY	2,000
Centralia Nos. 1 & 2	Centralia, WA	1,400
Boardman	Boardman, OR	530
Dave Johnston	Glenrock, WY	750
Valmy Nos. 1 & 2	Valmy, NV	500
Combustion Turbine in Operation		
Beaver	Clatskanie, OR	409

The region's seven IOUs either individually or jointly own generation resources. Under the Pacific Northwest Power Act, BPA is obligated to serve the IOUs' loads if so requested. Additionally, a provision unique to the Pacific Northwest Power Act creates what is called the Residential Purchase and Sale Agreement. Under this agreement, BPA purchases power equal to each utility's residential and farm load from IOUs and other utilities participating in the exchange at the utility's average system cost. In turn, BPA sells the participating utility an equal amount of power at the same rate as BPA's firm sales to preference customers. The benefits from the exchange are passed through to each utility's residential and small farm consumers in the form of lowered rates.

Besides public utilities, IOUs, and the DSIs, BPA also serves a few Federal agencies. These form a very small block of BPA sales and are served under the PF rate.

3.2 AREAS OF PARTICULAR CONCERN

This section identifies and describes the aspects of the existing Pacific Northwest environment that are most likely to be affected by BPA's power marketing decisions.

3.2.1 Columbia River and Tributaries

The Columbia River and its tributaries are one of the region's greatest natural resources. Close relationships exist between alternative uses of this resource and power production.

The Columbia River and its tributaries constitute the hydrologic system that generates the majority of the power marketed by BPA. Proposals or alternatives relating to the DSIs may cause changes in the demand for power. To meet these changed power demands, operations of the dams on the Columbia River may be altered, potentially influencing streamflows and water quality. Changes in river operations could, in turn, affect fish and wildlife and recreational uses of the river system. In addition, any effects of power rates on the use of electricity for irrigated farming may have implications for water usage, air and water quality, land use, and electric power generation.

3.2.1.1 Water Quality

Generally, surface water quality in the Northwest is better than that in many parts of the country. Water quality problems exist in some parts of the Columbia Basin, however, particularly on a seasonal basis. Seasonal temperature increases are a water quality problem in the major Columbia River tributaries during periods of low flow. This affects natural fish reproduction, particularly that of salmonids.

One water quality problem directly attributable to the dams is nitrogen supersaturation. This condition occurs in the Columbia and Lower Snake Rivers when flows greatly exceed powerhouse capacity or levels needed for power generation, and large amounts of water must be spilled to regulate reservoir levels. Nitrogen supersaturation is a threat to migratory salmonids.

Nutrients, such as nitrates and phosphates from agricultural fertilizers, have been a major cause of excessive aquatic algal growth in the Snake and Yakima River Basins and other areas where chemical fertilizers are used in conjunction with irrigation. This condition can be remedied if water and fertilizer use are better managed and sufficient streamflows are maintained.

3.2.1.2 Fish

The Columbia River and its tributaries are internationally recognized for their runs of anadromous fish and the commercial and recreational fisheries they support. Anadromous fish require access to fresh water rivers to spawn. Construction of Grand Coulee Dam on the Columbia River in 1938 eliminated access to over 500 miles of the River above the dam. Dams also have blocked 50 percent of the Snake River to fish migration.

Impounding of 450 miles of the Columbia River downstream from Grand Coulee Dam has eliminated salmonid spawning in the Columbia River mainstream except in the reach from Lake Wallula to Priest Rapids Dam (the Hanford Reach). Passage through dam turbines and increased migration time caused by the size and slow movement of reservoirs have increased mortality of migrant juvenile fish. In addition, during high flow conditions when large volumes of water are spilled, nitrogen supersaturation creates a potentially lethal condition for fish.

Other activities such as channeling, dredging, logging, and mining have affected migratory fish by destroying natural habitat and changing water

quantity and quality. Pollution from industrial, domestic, mining, and agricultural sources has lowered water quality in some areas by introducing silt, pesticides, organic wastes, and toxins. This pollution increases fish mortality.

As a result of these effects, artificial propagation (hatcheries and spawning channels) and fish passage facilities and collection and transportation programs now are employed to maintain anadromous fish populations. However, some populations are no longer at harvestable levels. Provisions in the Pacific Northwest Power Act ensure that further programs are developed for the protection and enhancement of fish and wildlife along the Columbia River and its tributaries.

In addition to anadromous fish, several varieties of resident fish inhabit the Columbia River drainage. Among those of recreational importance are several species of trout (rainbow, cutthroat, lake, brook, and brown), walleye, large- and small-mouth bass, catfish, whitefish, and landlocked populations of sturgeon. Most of the easily accessible trout waters are stocked with fish annually because natural production cannot keep pace with demand. While some reservoirs are good resident game fish producers, others have promoted the growth of undesirable fish (squawfish, carp, and suckers) or are poor fish producers because of a variety of factors.

3.2.1.3 Wildlife

A number of factors affect wildlife species in the Pacific Northwest. Many animals, such as small birds, rodents, weasels, snakes, and frogs, have small territories or ranges that are restricted by the variety, type, and abundance of cover. Beavers, muskrats, and river otters, for example, require specific vegetation for food. On the other hand, deer, elk, larger birds, and large carnivores have larger territories and use a variety of vegetation for food and cover. Finally, migratory animals, such as waterfowl, are influenced by weather and the availability of water and move between communities on a daily and seasonal basis.

Changes or disturbances to vegetation communities affect wildlife populations. The development or abandonment of agricultural land, especially irrigated cropland, has a distinct influence on wildlife diversity and numbers. Irrigation development enhances the habitats of ring-necked pheasants, gray partridges, scrub jays, leopard frogs, montane voles, and yellow-bellied marmots. However, it adversely affects species that include sharp-tailed grouse, short-horned lizards, and various animals that depend on a shrub-steppe ecosystem.

