TRANSPORTATION IN THE PUGET SOUND REGION:

PAST, PRESENT & FUTURE.

Edited By
James W. Scott

Occasional Paper #6

Center for Pacific Northwest Studies
Western Washington State College

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PREFACE

There are few themes in the social sciences that have such wide and ready applicability as transportation, for without transportation the development of virtually every aspect of human endeavor is virtually inconceivable. A region's transportation, considered in terms of its past and present, with predictions regarding future modes and patterns, is a topic almost as far reaching in its implications as the region's history itself, as Hilaire Belloc argued so cogently a half century ago.

Not surprisingly, therefore, in discussing the possibility and, later, the desirability of sponsoring a series of annual (initially biennial) conferences, members of the Center for Pacific Northwest Studies decided unanimously on the theme of transportation for their first conference. The present publication is an outgrowth of that first conference (of the same name), held on the campus of Western Washington State College in April 1974. However, to explain fully the delay between conference and publication of certain parts of the latter would entail more space than is presently available; suffice it to say that some of the papers promised were slow to "surface" and, indeed, some that were delivered have never been received. What is presented then is a selection of the talks given, and of the papers read at the conference, rather than its formal proceedings.

The papers and talks published herewith are a fair sampling of those presented at the conference. In turn they deal with a variety of aspects of the region's transportation--historical, geographical, economic--with even a glance or two towards the future. Roads, railroads and air transportation are the principal systems analyzed. Others, including hydrofoil and pipeline systems, were discussed in forum and panel sessions by experts representing a number of transport companies and associations, including Burlington Northern Railroad and Boeing.

The conference was originally planned with Senator Warren G. Magnuson as its keynote speaker. In the event, urgent business in Washington, D.C. prevented his attendance, and Mr. Lynn Sutcliffe, Chief Counsel on Transportation of the U.S. Senate Commerce Committee deputized for its chairman, Senator Magnuson. Among the other main speakers we were honored to have were Professor W. Turrentine Jackson, distinguished historian of transportation from the University of California, Davis; Commissioner A. Daniel O'Neal, of the Interstate Commerce Commission; Dr. Gordon M. Shrum, former head of B.C. Hydro, British Columbia, and the late Professor Edward L. Ullman, Professor of Geography at the University of Washington, Director of Amtrak, and for more than two decades one of the country's leading experts on regional transportation and "spatial interaction" (Ullman's own term, now widely accepted in the discipline of geography). The talks of Professor Jackson and Commissioner O'Neal are printed below.

Since that first conference on transportation, the Center for Pacific Northwest Studies has sponsored a number of other conferences, and its proposed biennial conference has become an annual affair. In 1975 a five-day conference was held on MAN, GOVERNMENT AND THE SEA: NORTHERN PUGET SOUND AND THE STRAIT OF GEORGIA. The 1976 conference had as its theme, FISHERIES IN PUGET SOUND: PUBLIC GOOD AND PRIVATE INTEREST, and a conference scheduled for April 1977 will consider OIL IN WASHINGTON WATERS: BOON OR BANE? The proceedings of the 1975 conference have appeared as Occasional Paper #5, and those of the 1976 conference will appear shortly as Occasional Paper #8. In due time the proceedings of the 1977 conference will be issued.

From the start the Center has had the close cooperation of the Bureau for Faculty Research and the much valued help of its Director, Mrs. Jane Clark, and her staff. For the second, third, and fourth conferences the financial support of the Washington Commission for the Humanities has been a major factor in the success of the conferences. Also acknowledged is the expert help of Anita Johnson and Irene Kwasny in the typing of the papers in this collection.

James W. Scott
Director

Transportation in the Pacific Northwest: The Past Speaks to the Present and the Future[1]

W. Turrentine Jackson
University of California, Davis

Pioneers participating in the frontier experience cherished their strength, drive and independence firmly believing in the cult of individualism. Yet in truth they often found cooperation with fellow citizens essential to success and regularly sought support from the federal government in achieving their goals. This was particularly true in the trans-Mississippi West--and in the Pacific Northwest--where much of the early system of transportation and communication was based on federal government expenditures and subsidies, direct and indirect.

Many of the main arteries of travel across the continent were explored, surveyed, re-routed or improved by army engineers such as Stephen H. Long, James H. Simpson, and John C. Fremont. The Corps of Topographical Engineers was the federal agency charged with improving the nation's transportation system prior to the Civil War, largely because military necessity was the primary justification of such activity in the minds of those Congressmen concerned with abiding by the wording of the Constitution. The transportation question was also of primary interest to Oregon's territorial officials. Delegate Joseph Lane obtained twenty thousand dollar appropriations in 1853 to improve two routes; one from Steilacoom on Puget Sound to old Fort Walla Walla and a second to connect the valleys of the Rogue and the Umpqua. Jesse Applegate assisted Major Benjamin Alvord in surveying the latter and a young lieutenant by the name of John Withers followed with instructions, "Your object will be first to secure a practical wagon road between the points indicated, and then to devote the remainder of the funds at your disposal to improvement of the most difficult places, aiming to make the road uniformly good throughout its length."[2] The actual work was to be done by local residents under contract or employed for wages. In 1854, another Army officer, Lt. George H. Derby, was ordered to survey a military road from Salem to Astoria, one hundred feet wide. In disgust with Washington, D.C. planners, he reported his frustration:

> The woods are very thick, with a dense growth of underbrush, and the mountains are represented as almost impassable. I can see no object in making these roads one hundred feet wide, as directed by instructions from the Bureau. If the idea is, that this width will prevent the road from being encumbered by falling timber it is a mistaken one, the growth being generally over a hundred feet in height. . . . I would respectfully suggest that sixteen feet is quite enough for all practical purposes.[3]

The struggle in the wooded wilderness continued as annual Congressional appropriations were made for additional work. Between 1857 and 1860 the Army engineers were also engaged in systematic surveys attempting to locate a shorter emigrant road between the Great Salt Lake and the Willamette Valley than that provided by the Oregon Trail.

When Major Isaac I. Stevens, a former engineer, accepted appointment as Governor of Washington Territory, he was assigned a dual responsibility relating to transportation: construction of the wagon road from old Fort Walla Walla to Puget Sound and general reconnaissance in the Cascades to locate the best pass for both a wagon road and a railroad. The governor was obsessed with the necessity for improving transportation and succeeded in obtaining federal funds for the route from Ft. Vancouver to The Dalles, particularly for the "Portage Road" around the Cascades of the Columbia, for the trace northward from Ft. Vancouver to Ft. Steilacoom, and for improving the road from Ft. Steilacoom to Bellingham Bay.[4]

The most famous, and perhaps the most significant, of the road building projects in the Northwest was the Mullan Road, 624 miles long, connecting Fort Benton, the head of navigation on the Missouri River, with old Fort Walla Walla. Lieutenant John Mullan spent seven years on the project, three years making preliminary surveys and four others slashing his way through wooded mountain sides, working across rolling prairie, or building corduroy through bogs and bridging streams.[5] Winter work was desperately hard. The men constantly suffered from cold. Many cases of frostbite resulted from open boots torn to pieces by wear and tear on the road. One hunter, lost in the mountain forest, remained away from camp four days and nights without food or blankets. In time, he crawled

into the cantonment with frozen feet and nearly deranged in mind, only to learn that both legs had to be amputated to save his life. By the winter's close there were twenty-five cases of scurvy, so Mullan made an overland trip to the Pend d'Oreille Mission to procure fresh vegetables from the men there. Congress allocated $230,000 for this road project. Mullan exaggerated the importance of his achievements in a final report in which he referred to "a creditable piece of mountain work...[which] will compare favorably with any turnpike of the same length and through similar difficult country."[6] Local observers suggested, "The Mullan trail wasn't much of a road."[7] but it did provide a trace for the goldseekers trailing to western Montana even before its final completion.

Congress also recognized a second justification for federal aid to transportation: the delivery of the United States mails. Oscar O. Winther has described the pre-statehood mail service in the Oregon Country in one word, "abominable." Initially Congress authorized the Pacific Mail Steamship Company to bring the mails as far as Astoria. In the 1850's the first post roads were designated, one running up the Columbia River from Astoria to the Willamette, then southward to the Umpqua; a second ran between the mouth of the Cowlitz northward to Nisqually. Within a decade stagecoach lines spanned the trans-Mississippi West bringing the mails overland into San Francisco and thence northward on the Concord coaches of the California Stage Company in Portland.[8]

When one reflects on the broad pattern of pre-railroad transportation and communication in the Pacific Northwest one notes similarities with the eastern United States where people selected the coastal areas, the bays and inlets, as their first choice of residence. The rivers provided the initial avenues of transportation and soon settlements sprang up along the banks. Civilization moved westward along the Columbia River just as it did along the Ohio River. Certainly the Willamette was as important to Oregon as the Wabash to Indiana. In the Great Plains roadbuilders had the advantages of a comparatively level terrain, but the tremendous disadvantages of the absence of trees and adequate water. In the Northwest, in contrast, environmental factors, always of prime importance, were similar to those in the East. Roadbuilders had to concern themselves with too much water and mud rather than digging artesian

wells to support man and beast as in the Southwest. While the smallest grove of trees proved a boon to roadbuilders in most of the American West, we have noted that the dense forests and bogs were the torment of many settlers and roadbuilders moving from place to place in the Northwest.

Traces for packtrains and routes for wagons were built primarily to connect one known geographic location or settlement with another. Seaports, river junction towns, gold camps and military installations were the usual focal points. Because of the transitory nature of the economy, especially where the mining camp was concerned, and because of changing military requirements of the United States, many times the road system was obsolete before it was completed. Although technology has usually been described as a factor leading to flux and change, in the area of transportation, it was to bring greater stability and continuity to the pattern of transportation in the railroad era.