Changes or disturbances to water areas, wetlands, and the high-yield grain crops adjacent to wetlands contribute to an increase or decrease in waterfowl habitat. The region's wetlands are productive for resident species as well as for transient and/or wintering waterfowl, although many of the coastal and inland wetlands in the Pacific Northwest have been altered or destroyed by development.

Changes or disturbances to vegetation along river banks or other bodies of water are associated with shoreland construction, water level fluctuations, and shoreland erosion. Loss of this riparian habitat can adversely affect beavers, muskrats, swallows, and kingfishers. Construction and operation of the Federal dams have modified much of the original vegetation along the Columbia River and tributaries. In accordance with the Endangered Species Act (16 U.S.C. 1531 et. seq.), BPA proposals and alternatives examined in this document must avoid jeopardizing the existence of any endangered or threatened species or adversely changing critical habitat.

3.2.1.4 Recreation

The Columbia River and tributaries provide recreational opportunities for persons within and outside the Pacific Northwest including fishing, swimming, boating, and rafting. Reservoirs created by the dams have enhanced swimming and boating opportunities. Fluctuations in reservoir levels and streamflows can affect each of these activities. The enhanced habitat for bird species resulting from irrigated grain farming has improved recreational opportunities for hunters and bird watchers.

3.2.2 AIR QUALITY

Air quality in the Pacific Northwest varies with the level and types of human activity present. The urban areas often violate ambient air quality standards because of the concentration of vehicular and industrial activity. Some rural areas, especially in the Columbia Basin, experience high particulate concentrations as a result of wind-blown dust from agricultural operations and unpaved roads. Field and slash burning also can cause excessive particulate concentrations and poor visibility in areas near forestry operations and some agricultural operations. There also are localized air quality problems caused by particular industrial operations. Direct combustion of wood for home heating is becoming an increasing source of air pollution.

Areas within the region designated in violation of one or more Federal ambient air quality standards are listed in Table 5. These areas are referred to as nonattainment areas and typically include relatively small areas that center around urban or industrial zones.

3.2.3 NON-DSI CONSUMER SECTORS

This section describes four major consumer sectors: retail (i.e., non-DSI) industrial; agricultural; commercial; and residential which are components of the Pacific Northwest's physical and socioeconomic environment that could be affected indirectly by BPA's actions with respect to the region's aluminum smelters.

The overall finding made in the following sections is that industrial, agricultural, and commercial sectors of the Northwest economy generally are not very sensitive to electricity prices, and are therefore unlikely to be adversely affected by changes in BPA's PF rates. These sectors of the

Table 5

AIR QUALITY NONATTAINMENT AREAS IN THE BPA SERVICE AREA 1/ 2/

Area	Pollutants for Which Designation is Effective 3/				
	Total Suspended Particulate	Carbon Monoxide	Sulfur Dioxide	Ozone	Nitrogen Dioxiode
Idaho					
Silver Valley (Shoshone Co.)	unclassifiable 4/		unclassi-fiable		
Lewiston	X				
Boise		XX			
Pocatello	XX				
Soda Springs	XX				
Montana					
Butte Area	XX				
Columbia Falls Area	XX				
City of Missoula	XX	XX			
Missoula Area	X				
Oregon					
Portland	X	XX		XX	
Eugene-Springfield	X	XX			
Salem		XX		XX	
Medford-Ashland	XX	XX		XX	
Washington					
Seattle	XX	XX		XX	
Spokane	XX	XX			
Longview	X				
Vancouver	XX			XX	
Yakima		XX			
Clarkston	X				
Renton	X				
Kent	X				
Tacoma	XX	XX	unclassi-fiable	XX	

1/ This table indicates the general location of nonattainment areas. Some areas are actually quite limited in size, and all have definitive, prescribed boundaries not identified on this table.

2/ Source: Code of Federal Regulations, Title 40, Protection of Environment, Part 81, U.S. Government Printing Office, Washington, D.C., revised July 1, 1985.

3/ Designation "X" indicates that the area or a portion of the area violates the Federal secondary air quality standards. Designation "XX" indicates that the area or a portion of the area violates the Federal primary air quality standards.

4/ Sufficient data or other circumstances prevent classifying a location as attainment or nonattainment. For example, Silver Valley and Tacoma are probably both "unclassifiable" for sulfur dioxide because smelters have recently closed in both areas and not enough time has passed to collect data to document attainment or nonattainment, and there may be uncertainty regarding reopening of the smelters.

Northwest economy respond principally to market demands, and little to electricity price. Exceptions may be certain paper products plants. Commercial firms which exist in communities largely dependent on customers or employers whose operating decisions are strongly influenced by electricity prices may also be affected. These effects would occur either because the customer would reduce purchases from the firm or affect local individuals' demands for goods and services, rather than because an electricity price change directly affected the firm's overall costs.

3.2.3.1 Retail Industrial

Industries served by the region's retail utilities consumed 3,582 average MW of electrical energy in 1984. Of this amount, industries served by public utilities purchased 1,721 average MW and industries served by IOUs purchased 1,861 average MW (BPA, 1985c).

The Pacific Northwest's non-DSI industrial consumers are a heterogeneous group of industries, varying in size of electric load, products, technology, and energy intensiveness. Retail electricity rates paid by industrial consumers of public utilities, who purchase all or a large portion of their power from BPA under the PF rate, are most directly affected by changes in BPA wholesale power rates. BPA wholesale power costs comprise most of the total electric bill for the majority of large industries purchasing power from BPA's public utility customers (BPA, 1985d).

The importance of electricity rates paid by industries varies depending on several factors: strength of product market, overall cost competitiveness, financial health of the individual firm, and degree of electrical energy intensiveness. With some exceptions, price of electricity is a much less significant factor than product demand and/or domestic and foreign competition in determining operating levels for most of the region's industries, including some large users of electricity (NEA, 1986). The exceptions are those industries which are inherently electricity intensive and those which, while not in industry categories regarded as electrically intensive, face sufficiently small operating margins such that all cost components, including electricity, become increasingly important in operating decisions.

The amount of electricity used by industry can be indirectly affected by two other factors. First, there can be an interdependence among industries sensitive to electric rate levels and other industries in a locality. Any change in production by a firm in response to rate changes can affect other local industries which are that firm's major suppliers or purchasers (Carlson, 1983). Second, changes in electricity consumption resulting from technology changes can be influenced by the price of electricity relative to other fuels. For instance, a potential exists in the food products industry and the pulp and paper industry for adaption to more electrically intensive processes from processes that currently use other fuels. Since conversion represents a long term investment, a firm needs to perceive the price of electricity relative to other fuels to be sufficiently favorable over the long term to justify this investment. One recent development which could slow any conversion to electric intensive processes (or accelerate conversion away from electricity use) is the simultaneous drop in natural gas and oil prices.

3.2.3.1.1. Food Products Industry - The food products industry in the Pacific Northwest is a mature, stable industry and the second largest employer in the region. Over one-half of the electricity purchased is used to preserve fruits and vegetables. Recent shifts in consumer preferences have resulted in a gradual shift in product mix from canned fruits and vegetables to fresh and frozen products. Nevertheless, this industry is expected to display fairly stable employment and output levels in the coming years.

Although one of the largest industrial consumers of electricity, the food products industry is not electrically intensive. Electricity accounts for less than 5 percent of production costs for most food products firms. Production levels in the food products industry, and, therefore, electricity consumption, are determined primarily by market activity (NEA, 1986).

3.2.3.1.2 Lumber and Wood Products Industry - The Pacific Northwest lumber and wood products industry has been experiencing a decline in the last 5 years. This industry has been adversely affected by high interest rates, domestic competition in the Southeast and foreign competition, and low timber prices. Despite the recent decline in output, the lumber and wood products industry still accounts for the largest share of the Pacific Northwest manufacturing employment. The lumber and wood products industry uses large amounts of electricity, primarily for motors in sawmills, planing mills, and plywood and structural members industry. However, electricity represents less than 5 percent of product value for this industry, and it is not likely that the industry as a whole would make significant production changes in response to electricity rate changes. The product market for lumber and wood products generally influences the industry's use of electricity rather than electricity price (NEA, 1986).

3.2.3.1.3 Paper Industry - The paper and allied products industry in the Pacific Northwest has been relatively stable despite the recent recession, due to a fairly stable demand for paper products. This industry has potential for expanding sales to Pacific Rim markets. However, foreign competition and the strength of the U.S. dollar could impede the Pacific Northwest pulp and paper industry's share of this market. Most of the domestic competition for the regions; paper and allied products industry is in the Southeast, with cheaper labor and pulpwood costs and easier access to eastern markets. This industry is fairly electrical energy intensive, particularly for paperboard, paper and pulp mills. For pulp mills employing a new thermomechanical pulping process, electricity costs can account for as much as 30 percent of total production costs. The paper and allied products industry does cogenerate a portion of its electricity needs, and self-generates from hydro and other sources. The overall outlook for the region's paper and allied products industry is for stable production levels. Future changes in electricity use, therefore, are more likely to result from process changes rather than changes in production levels. Production levels themselves are generally much more sensitive to the demand for paper products than to electricity prices (NEA, 1986). However, certain plants have been identified for whom electricity price could be important in determining operating levels (Carlson, 1983).

3.2.3.1.4 Chemical Industry - The Pacific Northwest chemical industry has also displayed relative stability due to a stable market. For instance, a primary market for the chlorine-caustic soda sector (which includes two DSIs) is the pulp and paper industry. Employment in the region's chemical industry comprises about 3 percent of total manufacturing employment; this share is projected to increase somewhat through the 1980s. The chemical industry as a whole is fairly electrically energy intensive. The share of total production costs in the chlorine-caustic soda industry, which like the aluminum industry uses an electrolytic process, is particularly significant, with estimates ranging as high as 25 percent. For the most part, however, demand for electricity is driven by changes in product demand for the chemical industry. The chemicals industry serves primarily a regional market, and its output (and demand for electricity) is largely dependent on the pulp and paper industry and the agricultural sector (NEA, 1986).

3.2.3.1.5 Primary Metals Industry - The primary metals industry in the region is dominated by the DSIs, primarily aluminum producers. However, there are other primary metal businesses which are served by retail utilities. These include blast furnaces, steel works and rolling mills, electrometullurgical products, steel pipes, and a new silicon metal alloys producer, among others. These non-DSI metals producers account for a relatively small share of total employment in the primary metals sector. However, they are electricity intensive industries (NEA, 1986).

3.2.3.1.6 Other Industries - The food products, lumber and wood products, pulp and paper, chemicals, and primary metals industries are the major Pacific Northwest industry groups in terms of electricity use. Other firms exist that employ large numbers of people but are not electricity intensive, such as those in the aerospace industry. Certain other firms, despite their relative smallness, may be sufficiently electricity intensive or face profit margins such that they are sensitive to electric rates (Carlson, 1983). In general, though, for most firms the health of product market and other factors are more significant than the price of electricity.

3.2.3.2 Agriculture

Seventy percent of the value of agricultural crops sold in the region are from commodities grown on farms with some irrigated acreage. Sustained high interest rates, a strong U.S. dollar, and declining commodity prices have adversely affected the region's irrigated agriculture industry.