As the stagecoach era recedes into the past, many of its aspects have been associated with romantic folklore, what one might term the "myth of the west." May I suggest that for the generation involved that much of what transpired was reality rather than myth. Many communities faced privation, even near-starvation, when freight lines were disrupted, business negotiations collapsed when the mail was not delivered, physical obstacles along the roads led to accidents that left pioneer travelers with injuries plaguing them for a life-time. Certainly in the "inland empire" the stagecoach <u>was</u> attacked by Indians with devastating effect and the road agents held up the stages in hopes of obtaining the treasure chest of the express companies and rob the passengers.[9] In addition to this reality associated with violence, one must not overlook the more important reality of the achievements of a long-line of frontier types--the emigrant on the overland trail, the Army engineer surveying a trace or improving a route, the mail carriers, the stagecoach driver, the bullwhacker with freight wagons--all these, and many more, made a real contribution.

Shortly the railroads engulfed all their predecessors--the steamship lines, stage, mail and express companies--but most of the great western railroads were railroads from the beginning, created and endowed as such by Congress. One of the first three transcontinental lines authorized was the Northern Pacific and the basic legislation not only laid down the terms of the building and finance, but also stated the government's plan of subsidy. The Northern Pacific was given a strip of land 200 feet wide as a right of way and alternate sections of public land, ten sections for every mile construction within the states and twenty in the territories, to help finance construction. No provision was included for liberal construction loans, as in the case of the Central-Union Pacific, so the land grant had been doubled.

Thus we must recognize that from the beginning to the present day the policies of the federal government have been a primary factor in determining the pattern of transportation and communication in the Pacific Northwest. Through the survey and improvement of military and post roads, in subsidizing mail deliveries, in providing business for the stage companies and freight lines, and in aiding railroad construction by land grants and transportation pattern by water, road and rail was largely determined.

More recently, historians have begun to speak of railroad building in terms of what is called "mixed enterprise," suggesting a marriage of cooperation, born of necessity, between the government and the private sector of business. Perhaps it was unthinkable that at the height of "The Age of Enterprise" that entrepreneurs would not play a major role in railroad building. Some writers have suggested that even though the railroads received government assistance in engineering surveys, land grants, reduced tariffs on imported steel rails, tax benefits, and more recently, RVC loans, the government drove a hard bargain in requiring the land grant roads to carry government property, including troops and hardward, at lower rates than those charged private-enterprise customers. These land-grant rates forced the non-land-grant roads to establish equal-

ization rates so they could compete. As a rule the rate reduction was fifty percent. In the Transportation Act of 1940 Congress eliminated this preferential treatment as it applied to mail, freight and the travel of civilian employees of the government. Movement of troops was another matter. When one adds up the month to month savings in troop shipments in World War II, the total savings to the government through the years reached $1 billion. Perhaps it is a fruitless endeavor to try to determine whether the government or the builder-owners of the land-grant railroads benefitted more. If sales from federal land grants alone are considered the government was far ahead. If all public aids are considered the books balance out about even.[10] Robert W. Fogel in his study, The Union Pacific Railroad: A Case of Premature Enterprise concludes, "Clearly then, from a social point of view the Union Pacific was a most profitable venture. There can be little doubt that the government was economically justified in intervening to build a road that would not have been built by unaided private enterprise."[11] More recently, Robert G. Athearn in his Union Pacific Country[12] in discussing the branches of the main line penetrating the Colorado Rockies, into the inter-mountain district of Utah to the Mining camps of Idaho and Montana and finally a move into the Pacific Northwest, emphasizes the fact that profits from land grants were less important than locating on the land settlers who would make it productive. The railroad, rather than the prospective farmers, appears to have been the victim of the government that delayed the issuance of patents to land and the surveying necessary for its sale. One gets the impression that the government was a millstone around the neck of the Union Pacific, bickering about re-payment of loans and restricting the company so it could not fully demonstrate its entrepreneurial ability in competition with other lines that had no similar obligation. This viewpoint parallels that of other historians who have recently suggested that all the initial financial manipulations of the builders were necessary because of the unrealistic requirements of the government. To them, the huge profits and massive fortunes accumulated were justified by the risk involved.

Amidst the debate over high policy, the local citizen has a different perspective as expressed by Earl Pomeroy in The Pacific Slope.

> To the resident the dominance of track over countryside meant much more than the means of serving his needs as a traveler. He had invested himself and his savings in a country whose development depended upon the kind of transportation that only railroads could supply, and it seemed sometimes that the managers of the railroads were collecting all the dividends. He found small reassurance in reflecting that the extraordinary profits had followed on extra-ordinary risks, that great power naturally followed on great responsibility and on the privileges that governments and communities had extended to induce private capital to undertake ventures that were both socially useful and economically uncertain.[13]

Certainly one must not overlook the contribution of those pioneer men of enterprise who contributed to improving transportation and communication without any thought of government aid. The waterways were the first transportation routes in the Oregon country, and, as noted, the people naturally had made their homes beside them. For the first generation the preoccupation had involved steamboats rather than railroads. Regular steamer service on the Columbia between Astoria and Portland began in 1850. Within months another entrepreneur ran a vessel between Portland and the Cascades. A third man transported a steamer in sections above the Cascades, reassembled it and operated between there and The Dalles. In 1859, a steamer The Colonel Wright was launched above The Dalles carrying freight to old Fort Walla Walla and on occasions venturing fifty miles up the Snake River on even ascending the Clearwater to within twelve miles of its forks at the height of the Idaho gold rush. Consolidation of effort was inevitable and these enterprises and their vessels merged into the Oregon Steam Navigation Company. Similar developments occurred in the Willamette Valley where at least a half-dozen steamships operated above or below the Willamette River Falls.

There were men who undertook roadbuilding as private ventures. Among the pioneers, the name of Samuel K. Barlow looms large in this connection. As the emigration of 1845 reached The Dalles and found no boat available for the long and broken trip down the Columbia to the mouth of the Willamette, thence southward, Barlow determined to find an overland route

announcing that "God never made a mountain that he had not made a place for some man to go over it or under it. I am going to hunt for that place." It took his party two months to get out of the mountains, cattle had to be forwarded by another route, wagons had to be abandoned and the emigrants finally reached the banks of the Willamette with pack horses. The next summer Barlow organized a party that found a usable pass through the Cascades on the southern slopes of Mount Hood and began construction on a wagon road from The Dalles to Oregon City. The Barlow Road was completed for the emigration of 1846 and it continued in operation as a toll road to 1912.[14]

Men of limited means organized stagecoach lines and express services to operate over the wagon roads built by Army engineers or private citizens. T'Vault & Co.'s Oregon & Shasta Express ran from Oregon City to Shasta City, California in 1852. Stuart's Express operated between Portland and Olympia, carrying Adams & Company's Express until 1855 and after that date for Wells, Fargo & Co. His lines extended northward through Seattle, Port Townsend to Vancouver Island and southward as far as Corvallis. The California Stage Company that transported passengers, express and mails from the south in the 1850's went into eclipse during the Civil War. A Portland publisher of the Oregonian, Henry W. Corbett, obtained the mail contract, organized the Oregon Line Stages and through this Oregon State Company controlled the stagecoach business between California and Oregon until the two states were joined by rails in 1887.

Express companies became so numerous, almost a dozen, in the 1850's that competition led to financial decline and consolidation resulted. By 1860 Wells Fargo had established five offices in Oregon, five in Washington, and two in British Columbia. The company continued to expand in the 1860's and 1870's in the Pacific Northwest particularly when the mining frontier moved into the "Inland Empire." Here Wells, Fargo & Co. ran into competition with Ben Holladay, the "Stagecoach King" and "Napoleon of the West" who operated a network of 2,000 miles of stages, most of which ran into the Northwest from Salt Lake City. The interests of the two great transportation systems clashed. The upshot was Wells Fargo's

purchase of Holladay's interests at an inflated price. Wells Fargo obtained a monopoly in the stagecoach and express field, but within a few years railroad construction revolutionized the express business.[15]

While some men of business concentrated on road building and organizing stagecoach and express companies, others began to experiment with railroad construction. As early as 1851 the first portage railroad had been constructed around the Cascades on the Washington side followed shortly by another on Oregon side. The rails were made of six by six inch fir, partly faced with strap iron. The Oregon Portage Railroad was the first to place a steam locomotive in operation in the Pacific Northwest. The so-called "Pony" was a menace to passengers when it belched forth both steam and cinders and was retired from service within three years.

The first railroad in the interior bore the grandiose title of the Walla Walla and Columbia, but actually was a thirty-two mile line, extending from the vicinity of Wallula to Walla Walla, built by Dr. Dorsey S. Baker, an improvising genius. Again the rails were made of fir, 4 x 6 and sixteen feet long, reinforced with strap iron two inches wide. Construction began in 1871, the next year a seven and one-half ton locomotive was purchased in Pittsburg, and by 1875 the line was completed. This homemade road did not operate at night. Daylight was needed to make certain the strap iron strips did not come loose, wrap around the wheels, penetrate railcar's floors, or possibly wreck the train. On such occasions, the train was stopped and repairs made. Staggering profits were made in this pioneer enterprise, climaxed by its sale in 1878 to the Oregon Steam Navigation Company.[16]

Baker's career as a railroad builder was a prelude to those of the great transportation entrepreneurs of the Pacific Northwest: Ben Holladay, Henry Villard, James J. Hill and Robert E. Strahorn. When Ben Holladay arrived in Oregon in 1868, after selling his stagecoach empire to Wells Fargo, he launched a campaign to end the struggle between two rival groups of railroad builders jockeying for control of north-south route

along the Willamette River in Oregon. Holladay made an agreement with the East Side company giving him control and immediately launched a campaign of elaborate entertainment, bribery and bullying in the Oregon legislature and Congress to obtain a land grant totalling five million acres. He reorganized the enterprise as the Oregon and California Railroad, and plunged ahead by selling several millions of dollars worth of bonds anywhere from 65% to 75% of par value, largely to German investors. Oregon greatly benefitted from Holladay's promotion when the Oregon Land Company, the colonizing agency for the railroad, began to sell the acquired lands on credit, with only 20 percent down and five years to complete payment. Farm lands around Salem and Albany and in the Umpqua Valley sold at boom prices, four to five times the previous norm. Farm produce--wool, wheat, oats and potatoes--also greatly increased. However, railroad revenues were small and when the German bondholders failed to receive their interest during the Panic of 1873 they grew restive. They prevailed upon Henry Villard to represent their interests.