Electricity for irrigation accounts for a small part of agricultural production costs, though the actual share varies with the production location and crop type. Total electricity costs for irrigation pumping are greater in areas of high-ground water or surface-water lift relative to low-lift areas. The electricity cost share varies from less than 1 percent for apples grown in low-lift areas to over 10 percent for alfalfa grown in high-lift areas.

Irrigation systems are fairly fixed, but farmers can reduce water and energy use through improving water management and irrigation scheduling, and conversion to low-pressure systems. Most of the high-lift areas have already

made major water and energy reductions during 1980-1984. No further significant response to increased electricity rates is expected from this industry. There is some potential for shifting consumption from peak load hours to the off-peak hours during April, May, September, and October. However, the total demand for electricity by irrigated agriculture will be more influenced by shifts in the product demand market and changes in the cost of capital than by modest changes in electricity rates (NEA, 1986).

3.2.3.3 Commercial Consumers

For most commercial firms, electricity costs are a minor consideration. The major costs these firms face are inventory, salaries, advertising, and other non-energy related costs. Commercial consumers are, however, significantly affected by the overall health of basic industries in their communities. Therefore, if major industries cut back on production or shut down completely for reasons relating to electricity prices, electricity supply, or any other reasons, the local markets faced by commercial consumers are adversely impacted. These indirect impacts would be felt first by businesses providing nonessential services, such as theaters and restaurants.

3.2.3.4 Residential Consumers

Residential consumers are unable to pass along power rate increases to other consumers (as do commercial and industrial consumers). The impact of increases in BPA's rates on individual consumers depends on: (1) the proportion of the utility's power purchased from BPA; (2) the utility's retail rate structure; and (3) the characteristics of the individual residential consumer. In addition to price, the individual residence's consumption for electricity is also a function of family income; heating degree days; cooling degree days; age, condition, and type of the residence; number and ages of occupants; and price of substitute fuels.

The impacts of higher electricity prices are most severe for low-income residential consumers including senior citizens on low fixed incomes. Low-income consumers spend disproportionately large portions of their incomes on all energy purchases. The cost of all energy has been estimated as high as 36 percent of the total low-income budget, as compared to 3 to 4 percent for the nonpoor (Public Utilities Fortnightly, 1986). It is also likely that low-income people live in houses and apartments with baseboard electric heat, the least costly to install. These residences may also be less well insulated for further construction cost-cutting. Reduction in the use of necessities (cooking, water heating, etc.) is more difficult than the reduction of luxuries (dishwashers, air conditioners, etc.).

3.3 ALUMINUM PLANT ENVIRONS

The environments in which the region's 10 aluminum plants exert their principal influences, both physically and socioeconomically, are described in Appendix A. Impacts of the aluminum plants are predominantly localized. This section is intended to point out particular characteristics of the individual aluminum smelter sites pertinent to environmental concerns. These characteristics are notably different than for the region in general, as described in section 3.1, or are unique to a plant or group of plants.

Locations of the 10 Pacific Northwest aluminum plants are shown in Figure 6. Except for the 3 plants in the Portland/Vancouver/Longview area and the 2 at The Dalles, Oregon and near Goldendale, Washington, the plants are remote from each other. The plants at Troutdale, Oregon, and Vancouver, Tacoma, and Mead in Washington are in or close to major urban areas. The others are in or near smaller cities or towns. The most remotely sited plant is the Commonwealth plant, which is about 17 miles south of the town of Goldendale, Washington.

All the plant sites are zoned for industrial use, but only in the cases of the Longview, Tacoma, Ferndale, and Vancouver plants is use of nearby areas devoted primarily to other major industrial facilities of similar scale. Substantial residential land use in close proximity to an aluminum smelter is evident at Mead and at Longview, where a residential neighborhood borders the plant site on the north.

Two plants are located within nonattainment areas for particulate air pollution, Kaiser in Tacoma, Washington and Reynolds Metals in Troutdale, Oregon (see Table 5). Washington's Department of Ecology (WDOE) State Implementation Plan (SIP) for the Tacoma area is tentatively considering better control of industry related road dust as a means for resolution of the particular problem. Troutdale is at the edge of the Portland - Vancouver nonattainment area for particulates. While industry contributes to the pollutant load, Oregon's Department of Environmental Quality (ODEQ) SIP has identified residential burning and road dust as the prime targets for managing particulate levels in this nonattainment area.

Six of the plants (those at Longview, Vancouver, Troutdale, The Dalles, and near Goldendale and Wenatchee) are adjacent to the Columbia River. These six plants discharge waste water into the Columbia. In general these waters are considered to be Class A waters (excellent) suitable for domestic water uses, salmonid life requisites, and swimming. Class A water quality standards and actual conditions are shown in Table 6. The other three waters receiving aluminum smelter discharges are Peone (Deadman) Creek in Washington - Class A, the Strait of Georgia - Class AA (extraordinary), and Hylebos Waterway in Washington - Class B (good).

The Columbia Falls Aluminum Company plant near Columbia Falls, Montana, is approximately 8 miles southwest of Glacier National Park. It is also near the Flathead River, a Wild and Scenic River, but does not discharge waste water into the river. The Vancouver plant is near Vancouver Lake, which has recently been reclaimed to enhance recreation. Other than the 6 plants located on the Columbia River, the remaining plants, those at Tacoma, Ferndale, and Mead, are not located near recreational sites.

The National Register of Historic Places lists 102 entries in cities located near aluminum smelter sites (see Table 7). All the aluminum smelters predate the National Historic Preservation Act of 1966. Approximately 100 sites are near the Vancouver plant found on or near the Columbia River or the Lake River-Vancouver Lake flood plain area in Clark County, Washington (BPA, 1977c, p. IV-190).