Every schoolboy in the Northwest must know of Henry Villard's career. Villard first negotiated safeguards for his investors but when Holladay ignored the agreement, Villard drove him out of the company acquiring control for the bondholders. He then turned his attention to the Columbia River route to the East. He bought control of the Oregon Steam Navigation Company, with its boats and portage railways, reorganized it under the name of the Oregon Railway and Navigation Company and completed a continuous railroad on the south bank of the Columbia. He also purchased Baker's Walla Walla road and changed it to a standard gauge. In 1880 Frederick Billings of the Northern Pacific Railway arranged to use O. R. and N.'s tracks on the south bank of the Columbia also agreeing not to build along the north bank. When he decided later to build his own tracks on the north bank into Portland, thence to Tacoma and Seattle, Villard bought control of the Northern Pacific. Between 1881-1883 the construction crews from east and west competed to complete the transcontinental.

James J. Hill gained fame by proving one could build a profitable transcontinental railroad without the aid of land grants. His tactic was to buy up series of local lines serving productive agricultural

regions and to knit them together into a system extending ever westward across the northern Plains and Rocky Mountains. By 1888 his trains were going as far west as Butte when his engineers found Marias Pass to the west of Havre, Montana. To take advantage of this lower elevation, the route of the main line was moved northward to run just south of and parallel to the international boundary. Meanwhile, Seattle financiers organized the Seattle and Montana Railroad and between 1889-1890 built northward to Everett and then eastward. Local companies also laid tracks from Vancouver southward through Bellingham to Everett. The total system was incorporated into the Great Northern Railway that was completed in January, 1893. Hill also became a controlling influence in the Northern Pacific. He obtained an entrance for both railroads into Chicago by contractual negotiations with the Burlington Lines, an accomplishment of great significance to the economy of the Pacific Northwest. In the West his principal achievement was constructing down the north bank of the Columbia where the Northern Pacific had originally intended to build.

Not to be shut out of the Pacific Northwest, the Union Pacific, at the instigation of Robert E. Strahorn, obtained Congressional approval to build the Oregon Short Line following the route of the old Oregon Trail to connect its main line with the tracks of the Oregon Railway and Navigation Company down the Columbia River gorge into Portland. Strahorn succeeded in bringing the Chicago, Milwaukee and St. Paul into Spokane and completed a fourth transcontinental running into Seattle and Tacoma by 1909. Continuing to work in mysterious ways, he concentrated his efforts in eastern Oregon and by 1930 established an integrated rail network providing a direct avenue for Inland Empire products into the San Francisco market and at the same time breaking the stranglehold of the Southern Pacific on transportation between California and the Pacific Northwest.[17]

Reflecting on the era of the great railroad entrepreneurs of the Northwest, Earl Pomeroy has observed:

> Within their jurisdictions, the lords of the rails ruled as probably only the Du Ponts have ruled in Delaware or the copper magnates in Montana. . .The rule of the lords of transportation was both onerous and, according

> to their lights, benevolent. They were all enthusiastic boosters, some of them as residents, all of them as investors so heavily committed to the territory they served that they had to underwrite it broadly to safeguard their own profits. Their subsidiaries and satrapies seemed to multiply endlessly. Tacoma in the 1880's was a company town of the Northern Pacific, which operated it through the Tacoma Land and Improvement Company; railroad executives controlled the Tacoma Light and Water Company, the gas works, and the streetcar company.[18]

Quite true. Railroad leaders played a major role as community builders, in the field of resource development, and in providing demographic and economic stability--all in stark contrast to the transportation leaders that preceded them.

While emphasizing the importance of men of enterprise, the cooperative efforts of concerned citizens in the improvement of transportation must not be overlooked. Perhaps two of many examples that could be cited will suffice. When Baker's Strap Iron Railway reached the site of the Whitman mission, just six miles west of Walla Walla, Baker announced that his short line out of Wallula could go no farther because of inadequate funds. Concerned that a rival town might grow up there, the citizens of Walla Walla raised the $25,000 necessary to build the road the rest of the way.

Some years later when the Northern Pacific decided to build down the Columbia Valley into Portland and north to a terminus at Tacoma, Seattle residents were bitterly disappointed. Determined to become a railway town, the city's businessmen organized two railroad companies to build eastward. The schemes were grandiose, western management illustrated ineptness in its scattered efforts, and eastern capital was reluctant to support the projects. However, local residents had illustrated their determination to become a railroad center. Even so, Seattle did not become the terminus of a transcontinental railroad until the Great Northern was completed in 1893. Its position was further strengthened by the entry of the Milwaukee Line into the city in 1909.[19]

Perhaps transportation developments of the past have now spoken to the present and to the future. Certainly as discussion in this conference proceeds, participants will find it wise on many occasions to address

themselves to such questions as what will the position of the federal government be? What types of business arrangements can be worked out between the business community and the government? Where will we find men of enterprise and vision to propose ambitious plans? Can the cooperation of concerned citizenry be aroused as in times past to actively participate in efforts to improve transportation and communication?

Time does not permit an adequate discussion of the evolution of the highway system to accommodate the twentieth-centry automobile. Of the four highways crossing Washington in an east-west direction, U.S. 10 between Seattle and Spokane appears to be most important and will soon be the first multiple land road from east to west. Of the six north-south highways, U.S. 5 , a multiple lane, paved road following in general the route of the pioneers carries the highest density of traffic. At a recent professional meeting considering the impact of the automobile on urban planning and suburbia, the one fact on which there was agreement was that the subject was a complicated one. The responsibilities, objectives, and priorities of the federal and state governments are often in conflict, to say nothing of local interests. Specialists in urban location theory suggest that the factor of distance is not as important as we think in determining the extent and nature of suburbia. More important factors are industrial location and the decentralization of employment itself. Professional men, such as lawyers and doctors, appear to be living in one suburb and practicing in another. Among the anonymous shapers of planning and growth must be listed the power and telephone company representatives, the civil engineers dealing with problems of water and sewage, the mortgage lending agencies, both governmental and private, whose policies determine the pattern of growth. All types of experts are concerned about the loss of population by the inner city, the great sea of skyscrapers surrounded by acres of empty parking lots, and speculate upon the factor of transportation as a cause or result.[20]

Air transportation in the Pacific Northwest has largely been limited to passenger traffic because charges for the transport of bulky Northwestern products are prohibitive. The value of regional air freight shipments account for only 2% of the region's exports and 3% of the imports. Although water transportation both by sea and river continues to

be of utmost importance, particularly for heavy transport, it appears to me to be of more regional than national significance. Even today, the railroads seem to be on a par with truckers as the prime movers in the Northwestern states. The perennial problem with rates continues as the section has a resource-oriented industry producing goods that are bulky and of low unit value and must have shipment rates lower than those applied to the finished goods brought into the region. This is essential if Northwestern goods can compete in the national market. Yet, at the same time, one observer has noted that the consumer in the Northwest through his living expenses, based in part upon these imports, is subsidizing the region's industries.[21]

In closing, perhaps we should take a brief look at the present situation. To do so, I have chosen a very small but recent and informative book by Charles W. Booth, The Northwestern United States. In surveying "Population--The Settlement Pattern," a discussion of demography--where people live, the author classifies certain transportation centers among the towns and cities of this region. Three categories are proposed based on the sub-functions that they provide: gateway, including both internal and external; junction; terminus. Both inbound and outbound traffic is important to the gateway center. Spokane, Washington and Pocatello, Idaho are prime examples of gateway cities important for inbound transportation lines. Portland is perhaps the most important external transport center for it is at the head of the internal water transport system and of two of the important national rail systems. It is also the major Northwestern seaport. Pasco, Washington, with one of the largest automated gravity switching railroad yards in the United States, is the outstanding example of the junction sub-function of transportation centers. The importance of this "railroad town," so strategically located will be increased as inland water transportation is extended on up the Snake River. Perhaps the terminus sub-function is best illustrated by those ports with facilities to handle incoming crude petroleum and outbound refined products. The ports of Anacortes and Ferndale on Puget Sound come to mind. The tidewater locations include deep water handling facilities so that in addition to being termini of pipelines from Canada, they can handle petroleum from Alaska and abroad to be refined there.[22]

Contemporary discussion of transportation development is far more complex than in our historic past. This is a period when the knowledge and skills of experts is essential. Scientists and social scientists are called upon to provide not only economic feasibility studies but also demographic and environmental impact studies. Resource use appears to provide the key to importance. In discussing land utilization and urban planning, as related to transportation, there are conflicting values expressed by the preservationists and the utilitarians. When great faith is placed upon scientific evidence provided by experts who disagree among themselves there are grave implications for political decision making. In a democracy the implementation of agreed-upon goals is in itself a complicated process that baffles not only the political scientist but also the sociologist and the social psychologist. When experts dealing with facts and figures, rather than priorities and values, disagree, progress is at a standstill.

As a region whose economic maturity has not yet been reached, the Pacific Northwest can expect to undergo major changes. Commerce and the transportation systems are certain to be two of the most dynamic features of the future growth of the region. In the years ahead the knowledge of experts, the skill of politicians, the venturesomeness of business and the vision and patience of a concerned citizenry will meet the challenge.

-Notes-

[1]The facts of Northwestern transportation history incorporated into this paper have been gleaned from the works of recognized authorities on the history of the region. I have not only relied upon but also borrowed heavily from books by George W. Fuller, Oscar O. Winther, Dorothy O. Johansen and Charles M. Gates. The organization and interpretation of these facts are my personal responsibility.

[2]W. Turrentine Jackson, Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869. (Berkeley and Los Angeles: University of California Press, 1952), p. 73.

[3]Ibid., p. 76 ff.

[4]Ibid., Chapter VI, pp. 89-106.

[5]Ibid., Chapter XVI, pp. 257-278.

[6]Quoted in Jackson, p. 270.

[7]Quoted in George W. Fuller, A History of the Pacific Northwest. (New York: Alfred A. Knopf, 1949), p. 317.

[8]Oscar O. Winther, The Great Northwest. (New York: Alfred A. Knopf, 1947), pp. 188-190.

[9]This theme has been explored in depth in my article, "Wells Fargo: Symbol of the Wild West?" The Western Historical Quarterly, III (April, 1972), pp. 179-196.

[10]David C. Nelson, "Historical Background of Transportation in the Trans-Mississippi West," in Jack R. Davidson and Howard W. Ottoson, editors, Transportation Problems and Policies in the Trans-Missouri West. (Lincoln, University of Nebraska Press, 1967).

[11]Baltimore; John Hopkins Press, 1960.

[12]Chicago: Rand McNally, 1971.

[13]Earl Pomeroy, The Pacific Slope (New York: Alfred A. Knopf, 1965), pp. 99-100.

[14]Oscar O. Winther, The Old Oregon Country: A History of Frontier Trade, Transportation and Travel (Stanford University Press, 1950), pp. 114-115.

[15]Winther, The Great Northwest, pp. 193-198, summarizes the early express and stagecoach business in the region.

[16]Fuller, op. cit., pp. 317-318.

[17]Among the many accounts of the early railroad builders in the Northwest, I have found the discussion in Dorothy O. Johansen and Charles M. Gates, Empire on the Columbia (New York: Harper & Brothers, 1957) most helpful on Holladay and Villard, pp. 372-378. Fuller has the fullest account on Robert E. Strahorn.

[18]Pomeroy, op. cit., p. 99, p. 100.

[19]Johansen and Gates have a discussion of the Seattle, Lake Shore, and Eastern, pp. 279-281.

[20]Speech by Kenneth T. Jackson, "Changing Spacial Patterns of Work and Residence in the Age of the Automobile," at a session of the meeting of the Organization of American Historians, Denver, April 19, 1974.

[21]Charles W. Booth, The Northwestern United States. (New York: Van Nostrand Reinhold Company, 1971), pp. 98-104.

[22]Ibid., pp. 39-40.

THE ROLE OF THE FEDERAL GOVERNMENT IN REGIONAL TRANSPORTATION

by

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Transportation as a service or business cannot be isolated from other endeavors by man. The nation is beginning to better appreciate the fact that economic goals, social goals, environmental problems and objectives, and energy matters are all inextricably intertwined with the quality and availability of transportation. There are still many elements to these relationships which are neither understood nor being examined and most of debate on these issues is carried on out of the public's view. A railroad rate adjustment that favors one city or region over another may cause businesses to close in one place and open in another, yet the public would probably be completely unaware of how such an important change came about.

Transportation policy should reflect the nation's aspirations for improving the quality of life and in so doing it must consider not only factors other than transportation but each mode of transportation -- whether air, water, highway, rail, or a combination of some or all of these. At the moment the nation has no National Transportation Policy that meets those criteria. The Interstate Commerce Act contains a policy statement which purports to be such a national policy but it is really limited to economic regulation of domestic surface transportation. The CAB and FMC are governed by separate acts. Transport safety and development are similarly fragmented with the Federal Highway Administration, the Federal Railway Administration, the Federal Aviation Administration and the Federal Urban Mass Transit Administration all functioning under the loosest kind of coordination within the Department of Transportation.

Prior to being appointed to the Interstate Commerce Commission I was Transportation Counsel of the Senate Commerce Committee of which Senator Magnuson is, of course, the Chairman. Chairman Magnuson instructed the

staff at the beginning of the 91st Congress (in 1969) to develop legislation which would eliminate or drastically reduce the fragmentation of effort while at the same time encourage local initiative in the planning and development of a better coordinated and better balanced transport system. This was to be achieved in a manner consistent with preserving and enhancing the environment, conservation of natural resources (before the energy crisis/problem,), improved land-use planning, better economic conditions, and recognized social objectives.

Subsequently legislation was developed which would carry out the objectives through the vehicle of regional commissions. In the latest version of the bill, S.2279 of the 92nd Congress, the Commissions would be made up of representatives of affected states, the Federal government and affected Standard Metropolitan Statistical Areas. The makeup was considered subject to change after hearings. The regions were to be designated by the Secretary of Transportation and it was anticipated that there should be a considerable flexibility in the size and shape of such regions. Federal funds would be available to help staff and administer the commissions and otherwise on a 90% Federal, 10% local matching basis. Some regions might involve several states, others might be wholly within one state or even within one metropolitan area. The hope was that this legislation would provide for the local concentration of effort, Federal money, compatibility with national goals and with other local, state or regional efforts. And since the funds would be available for whatever transportation purpose the regions desired, there would be no money bias favoring one mode over another.

The legislation had the strong backing of the Surface Transportation Subcommittee (Chairman, Senator Vance Hartke of Indiana). In all, 19 Senators joined in sponsoring the measure in 1971. Among them, from the Northwest were Senator Henry Jackson, Senator Mark Hatfield, and Senator George McGovern.[1] The legislation, which we called the National Transportation Act had been previously introduced in the 91st Congress.[2] The Senate Commerce Committee held extensive hearings in February, April and May of 1970 on the earlier bill which was passed by the Senate in the 91st Congress as a floor amendment to the Highway Act of 1970. Unfortunately, it had not been enacted in the House of Representatives and the joint House-Senate Conference on the legislation dropped the provision from the bill.

In the 92nd Congress (first session) S.2279 was the subject of a

number of hearings in September of 1971 and in March, April and May of 1972.

In the two sessions of Congress hearings were conducted in San Francisco and New York as well as in Washington. Witnesses included Professor Edgar Harwood from the University of Washington, Theodore Kheel prominent New York attorney, Leonard Woodcock of the United Auto Workers, Mayor Alioto of San Francisco, Dr. Constantinos Doxiadis, international city planner, Ian McHarg from the University of Pennsylvania's graduate school of fine arts; and then Secretary of Transportation John Volpe. Legislation introduced by Senators Kennedy and Percy which would have established a single transportation trust fund and a bill by Senator Caliborne Pell to establish regional rail passenger authorities because of their relevance were considered in the same hearings with Senator Magnuson's bill. There were therefore a great diversity of persons and views expressed at the hearings.

Interestingly, during the 1972 hearings we began to get the first inkling of how an energy crisis might change attitudes about transportation development. The Mobil Oil Corporation sent a letter to the Committee stating that development of each of the transport modes should not continue to be carried out separately and that the highway trust fund concept should not be continued. The American Trucking Association on the other hand, took a more traditional position of opposing any tampering with the trust fund and the formation of any new regional entities that might replace the Federal-State relationship which had worked so well in the building of the interstate highway system.

Again, however, the bill was not enacted. The hearings and the debate on the issue, however, contributed considerably to discussion concerning improving transportation. And I am pleased to have the opportunity to share some of the ideas, pro and con, that have been generated during that debate with you today.

I have broken this discussion for today into two parts. First I'll talk about the proposed legislation and the entire question of a regional approach to transportation planning. Second, I plan to discuss the efforts of the United States Department of Transportation to focus on one particular region - in this case it will be the Portland/Seattle corridor - and try to make some planning projections based on the available data. That should serve as a concrete example (no pun intended) of what some of the benefits and some of the problems are of trying to focus in on a region from the

point of view of its transportation requirements.

I have already given you a brief analysis of the proposed legislation. Let me say a bit more about it now. Basically, the bill would have authorized and directed the Secretary of Transportation to designate transportation regions made up of clusters of states, urban areas or parts thereof, that had broad natural, demographic, or economic relationships. Each region, which would be designated as such by the Secretary would be invited to establish a Regional Transportation Commission.

The functions of the commissions would be to develop overall transportation programs, to conduct surveys and studies, to develop comprehensive and coordinated plans and programs, to accomplish research and development, to construct new transportation systems and facilities, to provide a forum for considering transportation problems, to formulate and recommend appropriate forms of inter-regional cooperation, and to provide for the financial participation of the states and local governments, and private industry.

In making its planning, development and other decisions, the commission would have been required to consider various factors including impact on the environment, the need for integrated and balanced transportation, economic and sociological factors and Federal, state and local land-use planning goals.

The bill would authorize Federal expenditures of up to 90 percent of the cost of transportation projects and programs approved by the Regional Commissions and for administrative expenses. It also provided that no region would receive more than 25 percent of the total funds appropriated for any single year. The commissions would be free to spend their funds within their own areas, or for projects involving two or more regions. The money which the bill made available was $200 million for the first year, $750 million for the second, and $2 billion for each of the following fiscal years.

Before I give the arguments for or against it, let me tender an explanation for why it did not pass. First, there were some valid questions raised about how the regions would be selected and what government entities would have how much representation on the Commissions. As an example of what can happen, consider that in the first bill the Commission membership would have been dominated by the States. Governor Sargeant, representing the Governors' Conference, testified in favor of that bill but the

National League of Cities expressed some fears. The next bill was adjusted so that urban areas would be better represented. Result: Governor Sargeant testified against the bill, but the cities were happy.

Second, the administration was opposed to the concept according to Secretary Volpe. (Interestingly, however, a year later the Department proposed that urban regions be established as the most effective units for using the funds that the Department hoped would be available for urban transit from the Highway Trust Fund). With administration opposition, a veto was very likely, thus making clear the need for very strong support in the Congress and among at least a good part of the affected parties such as the States and cities.

Third, it is just extremely difficult to interest people in non-hardware solutions to problems such as transportation. It is much easier to find supporters for building a rocket to get to the moon or developing a 150 mile an hour passenger train than to create the institutionalized framework that's necessary if these tools can be sensibly employed. Change is always more quickly brought about in the natural sciences than in political science.

A very good example of this was present with the arguments that were in full force over breaking up the Highway Trust Fund. "Bust the Trust" became a rallying cry of the cities, States, an Administration searching for new sources of funds, environmentalists, and even a few oil companies. Establishing a systematic approach for getting the most effective use out of a "busted trust" was just not a "sexy" issue.