Figure 6

ALUMINUM PLANT LOCATIONS

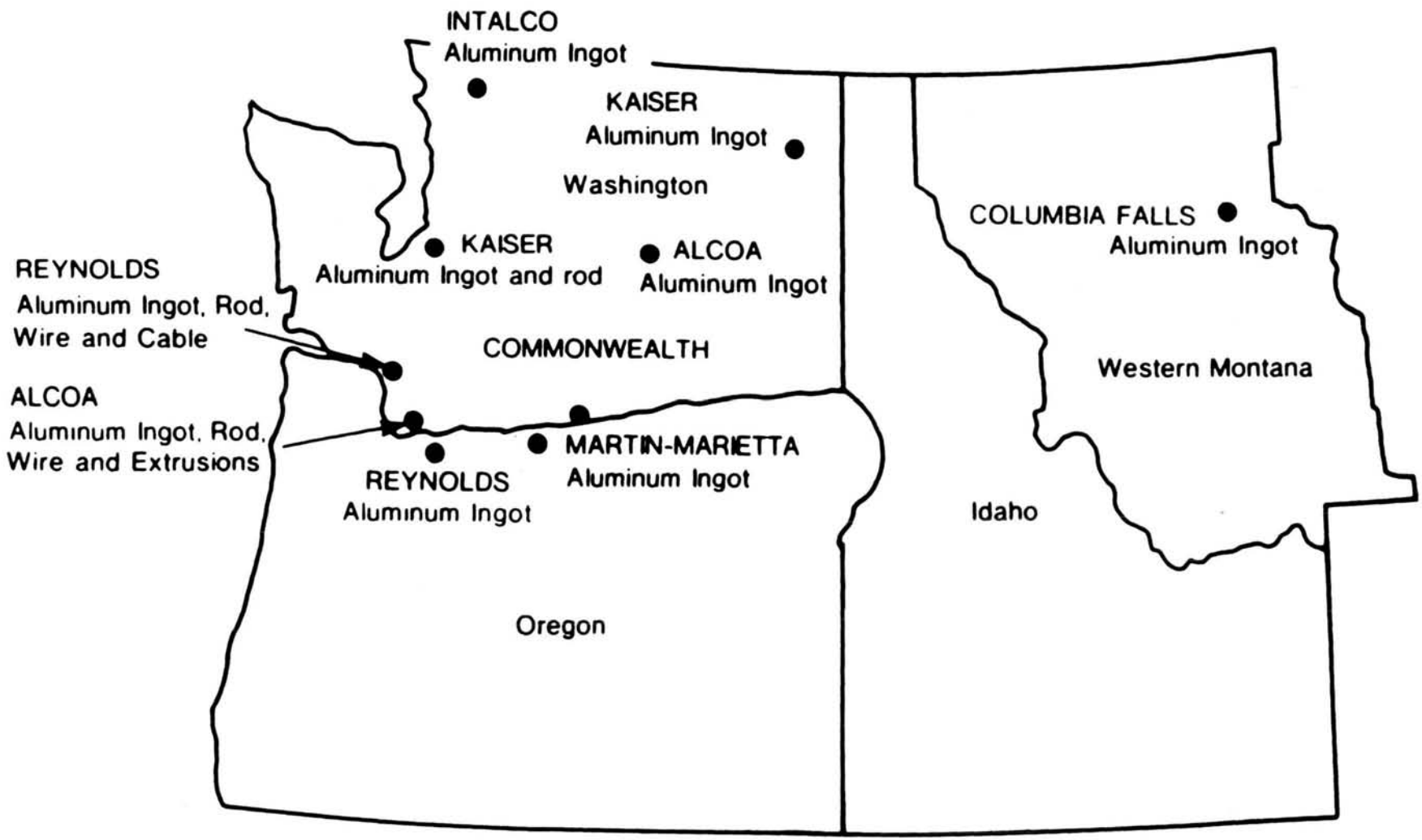


Table 6

COLUMBIA RIVER WATER QUALITY STANDARDS AND ACTUAL PARAMETER CONCENTRATION

Parameter	Standard	Actual Concentrations 1/		
		Site 1 2/	Site 2 3/	Site 3 4/
Turbidity	50 NTU or less	.6 - 12	no data	no data
Fecal coliform	100 organisms/100 mL	21	no data	no data
Dissolved oxygen	8 mg/L or greater	8.6-12.6	no data	no data
Temperature	shall not exceed 18°C due to man	4-20°C	no data	no data
pH	6.5 - 8.5	8.0-8.3	no data	no data
Arsenic (dissolved)	.01 mg/L	.001-.002	.001	.001
Barium (dissolved)	1.0 mg/L	.026-.031	.036	no data
Boron (dissolved)	.5 mg/L	no data	.02	no data
Cadmium (dissolved)	.003 mg/L	.001	.001	no data
Chloride (dissolved)	30 mg/L	5	1.3	1.2
Chromium (dissolved)	.02 mg/L	.001	.001	.01
Copper (dissolved)	.005 mg/L	.004-.006	.003	.002
Cyanide (dissolved)	.005 mg/L	no data	no data	no data
Fluoride (dissolved)	1.0 mg/L	.2	.1	.1
Iron (dissolved)	0.1 mg/L	.012-.078	.011	.013
Lead (dissolved)	.05 mg/L	.01-.001	.002	no data
Manganese (dissolved)	.05 mg/L	.001-.008	.003	.0044
Phenols	.001 mg/L	no data	no data	no data
Total Dissolved Solids	200.0 mg/L	81-120	no data	no data
Zinc	.01 mg/L	.015-.040	.014	no data

1/ Data from the U.S. Geological Service
2/ Columbia River at Warrendale. Data represent samples from 4 dates during 1982 and 1983.
3/ Columbia River at Vernita. Data represent median value of samples collected from 1973-1985.
4/ Columbia River at Richland. Data represent median value of samples collected from 1973-1985.