Finally, the Commerce Committee which had to be the moving force if the bill were ever to become law, found itself almost overwhelmed with other legislative matters which either had more support or which seemed to be more urgently required. During this period the Northeast railroad crisis came to a head and refused to go away, the Committee under Chairman Magnuson's leadership developed the Amtrak legislation, a rail safety law, considered Administration backed regulatory "reforms", approved a massive new airport/airways development program, a new maritime program, and a host of non-transportation legislation affecting individual consumers, campaign reform, and the national television networks. So there was plenty of legislative work to keep the Committee busy and it was thought that probably the time was just not right.

The regional approach to transportation planning was advocated for the following reasons. First, each mode of transportation today is developed for the most part without reference to other modes, and without enough attention to sociological, economic and environmental concerns. In short, there is not now a comprehensive approach to transportation planning -- one that coordinates the urban transit systems with the inter-city systems in the air and on the ground.

Second, it was believed that, while it is often too restrictive to look at the movement of people and goods simply in terms of statewide or citywide movements, often transportation problems are too localized to really be subject to a national approach.

Third, it was felt that a major handicap to efforts to improve transportation is the large number of political subdivisions affected by transportation decisions. These subdivisions at the local, state and sometimes the national level often have a high degree of autonomy and it is very difficult for them to work together, as they must, without some kind of coordinating framework.

Fourth, the transportation system in this country has pretty much grown up without central planning, and often without much planning at all, subject only to certain basic geographic considerations. Although this kind of development has been relatively successful in the past, there is a question in our more crowded, modern age as to whether it can continue to be depended upon. As our society grows more complex, planning becomes more important and more necessary. This is no less true in the transportation area than with the environment, energy or any of a number of other of our national concerns.

The present system of transportation has often been criticized as a non-system with too much reliance on automobile traffic resulting in continual urban traffic jams, with high-speed jet air travel permitting quick transit from city to city, only to be frustrated by congestion and delay at terminal facilities and by traffic congestion making access to those terminals difficult.

It has been claimed that Federal investment in transportation capital facilities has been made without adequate concern for other forms of transportation. For example, the interstate highway system had a dramatic effect on rail passenger service as did Federal subsidies to the airline

passenger industry following World War II. Federal participation in the inland waterway industry through the Corps of Engineers construction of capital facilities, such as channels and locks, has boosted the inland waterway industry but has also had an impact on railroad freight transportation. Moreover, often these transportation decisions were made not only without a proper evaluation of the impact on other modes, but also without serious consideration being given to the impact on the environment and other national concerns, as anyone who is so unfortunate as to live near a large jet airport can testify.

It was hoped that the bill, by identifying logical, coherent transportation regions and stimulating the formation of governmental units to deal with them as a single entity, could get a handle on some of these problems and work toward the solution of them.

There is, of course, another side of the argument, and that side is not necessarily unreasonable. As indicated previously the disagreement was one of the reasons why this legislation as written did not prevail. The Nixon Administration opposed the legislation. And its spokesman before the Committee, Secretary Volpe, outlined one of the basic problems, which was how to define a transportation region. He said he thought it would be very difficult to come up with any kind of workable boundaries. He pointed out that transportation regions can be drawn differently for freight problems than for passenger problems, for air versus surface transportation and for land versus waterways. A particular city, for example, may be in more than one identifiable region. Chicago, for example, could be assigned to a lower Great Lakes transportation region. However, that city originates and terminates much traffic coming from the East Coast, particularly to and from the Middle Atlantic states. It is also the Northern terminus for waterway systems stretching all the way down the Mississippi River to New Orleans. I might point out here, that advocates of the legislation felt that such flexibility was an asset not a liability - believing there's nothing inherently wrong with using separate entities to accomplish different results.

It is true that establishing regions for river basin planning is easier because watersheds are well known. Regions for economic development can be set up to cover areas of below average income and the regional commissions were established on that basis. There would probably have to

be more arbitrariness in establishing transportation regions and certain regions would overlap others with certain gaps existing.

Another problem is that there are no commonly accepted theories of regionalism. Which is to say, should the government create more regional entities to concentrate on a specific problem when so many problems are interrelated? Perhaps economic development regions or land planning regions would be better. Some of these ideas are contained in a land use planning measure that Senator Jackson has worked on. Housing, industrial expansion and location, development of natural resources, preservation of recreational areas, to say nothing to the responsiveness to the wishes of local inhabitants, are major considerations that intimately involve transportation.

Secretary Volpe raised such questions as "Should we prefer a national development policy, which encourages regional specialization on the basis of each region's respective comparative economic advantage, or a policy which encourages each region independently to seek balanced growth within its own boundaries?" Senator Magnuson's bill was an effort to avoid this kind of choice by having the Federal government be a part of the local decision. Nevertheless the Administration argued that the latter policy could lead to investment by some regions in economic activities that could be done much more efficiently by others, and this could prove very costly to the nation as a whole. Mr. Volpe argued further that it simply hasn't been established that institutionalized regional transportation planning is conceptually superior to more traditional approaches of the Federal, State and local governments.

Third, the Secretary said that even if the proposed transportation region did know what should be done, it could not very easily carry out its plans. Many key matters would be well beyond regional control. Economic regulation of transportation under the jurisdiction of the CAB, the Federal Maritime Commission and the ICC is a good example. Others would be tax policy and the Federal trust funds for highways and trust funds for mass transit and airport airways. It isn't clear how this would have made the regional commissions any different from existing state and local governments, or for that matter from DOT itself.

The Secretary's conclusion was that given all these uncertainties we should be very reluctant to carve up the country to yet another set of regional boundaries and to establish another set of "permanent bureaucracies". He pointed out that a number of regional development

organizations already exist and that the establishment of regional transportation commissions might confuse and complicate the problems of regional planning. With respect to the latter statement, it is only necessary to point out that the bill contemplated the recognition of existing commissions.

Well, the legislation did not become low. The Administration has implemented another program - federal revenue sharing, which relies on existing States and localities, who are free if they wish to join together in regional commissions for planning or other purposes. The success of federal revenue sharing, I think, has yet to be determined. Certainly, a number of benefits and problems have surfaced in our experience with it so far. However, I would like to cite a most pertinent regional planning that I think even the Department of Transportation would agree has begun to work that is in the Northeast corridor.

DOT undertook an exhaustive study of the transportation problems in the Northeast and recommended a high-speed surface transportation network linking the cities in the Boston - Washington corridor. The Congress also considered the problems of that region in developing legislation to deal with the Penn Central problem, as well as the problems posed by the financial failures of the other railroads in the Northeast.

My experience on those projects has convinced me that regional transportation planning is a workable concept, at least with regard to the Northeast, and perhaps with regard to other coherent, identifiable regions in the country. It is certainly an approach which deserves further attention.

So much for the broad philosophical questions. The second part of my remarks today will focus on a specific current planning project. The one I have in mind was undertaken by the Department of Transportation, perhaps in response to the Senate Commerce Committee's legislative initiative. The Department of Transportation designated ten regions in the country for study as transportation corridors. One of them was Seattle-Portland, and I would like to discuss that a little today.

Specifically, the DOT analysis examined the feasibility of establishing new high-speed ground transportation service requiring heavy capital investments in the corridor based on demand for the 1975-1980 period. The study examined such surface transportation alternatives as conventional rail, now provided by the Amtrak system, the turbo-train, specifically

referring, I believe, to the United Aircraft model, and an alternative which DOT referred to as the improved passenger train, which has many of the characteristics of the French turbo-train, now being tested in the Chicago-St. Louis corridor.

I want to stress that this is an analysis which is still in progress at DOT and does not represent a finished product. The Department has been kind enough to let us peek over the shoulders of its researchers and relate some of the things that they are considering. These Department of Transportation analyses are being performed in the context of the bi-annual national transportation reports which DOT issues, which I think some of you may know as the Transportation Needs Studies. They grew out of the highway needs studies, which the Federal Highway Administration previously undertook, focusing on a single mode.

The DOT analysis has a demand side and a cost side. For every alternative service, such as conventional rail, turbo-train, etc., a demand was projected based on population data, income data, current levels of use etc. for the 1975 - 1980 period. The cost analysis, at least with respect to Seattle-Portland has been published. In December of 1972 the Federal Railroad Administration (part of DOT) released a survey on the potential for improved rail advanced vehicle service. That survey costed out present and projected high-speed ground transportation alternatives for inter-city service between Chicago, St. Louis; Chicago, Minneapolis-St. Paul; Florida points which included Tampa, Orlando, Jacksonville and Miami; and Seattle-Portland.

The demand analysis has been performed by the DOT staff as part of the National Transport Report effort. Also a preliminary assessment of the most promising short-haul ground service has previously been published as the High-Speed Ground Transportation Alternative Study by the Department of Transportation in January of 1973.

The purpose of the study was first to identify high-density corridors in the United States outside of the Northeast corridor and to provide an assessment of the desirability of alternative transportation development options. The study examined air and bus alternatives as well as conventional and high-speed rail for the target year 1975. The corridors or high density regions were defined to encompass two or more large urbanized areas and the areas between them. Although often these

regions have considerable urban transportation problems, the analyses focus on the intercity movements, and is concerned only with passenger movements. Intercity trips were defined as being either greater than 50 miles or consisting of a trip that went outside the particular urbanized area or Standard Metropolitan Statistical Area.

The study limited the intercity markets to areas of less than 500 miles. For intercity markets in which the distance between cities is greater than 500 miles, the data apparently indicates that ground transportation essentially on a cost-time basis cannot compete with air.

Some of the criteria that DOT used to determine the corridors to be analyzed are as follows:

1. The region as a whole, or important parts of it, experience regular congestion which affects and may be caused by intercity traffic flows.

2. The region consists of more than one state.

3. There may be a market for, or a public need, such as to justify investment and facilities for reliable, fast intercity passenger transportation.

4. There may be public interest in severely limiting the amount of land used by transportation facilities and/or coordinating the relationship between land use activity location and a transportation system.

5. There may be a need to give additional different considerations to environmental effects of intercity transportation facilities either because of already deteriorated environmental conditions or because of specific conservation objectives.

6. Because of the shortage of, and the price of fuel, there may be a rethinking of our present choice of transportation modes or toward a more efficient use of energy generally.

In the development of the corridors, cities with a 1995 projected population of 1/2 million or more were selected as the terminal points in each corridor. The 10 corridors chosen for consideration are as follows: Los Angeles-San Diego; New York-Buffalo; Chicago-Milwaukee (including Madison and Minneapolis); Pittsburgh-Detroit (including Cleveland); Chicago-Detroit; Cleveland-Cincinnati; Chicago-St. Louis; Tampa-Orlando (including Jacksonville and Miami); Texas (including Dallas-Fort Worth, Houston and San Antonio); and Seattle-Portland.

DOT has taken current demand data for the various transportation modes used in intercity travel and has projected them to the 1975 - 1980 time period. The data was collected in a number of ways.

For the automobile - Wilbur Smith and Associates conducted an automobile survey in 1971. The survey was expanded using average daily traffic data at various control points.

Air travel demand was developed in the 1970 Civil Aeronautics Board domestic origin destination survey of airline passenger traffic, which basically is a 10 percent sample running from January 1 to December 31, 1970 of all airline tickets sold by the certificated trunk and local service airlines for domestic travel supplemented by information on tickets originally issued by airlines not reporting traffic for the CAB domestic traffic survey.

Estimates of rail travel were developed from whatever passenger data was available in the files of the railroads providing service in a given corridor.

Bus travel was estimated from the 1971 Origin Destination Study conducted by the Greyhound Corporation and from operating statistics of the bus companies operating in the particular markets, principally Greyhound and Trailways.

The demand projections tried to do a few things. Not only was the total demand for intercity transportation service projected, but also an attempt was made to project how demand would shift from one mode to another based on various factors, and the key factors, of course, were time between the cities, the cost, being generally the fare, and also the frequency of service. These are the basic determinants. To do this, DOT cranked the existing demand based on existing data into two mathematical models to forecast demand for the projected year 1975. Two different mathematical models were used. First, total passenger travel demand for all modes was forecast utilizing a "Fratar" computer arithmetical model. And second, what DOT calls a "Policy Sensitive Modal Split Model" was applied to assess the share of the market, the patronage and the passenger revenue for each of the modes competing in a given market and corridor.

DOT has data on present demand and because they've been keeping

track of this they have some idea about current growth in demand. I understand that the analysis is pretty much a matter of extrapolating that growth rate into the future.

I'll give you the forecast for 1975, 1980 and 1985 for the cities in the Portland-Seattle corridor when we get to the discussion of that particular region.

Much more difficult, of course, was the projected analysis of modal choice, which not only involved total demand for transportation service, but demand for different services, rail as opposed to air for example, and how that demand would be effected by different factors -- time, money and frequency.

Without trying to evaluate the details of the mathematical models on which the DOT forecast is based, I can mention briefly the actual data which was used in developing figures for present travel time, cost and frequency for the air, automobile, bus and rail modes. Travel time between Portland and Seattle for all the modes was set out in Federal Railroad Administration -- Peat, Marwick, Mitchell studies. They measured existing travel times by automobile, bus, and airplane from central business district in Portland to central business district in Seattle and did the same for the other city pairs in the other regions. Line-haul rail travel time was taken from the 1972 Amtrak timetable and in those corridors where Amtrak does not provide rail service, the last existing conventional rail service was used, taken from the Official Guide of the Railways. Because we really don't have enough data on the turbo-trains, and certainly no data on them directly pertinent to the Seattle-Portland market, travel time for the turbo-trains was arbitrarily estimated at 70 percent of the travel time for conventional rail equipment. Because of its self-banking capability and its relatively higher power to weight ratio, the turbo-train would be expected to have a lower travel time for a given route than conventional rail equipment. However, the time savings which would result from utilization of turbo-train equipment is a function of various factors, unique to each corridor including curves on the route, intermediate stops, capabilities of the conventional rail equipment, the extent to which municipal speed restrictions will constrain rail operations and conflicts with existing freight transportation -- which is to say the available excess capacity on the rail routes

in question. We'll get into these as they apply to Portland and Seattle in a minute.

Improved Passenger Train (IPT) service was also projected and studied. The IPT doesn't exist. It's a theoretical construct which has the speed of a turbo-train, which by definition doesn't cost any more than conventional rail, and therefore time for the IPT was assumed to be 70 percent of the line-haul time for conventional rail - the same time projected for the turbo-train. The turbo-train which is characterized in the DOT analysis has pretty much the characteristics of the United Aircraft Turbo-Train. Actually the French turbo-train now being tested in the Chicago-St. Louis corridor has many of the characteristics of the Improved Passenger Train.

With respect to each corridor the Department has made an allowance for access time from and to theoretical origins and destinations so in effect when we get to the numbers for Portland-Seattle, that will be door to door service times between typical origins and destinations that we'll be talking about.

Line-haul costs, again for Seattle-Portland, has been taken out of the Peat, Marwick, Mitchell study which was commissioned by FRA. For example, the cost data for motor vehicles used an operating cost of 4¢ per vehicle mile and an average occupancy for intercity travel of two persons, driver plus a passenger.

Existing published fares were used for bus, for conventional rail and for existing airline service. The short takeoff and landing air service was estimated to be 120 percent of existing conventional airline service. This was based on a comparative analysis of conventional versus short takeoff and landing service in the Chicago-Detroit corridor.

Based on existing experience with the cost of operating turbo-trains, the turbo-train fares were estimated to be 150 percent of conventional rail. And as I indicated for the Improved Passenger Train the fare was posited to be the same as for conventional rail.

Frequency for existing bus, conventional rail and conventional air services of course, is, again, taken from the published tariffs. There is no frequency limitation for automobile service, of course. For the turbo-train the IPT and the short takeoff and landing plane various frequencies were posited by DOT in an effort to see if improved service in terms of greater frequencies would result in a different modal choice by

the 1975 passenger market.

Also, access costs, in addition to access time, in the cities studied and the location of the particular intercity transportation facilities were estimated and projected in order to provide a cost projection of not just city-to-city, but door-to-door transportation service.

The Seattle-Portland corridor has been broken down to include the various city pairs within the corridor, Seattle-Olympia, Seattle-Portland, Tacoma-Portland, and Olympia-Portland. The Seattle-Portland corridor area, or region if you prefer, has about 3 million residents now and is about average nationally in terms of per capita income and income growth. However, between 1960 and 1970 the average annual growth rate of the four principal cities in the corridor, Portland, Olympia, Seattle and Tacoma,was approximately 2.4 as compared with the national average of 1.3. Seattle has a somewhat higher per capita income and white collar employment than Tacoma or Portland. Comparable figures aren't available for Olympia because it's not a Standard Metropolitan Statistical Area. The forecast for total travel in the city pairs for the years 1975, 1980 and 1985 are available (Appendix) in table form.

There are no optional highways or rail routes in the corridor. Interstate 5 runs the length of the corridor connecting the principal cities. The only rail route is the Burlington Northern main line, between Seattle and Portland. The Route is used now by Amtrak and all through freight services. Seattle Tacoma Airport (Seatac) is located approximately half way between those two cities and the only significant air service is between Seatac and Portland. Only limited local service is offered to Tacoma and Olympia Airports.

The air, auto, bus and conventional rail mileage, time, cost and frequency for the major corridor trip segment, which is Seattle to Portland are also tabulated (Appendix). Both the time and the cost figures include an estimate to access and egress time and cost. The corridor is basically about 175 miles long, a little longer by rail and of course shorter by air. Air now has advantages in all areas except for cost. At present it is the most expensive mode. Bus travel is a half hour faster than rail and costs a little bit more. The time involved varies from almost 2 hours by air to over 4 hours by rail.

You'll notice the superior advantage that auto has over the other surface modes and I think in large part this has to do with the access time in the central business districts, which of course, you avoid with the automobile.

The cost advantage for the automobile is also significant and again remember we're positing two people in the car. With one it will, of course, be about twice as expensive, but with three or more the costs are lower. Of course, there is no frequency constraint with the automobile as with other modes, especially surface modes. Furthermore, the table doesn't reflect the fact that you've got your car at your destination when you get there.

Now what about the turbo-train? Well, at present the alignment of the railroad line in the corridor is very unsatisfactory for high-speed passenger operations, except for a segment of about 20 miles between Seattle and Tacoma. Over 25 percent of the route mileage is curved track, and heavy grades in the Napavine area are an obstacle to fast movement of freight trains and this results in significant freight train interference. This is a real problem. DOT notes, I believe, that even if there were no passenger trains on this route the density of freight traffic is sufficient to cause substantial interference among the freight trains. And frankly, I understand that the existing density of freight service alone over those lines is one of the reasons why the French turbo-train is being tested in a demonstration project between Chicago and St. Louis rather than between Portland and Seattle.

The result of the two mathematical models which DOT used to estimate and project demand, indicates that this corridor, Portland-Seattle doesn't really exhibit great potential (based on the DOT criteria) for heavy capital investment in new high-speed ground transit technology up to at least the year 1975. In the projected year 1975 none of the three rail alternatives are able to meet its operating costs under projected patronage generated revenues.

The bus revenues equal or exceed the total costs of operation. If the air mode is allowed to set frequencies according to projected patronage, given a reasonable historical load factor, their revenues would exceed their costs. DOT also made a projection based on a significant restriction in energy with accompanying increased energy costs.

The turbo-train doesn't perform especially well under this standard. Conventional rail service approaches the range of possible inclusion of corridor service, but the outcome for 1975 remains doubtful.

The hypothetical Improved Passenger Train benefits significantly from an energy price rise. However, operating revenues still fall below operating costs per passenger mile. And of course, no provision is made here for capital costs.