Table 7

NUMBER OF SITES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES

Company	Plant Site	Number of Sites Listed
Alcoa	Vancouver, WA	13
	Wenatchee, WA	8
	Addy, WA	0
Columbia Falls Aluminum Co.	Columbia Falls, MT	1
Commonwealth	Goldendale, WA	3
Intalco	Ferndale, WA	1
Kaiser	Mead, WA	0
	Tacoma, WA	42
	Trentwood, WA	0
Martin Marietta	The Dalles, OR	12
Reynolds	Longview, WA	20
	Troutdale, OR	2
Carborundum	Vancouver, WA	13
Georgia Pacific	Bellingham, WA	22
Hanna	Riddle, OR	0
Oremet	Albany, OR	18
Pacific Carbide	Portland, OR	156
Pennwalt	Portland, OR	156
Port Townsend	Port Townsend, WA	42
Gilmore Steel	Portland, OR	156
	Total Sites	340

This information was collected from the following FEDERAL REGISTER notices of National Register of Historic Places: 44 FR 7416, February 6, 1979; 45 FR 17446, March 18, 1980; 46 FR 10622, February 3, 1981; 47 FR 4932, February 2, 1982; 48 FR 8626, March 1, 1983; 49 FR 4608, February 7, 1984; 50 FR 3983, January 29, 1985; 50 FR 5824, February 12, 1985; 50 FR 8850, March 5, 1985; 50 FR 15987, April 23, 1985; 50 FR 18323, April 30, 1985; 50 FR 20944, May 21, 1985; 50 FR 31780, August 6, 1985; 50 FR 46704, November 12, 1985.

3.4 THE REGULATORY ENVIRONMENT FOR THE NORTHWEST ALUMINUM SMELTERS

Environmental regulations control, for the most part, aluminum smelter air emissions, water discharges, and hazardous waste. In the early 1970s the Clean Air and Water Acts were passed by Congress. These established the framework for national air and water pollution control programs. The U.S. Environmental Protection Agency (EPA) promulgated pollution control standards and regulations as the Acts directed. Implementation of these programs has for the most part been delegated to the states, with EPA retaining oversite authority.

The states in assuming their delegated responsibilities have promulgated their own regulations which are equal to or more stringent than those issued by the EPA. Regulations outlined below are applicable to the aluminum industry. The regulatory agencies (ODEQ, WDOE, and the Montana Department of Health and Environmental Sciences (MDHES)) and EPA have succeeded in implementing these controls.

In the future, it is not likely these regulatory agencies will relax standards pertinent to aluminum smelters. In fact, both ODEQ and WDOE are currently in the process of revising aluminum smelter water discharge permits to assure better toxic pollutant control. Also, EPA is planning to issue regulations to control fine particulates (less than 10 microns) in ambient air.

3.4.1 Regulatory Overview - Water

The Clean Water Act (as amended, 33 USC 1251) set national policies to eliminate discharge of water pollutants into navigable waters. It also established a National Pollutant Discharge Elimination System (NPDES) permit program to control pollutants discharged from industrial sources.

Permit conditions are determined from (1) effluent limitation guidelines and (2) water quality standards. The effluent guidelines for aluminum smelters were issued in 40 CFR Part 421. Effluent limitation guidelines prescribe a specific discharge rate for each pollutant common to an industrial process on a production rate basis (e.g., pounds of pollutant per ton of aluminum produced). Regulated aluminum plant water pollutants include benzo(a)pyrene (B-a-P), antimony (Sb), nickel (Ni), aluminum (Al), fluoride (F), cyanide, and total suspended solids (TSS). Permitted and actual discharge rates for each Northwest smelter are given in chapter 4 of Appendix A.

In addition, water quality standards prescribe guidelines and pollutant (parameter) concentrations for safe water usage. Standards vary depending on a water's potential uses, such as domestic water supply, salmonid life requisites, stock watering, or swimming. As can be expected, standards for waters used domestically are most stringent. As an example, WDOE classifies its waters with the following designations: Class AA - extraordinary, Class A - excellent, Class B - good, and Class C - fair. Only Classes AA and A waters are considered acceptable for domestic water uses. Class AA standards are

slightly more stringent than Class A waters but generally have similar use designations. Class B waters are not suited for domestic uses or swimming. Actual standard criteria within a Class are based on the EPA publication "Quality Criteria for Water" and other information.

Plant discharges are not allowed to violate water quality standards beyond the mixing zones. (Mixing zones from aluminum plants generally range from 150 to 300 feet beyond the point of discharge.) Outside the mixing zone the receiving water sufficiently dilutes the discharge to render the concentration of each pollutant acceptable for the water's designated uses.

3.4.2 Regulatory Overview - Air

The Clean Air Act (CAA) (as amended, 42 USC 1857) required EPA to set national primary and secondary ambient air quality standards (NAAQS) and develop national emission standards for hazardous pollutants and new source performance standards. The Act also required states to develop State Implementation Plans to attain and maintain Federal air quality standards and establish preconstruction review of major new sources.

The aim of the NAAQS is to protect human health and welfare and, to the extent practical, prevent injury to plant and animal life. The SIPs focus on areas where pollutant levels exceed NAAQS and applicable state standards (Table 8). Parts of the Northwest that exceed NAAQS are indicated in Table 5.

In support of SIPs, but not necessarily directed toward nonattainment problems are plant-specific emission standards. The standards for aluminum smelters are summarized in Table 9.