Let me sum this up. The DOT study pretty much discourages any prospects for heavy capital investment in high-speed ground transportation for the 1975 - 1980 time period. According to the DOT analysis, there is not enough demand to meet operating costs, and for that matter high-speed rail cannot compete in this corridor with existing modal alternatives, even if a severe energy shortage is posited. Again, let me stress, I'm just relating the interim readings on analysis still underway by DOT. The Department hasn't finalized this yet, so I want to stamp my remarks today pretty clearly as being in the nature of a draft report. And I'm neither criticizing nor endorsing the Department's study. And even if those projections and analyses are valid, there may well be other non-hardware, non-capital intensive approaches to help solve some of the problems that do exist with respect to intercity travel in the Portland-Seattle region and beyond; maybe the region should be described as Portland-Vancouver, B.C. It may well be that social or energy conservation considerations are of overriding importance. Moreover, the results should be studied in relation to potential for possible future government subsidy programs. Many of these problems are unique to this region simply because of geography, climate and its demographic characteristics. I think it is an area and a problem that merits further study.

It's useful at this point to reflect on the issue of regional transportation planning in the light of the Portland-Seattle Corridor Study. Despite all DOT's protestations in the Senate hearings as to weaknesses in taking a regional approach to transportation planning, the Department was able to develop criteria for regional entities, it was able to identify a number of regions, and it was able to analyze important aspects of transportation in the regions involved. A review

of the substantive merits of the analysis will have to await completion of the study and an evaluation by people with the necessary expertise. But I believe the study does demonstrate the workability of a regional approach to transportation. And the fact that of all the avenues available to the Department of Transportation it chose a regional approach, suggests the desirability of focusing on transport issues at a regional level. I would also like to advance the idea that perhaps the people here in the region with the most interest in the outcome of the solution are in fact the best qualified to perform those analyses, starting perhaps with defining the area that needs attention. This is one reason why a regional entity with flexibility and available funds such as proposed under the Magnuson bill still seems to make sense. And that's why I think it is a good idea to have a Center for Pacific Northwest Studies and to convene seminars, such as this one today.

ENDNOTES

[1]The co-sponsors with Senator Magnuson were: Senators Cranston, Jackson, Hart, Hartke, Hatfield, Hollings, Hughes, Inouye, Kennedy, McClellen, McGovern, Mathias, Mondale, Moss, Muskie, Pastore, Pell and Tunney.

[2]S.2425

APPENDIX

The Role of the Federal Government in Regional Transportation

Forecasts of Total Travel for Major Intercity Markets in the Portland-Seattle Corridor

City Pair	1975	1980	1985
Seattle - Olympia	3,965,192	4,158,509	4,557,289
Seattle - Portland	2,970,081	3,131,279	3,430,007
Tacoma - Portland	1,013,714	1,057,879	1,143,788
Olympia - Portland	385,389	397,614	427,521

Air, Auto, Bus and Conventional Rail Mileage, Time, Cost and Frequency between Portland and Seattle, Door to Door

	Air	Auto	Bus	Rail
Minutes	118	172	233	269
Miles	125	174	174	186
Cost ($)	27.59	3.48	8.56	7.11
Frequency	30	--	14	6

ACCESSIBILITY AND TRANSPORTATION: AN ANALYSIS OF MILITARY LAND USE POLICY AND PRACTICE IN THE PACIFIC NORTHWEST, 1849-1970

William H. Freeman Jr.

The military archives are burgeoning with the letters and entreaties of local governing bodies, representatives, and citizens who voraciously sought to persuade military authorities to place a military installation within their community. Communities who were selected to be neighbors of such facilities seldom felt it appropriate, and perhaps even unpatriotic, to question the propriety of military activities so long as sufficient Federal funds were left with local businesses, and military exercises did not interfere with Sunday morning worship services. All that has changed today.

The increasing scarcity of land and natural resources, in concert with a growing public environmental awareness, is stimulating an increasing public interest in military lands, particularly by those citizens who now covet them for alternative, non-military uses. In spite of this interest, the management history of military lands has received short shrift in both land use and economic impact studies in favor of those agencies who are responsible for the management of far greater quantities of public lands.

We know very little about the land management policies of the Department of Defense, or of its predecessors, the War and Navy Departments, which held in fee simple, or was otherwise responsible for the management of, 23,565,133 acres of land and resources within the contiguous United States in 1968.[1] This figure represented approximately 3.25 per cent of the total public, Federal lands, both Public Domain and acquired.

This paper attempts to fill a portion of that void by providing an initial introduction to the historical relationship between civilian transport systems and military installations and activities in the Pacific Northwest.

Influence of Transport Systems on Regional Military Land Use Policy

Military land use policy in the Pacific Northwest has developed through a series of historical periods which closely approximate the evolution and application of transport technology in the Pacific Northwest.[2] Military settlement patterns have, in fact, mirrored the development of the contiguous civilian landscape.[3]

Warfare is a dynamic social act which is not so much based on a strategy of positions as it is upon a strategy of movement between positions.[4] Land which facilitated such movement and maximized accessibility to other selected points in order to minimize cost in time and money has been highly valued by military authorities.[5]

The degree of accessibility to land parcels has been determined, in the main, by transport system effectiveness.[6] The placement, modification, and/or abandonment of military lands and installations in the Pacific Northwest has been based upon the necessity to maximize the accessibility of those activities to both domestic supply routes and to actual or projected theatres of operation. Harbor defense fortifications, for example, were constructed at the entrances to major Pacific Northwest ports at sites where a hostile confrontation, had it occurred, would have provided maximum access to enemy forces.

Interaction between two specific points in the landscape occurred only in the absence of more advantageous exchanges or relationships at alternative points or intervening opportunities.[7] Interaction occurred between two areas or points only if no intervening source of supply was available.[8] In the nineteenth century the Army ceased to import to the Pacific Northwest certain foodstuffs and supplies from the eastern seaboard as those commodities became available from local sources (Indians, or White farmers and businessmen).

Prior to the completion of transcontinental rail linkage, overland transit costs between the Pacific Coast and the eastern population centers were so expensive that the high transit costs themselves were considered adequate defense against foreign invasion via the Pacific Coast.[9] Transcontinental rail lines reduced such transit costs so much, however, that harbor and naval defenses were thereafter necessary at points in the Pacific Northwest to protect access to the East. A reduction in transport costs to the Pacific Northwest not only increased the economic ties

with the East, it also increased the potentially complementary (but politically negative) relationship between foreign and domestic military forces. Continental defenses needed to be adjusted to include the Pacific Coast, first at San Francisco, then at the Columbia River and finally on Puget Sound.[10] The reduced transit costs of transcontinental movements also caused a "substitution of products;"[11] the provision for permanent harbor defenses in the Pacific Northwest was substituted for long-range (defense-in-depth) transport costs. It was transit cost, or ease of movement between points, which determined accessibility, and which was particularly important in determining military site selection and military population density.

These previous examples suggest that changes in military transport preference mirrored significant shifts in regional transport technology and settlement patterns, and that a major factor in a land parcel's use-ability or military value has been determined by the accessibility of that site from other related or complementary sites and activities. Based upon data collected by the Bureau of the Census and other Federal agencies, since 1830, there would appear to have been four transitional periods when the concept of site or regional accessibility was modified by the implementation and use of new combinations of energy sources, motive power and pathway limitations.[12] By collecting or translating the data for these indicators on the basis of development or utilization in per cent of the peak decennial year, it is possible to compare the quantities used of various forms of energy, transport modes, and transport pathways during any decade.

It seems apparent that the steam engine, low-priced steel, electricity, the internal combustion engine, the turbo-jet engine, and electronics have been the primary innovations that have generated new forms and patterns of spatial interaction.[13] When applied to transportation, these innovations appear to have generated a sequence of preferred transport systems or modes which, in turn, encouraged modifications in military land use patterns, land use density, and nodality or concentration of activity.[14] If identified by the route pathways of the major mode of transportation, the sequence of military cultural landscapes in the Pacific Northwest are the Trail-waterway Epoch (sail and animal), to 1849; River-Waterway Epoch (steam), 1850-1875; Steel-Rail Epoch, 1876-

1919; Paved Road Epoch, 1920-1950; and the Aerospace-Airwave Epoch, 1950 to the Present.[15]

Military Use of Civilian Transportation Systems

As early as 1848, the Army began to resort to the use of contractors to move supplies overland and by sea to the Pacific Northwest. The freight rates for seaborne movements of military supplies and provisions to the Pacific Coast were high, but in spite of the long distance the movement generally took less time, and disasters at sea claimed considerably less cargo and men than did the harsh overland journey to the same post. Military personnel were poorly equipped and simply lacked the training and experience to supply their own posts by land routes. In October of 1849, Lt. Colonel William Loring arrived at Fort Vancouver, Oregon Territory, with four companies of mounted riflemen after a five-month overland trek from Fort Leavenworth. Along the way, most of the wagons and horses, plus many thousands of dollars worth of clothing and other provisions were lost.[16] By 1852, therefore, it was preferred to move supplies from the east coast to San Francisco by clipper ship around the tip of South America for about twenty cents per pound.

> In sending troops from the North to this place, I would suggest that they should hereafter come around Cape Horn. They reach here in clipper ships from New York in a very reasonable time, seldom taking over one hundred and twenty days, and sometimes less, and arrive in good health. Recent experience has shown that, unless in a case of emergency, the Isthmus is a very trying route, causing much sickness and a great loss in public property besides double the expense, compared with the other route.[17]

The completion of the railway across the Isthmus of Panama in 1855 reduced the transit time and the amount of sickness. The steamboat began replacing the clipper ship on both the Atlantic and Pacific links. The cost of transporting supplies was reduced to approximately eight and one-half cents per pound, and the journey for passengers now lasted for only one month, if all went well.[18] All supplies were routed to San Francisco, from which specific requisitions for the Pacific Northwest were shipped by coastal sailing vessel or steamer. Cost from San Francisco to all points on the Columbia River, by either mode, was about thirty

dollars per ton, or one and one-half cents per pound.[19] Supplies could, therefore, reach the Columbia River from the eastern seaboard in the 1850s for a total of ten cents per pound.