In nonattainment areas, best available control technology (BACT) for pollutants that exceed ambient standards is required for new sources. If the new source is a major source or an existing source becomes a major source as a result of a proposed modification, lowest achievable emission rates (LAER) are required with an offset for those pollutants for which nonattainment has been designated. (In Washington and Montana a major source is defined as one producing 100 tons per year of any regulated pollutant. In Oregon a major source is any source that generates emissions in excess of significant levels shown in Table 10.) The primary difference between BACT and LAER is that BACT explicitly takes economic factors into account while LAER does not. The offset must effect a net beneficial air quality impact.

In addition, new source performance standards (NSPS) (40 CRF Part 60) and prevention of significant deterioration (PSD) regulations must be met by new aluminum smelters, smelter expansions, and certain types of modifications of smelters, as defined in the primary aluminum smelter NSPS and the PSD regulations. NSPS tend to focus on problem pollutants common to an industry type. For primary aluminum smelters, particulate and fluoride emissions are regulated. National emission standards for hazardous air pollutants (NESHAP) also apply to aluminum plants if they emit mercury, asbestos, beryllium, or vinyl chloride; aluminum smelters rarely if ever do so. In Oregon, PSD

applies when new emissions exceed the PSD level of significance as shown in Table 10. PSD permit procedures are designed to assure increases will not violate ambient air standards (Table 8). Also, for particulates and SO_2, increases in ambient concentrations cannot exceed levels shown in Table 11.

Fluoride (F) emissions from aluminum smelters have caused considerable environmental concern. The potential acute and chronic effects of F on vegetation and livestock that eat vegetation with high fluoride content is well documented. This problem was aggressively researched in the early 1970s by scientists and regulatory agencies. As a result, consensus guidelines for safe ambient and forage levels were established and used to regulate aluminum plant emissions (see Table 9). (Appendix A, Part 4.2.4 summarizes toxic effects from F.) To assure that F concentrations are at an acceptable ambient level, states require emission control and F monitoring. Typically, ambient monitoring takes place at locations determined to receive highest exposure. Emission measurements are also made for F periodically to assure continued compliance to F emission standards.

Particulate and SO_2 emissions are also controlled by emission standards (see Table 9). Although ambient monitoring is not always required of aluminum smelters for particulate and SO_2, emission measurements are periodically made to assure that emission standards are met.

3.4.3 Regulatory Overview - Hazardous Waste

The Resource Conservation and Recovery Act (42 USC 6921) provides for EPA identification and listing of hazardous wastes for regulation and applicable standards. EPA permits also are required for the treatment, storage, or disposal of hazardous waste.

The regulations promulgated do not apply to most wastes generated by the aluminum smelters, but states manage some aluminum smelter wastes as hazardous materials anyway. Of principal concern is waste potliner. This is a carbon liner used to protect and insulate the pot. In the hot reductive process cyanides form and accumulate in the potliner. Potliners from each of the plants are periodically replaced and stored onsite or shipped to a hazardous waste disposal site. Storage sites are now designed to protect against cyanide groundwater contamination.

WDOE, using its own toxicity test criteria, also manages wastes shown in Table 12. Most containerized waste is disposed of at Arlington, Oregon, in a hazardous waste disposal site. Oregon and Montana do not manage these wastes as hazardous material.

Table 8

AMBIENT AIR QUALITY STANDARDS 1/

POLLUTANT	NATIONAL PRIMARY	NATIONAL SECONDARY	WASHINGTON	OREGON	MONTANA
TOTAL SUSPENDED PARTICULATES					
Annual Geometric Mean	75 ug/m^3 2/	60 ug/m^3	60 ug/m^3	60 ug/m^3	75 ug/m^3
24-Hour Average	260 ug/m^3	150 ug/m^3	150 ug/m^3	150 ug/m^3	200 ug/m^3
Monthly	_____	_____	_____	100 ug/m^3	_____
SULFUR DIOXIDE (SO_2)					
Annual Average	80 ug/m^3	_____	60 ug/m^3	60 ug/m^3	50 ug/m^3
24-Hour Average	365 ug/m^3	_____	260 ug/m^3	260 ug/m^3	260 ug/m^3
3-Hour Average	_____	1300 ug/m^3	_____	1300 ug/m^3	_____
1-Hour Average	_____	_____	1050 ug/m^3	_____	1300 ug/m^3
CARBON MONOXIDE					
8-Hour Average	10 mg/m^3 2/	10 mg/m^3	10 mg/m^3	10 mg/m^3	10 mg/m^3
1-Hour Average	40 mg/m^3	40 mg/m^3	40 mg/m^3	40 mg/m^3	27 mg/m^3
OZONE					
1-Hour Average	235 ug/m^3	235 ug/m^3	235 ug/m^3	235 ug/m^3	235 ug/m^3
NITROGEN DIOXIDE (NO_2)					
Annual Average	100 ug/m^3	100 ug/m^3	100 ug/m^3	100 ug/m^3	100 ug/m^3
1-Hour Average	_____	_____	_____	_____	500 ug/m^3
LEAD					
Quarterly Average	1.5 ug/m^3	_____	_____	1.5 ug/m^3	1.5 ug/m^3
HYDROCARBONS					
3 hours (6-9 a.m.) (nonmethane)	_____	_____	_____	160 ug/m^3	_____
HYDROGEN SULFIDE (H_2S)					
1-Hour Average	_____	_____	_____	_____	0.05 ppm 4/

1/ Washington and Montana also have regulations pertaining to ambient levels of fluorides. These are shown on Table 9 since they are particularly pertinent to aluminum smelters, although the regulations are applicable to fluoride air pollution from any source.

2/ mg/m^3 = milligrams per cubic meter

3/ ug/m^3 = micrograms per cubic meter

4/ ppm = parts per million

Table 9

ALUMINUM PLANT EMISSION AND AMBIENT AIR STANDARDS

POLLUTANT	STANDARDS Oregon	Washington	Montana
	Emission	Emission	Emission
Total Fluoride (F)	3.5 lb/ton/mon 2.5 lb/ton/yr 22 tons/mon		2.0 lb/ton/mon
Total Particulate - Soderberg anode	13 lb/ton/mon 10 lb/ton/yr	15 lb/ton/day	
- prebake	15.6 lb/ton/mon 13.5 lb/ton/yr	15 lb/ton/day	
Sulfur Dioxide (SO_2)	6/	60 lb/ton/mon	
	Ambient	Ambient	Ambient
Hydrogen Fluoride	7/	3.5 ug/m3/12 hrs 8/ 2.7 ug/m3/24 hrs 9/ 1.6 ug/m3/30 days 10/	
	Forage	Forage	Forage
Fluoride		40 ppm/12 mon 11/ 60 ppm/2 mon 12/ 80 ppm/2 mon/yr 13/ 40 ppm cured in forage	50 ug/g 14/ 35 ug/g
Opacity	not to exceed 20% at any time	20% except for 6 min. in any 60-minute period	not to exceed 10% any time
F Control	Best practical treatment and control technology	80-95% control efficiency (depending on system) 95% treatment	
Particulate Control	Best practical treatment and control technology	Reasonably available control technology	

1/ Pounds of pollutant allowable per ton of aluminum produced on a monthly average basis.
2/ Pounds of pollutant allowable per ton of aluminum produced on a yearly average basis.
3/ Maximum monthly emissions of pollutant allowable from any one plant.
4/ Washington State Standards do not prescribe an emission limit for fluorides. Instead, the State relies on its ambient and forage fluoride standards and individual smelter permit conditions for regulatory control.
5/ Pounds of pollutant allowable per ton of aluminum produced on a daily basis.
6/ ODEQ regulations do not prescribe SO_2 emission control rates. However, under plant site emissions limit criteria (Ore. 340-20-310), ODEQ has determined that SO_2 emissions be controlled and monitored on permit specific basis. Reynolds Metals Company shall not exceed 70 lbs/ton Aluminum and Martin Marietta Aluminum, Inc., shall not exceed 22.8 lbs/ton Aluminum.
7/ ODEQ regulations do not prescribe F ambient or forage standards, but do require monitoring. Further, permits have adopted WDOE's ambient and forage F standards as performance requirements.
8/ Micrograms per cubic meter average for any 12 consecutive hours.
9/ Micrograms per cubic meter average for any 24 consecutive hours.
10/ Micrograms per cubic meter average for any 30 consecutive days.
11/ Parts per million fluoride ion average for any 12 consecutive months.
12/ Parts per million fluoride ion average each month for more than 2 consecutive months.
13/ Parts per million fluoride ion more than once in any 2 consecutive months.
14/ Micrograms per gram monthly average.
15/ Micrograms per gram average for the grazing season.

Table 10

OREGON
SIGNIFICANT EMISSION RATES

Pollutant	Emission Rate (ton/yr)
Carbon monoxide	100
Nitrogen oxides	40
Sulfur dioxide	40
Particulate matter	25
Volatile Organic Compounds	40
Lead	0.6
Asbestos	0.007
Beryllium	0.0004
Mercury	0.1
Vinyl chloride	1
Fluorides	3
Sulfuric acid mist	7
Hydrogen sulfide (H_2S)	10
Total reduced sulfur (including H_2S)	10
Any other pollutant regulated under the Clean Air Act	Any emission rate.
Each regulated pollutant	Emission rate that causes an air quality impact of 1 ug/m^3 or greater (24-hr basis) in any Class 1 area located within 10 km of the source.

Table 11

MAXIMUM PSD INCREMENTS

	Micrograms per Cubic Meter
Class I Areas	
Particulate Matter	
Annual geometric mean	5
24-hour maximum	10
Sulfur Dioxide	
Annual arithmetic mean	2
24-hour maximum	5
3-hour maximum	25
Class II Areas	
Particulate Matter	
Annual geometric mean	19
24-hour maximum	37
Sulfur Dioxide	
Annual arithmetic mean	20
24-hour maximum	91
3-hour maximum	512

Table 12

DANGEROUS ALUMINUM SMELTER WASTES SUBJECT TO WDOE REGULATION

Facility	Wastes	Amount/Year	Handling Method
Kaiser, Tacoma	Spent Potlining	5,000 Tons	Waste Pile
	Leachate from Spent Potlining	720,000 Gallons	Tank
	Duct Dust	70 Tons	Waste Pile
Kaiser, Mead	Spent Potlining	4,300 Tons	Waste Pile
	Electromelt Dust	70 Tons	Waste Pile, Container
	Copper Dust	70 Tons	Container
	Coal Tar Oil	1,000 lbs.	Container
	Solvents/Thinners	14,000 lbs.	Tank/Container
Reynolds Metals, Longview	Black Mud	25,800 Tons	Surface Impoundment
Commonwealth, Goldendale	Scrubber Sludge	525,000 Gallons	Surface Impoundment
Alcoa, Wenatchee	Rod Blast Dust	72,000 lbs.	Container
	Electromelt Dust	36,000 lbs.	Container
	Spent Potlining	None	Storing Vancouver plant's spent pot-lining by Waste Pile
Alcoa, Vancouver	Spent Potlining	3,000 Tons	Container
	Electromelt Dust	56,400 lbs.	Container
	Stub Cleaning Catch	132,000 lbs.	Container
Intalco, Ferndale	Wastes currently being tested.		