Figure 1 is based upon domestic military passenger traffic for the years 1865 through 1930, inclusively.[20] Passenger movements by coach included both scheduled stage and unscheduled wagon train. Most of these passengers were moved by scheduled coach in later years. The last recorded year for such movements was for the fiscal year 1910.[21]

Waterborne passenger movements shown in Figure 1 are for inland and coastal waters exclusively. Overseas shipments and troop movements, as few as they were, were listed separately.[22] After 1910, only overseas waterborne movements are reported; domestic water movements probably still occurred,[23] but at a volume too small to report.

It is apparent from the data cited that the railroads held an increasing share of the military passenger movements from 1870 (46 per cent of the total) to about 1900 (94 per cent of the total).[24] From about 1900 to 1910 the railroad dominated domestic passenger movements. After 1919, no mention is made in annual reports of transport modes, other than that rail was utilized for the movement of personnel or freight. More recently, wagons were gradually replaced by trucks for tactical field and internal post movements from about 1916 through 1940.[26]

For the period 1931 through 1940, specific transportation data is remarkably absent from all of the records thus far searched. It is reasonable to presume, however, that most military passenger travel during this period was by rail.[27]

Figure 2 details military domestic transport data for the period 1940 to 1970.[28] A complete rail traffic record exists for the period 1941 through 1968, and is reflected in the figure.[29]

An incomplete record exists for the use of busses for the movement of military personnel in the region. Movements were reported for the periods 1942 through 1945, and from 1955 through 1960.[30] This record is too incomplete to formulate any conclusions. It is possible that busses were used for shorter, intraregional movements in lieu of rapidly diminishing rail service. It can be stated with more certainty that the use of busses diminished, as enlisted personnel were allowed greater use of their private automobiles for domestic movements.

FIGURE 1 .

DOMESTIC MILITARY PASSENGER TRAVEL BY TRANSPORT MODE: 1866–1930 25

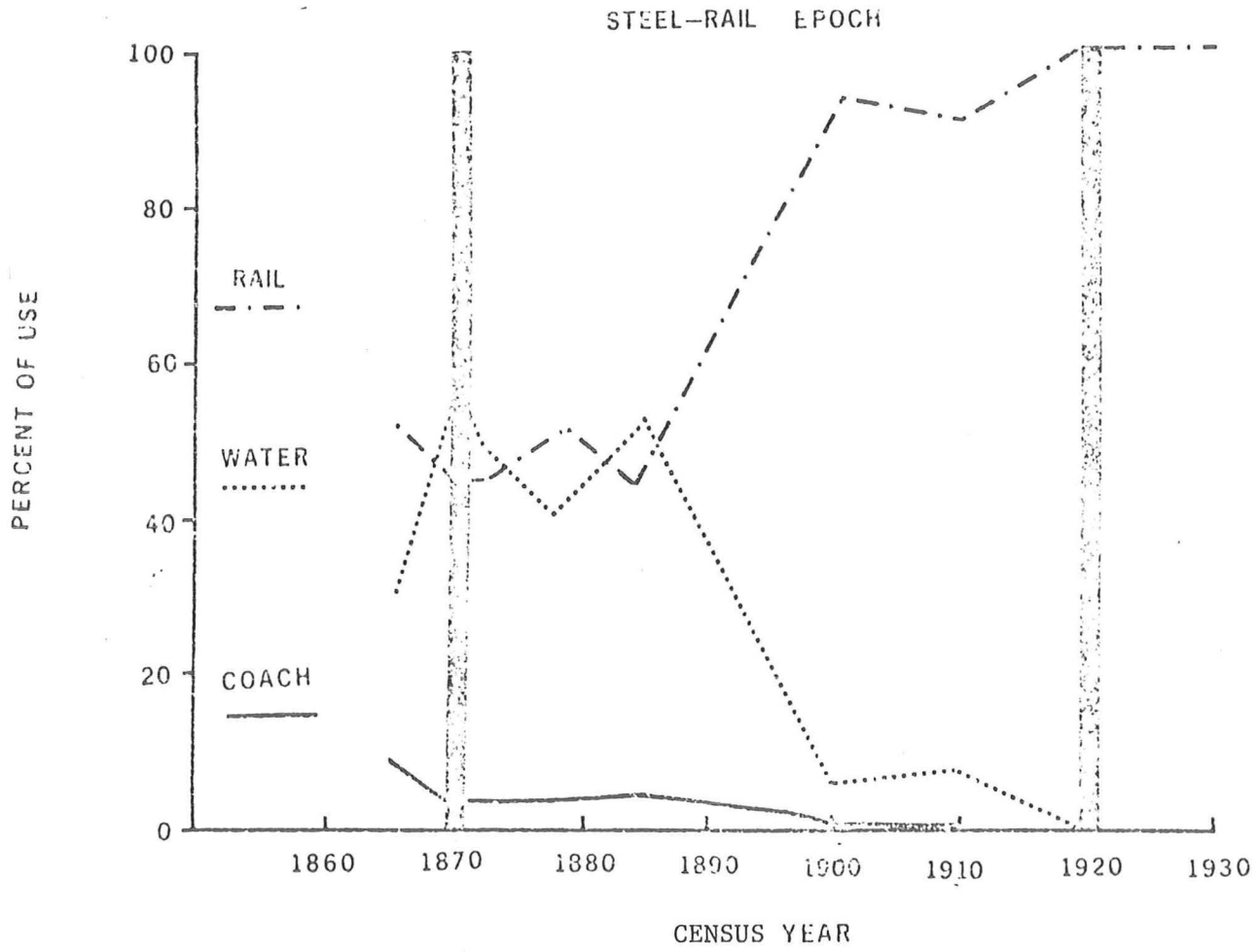
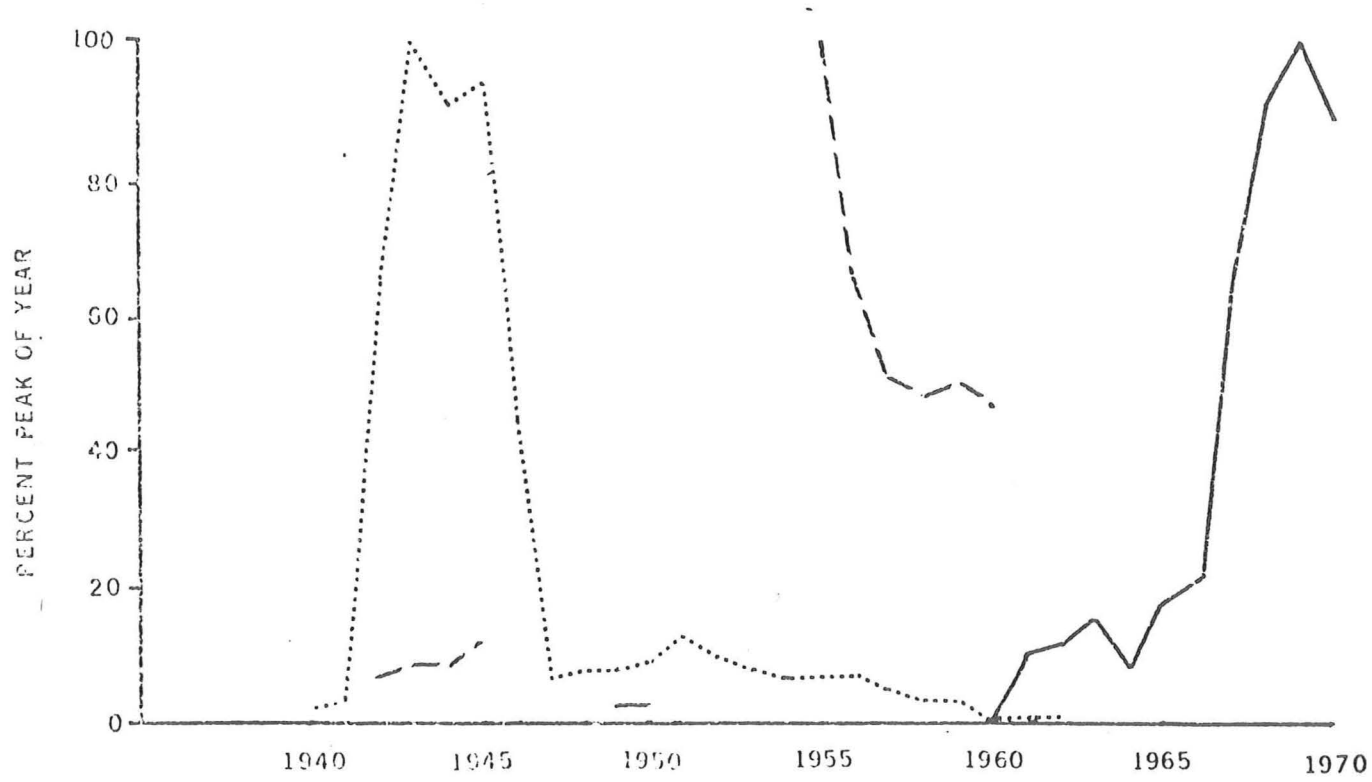


FIGURE 2

THREE INDICATORS OF DOMESTIC MILITARY PASSENGER MOVEMENTS: 1940–1970[32]



DOMESTIC MILITARY RAIL TRAVEL. PEAK YEAR 1943 .....

DOMESTIC BUS TRAVEL PEAK YEAR 1955 — — —

PASSENGER AIRLIFT THROUGH MC McCHORD AFB AERIAL PORT. PEAK YEAR 1969 ———

Airlift was increasingly used for military interregional and overseas passenger travel after 1960.[31] No record exists of the number of passengers using commercial airlines for domestic travel. A suitable surrogate for airlift does exist, however, in the total number of passengers who passed through the McChord Air Force Base, Washington passenger terminal. While data for authorized military travel by private automobile is still not available, it does seem logical that the automobile accounted for virtually all of the passenger travel not accounted for by airlift.[33]

The record shows that military planners were opportunists in the use of civilian transport modes and routes, and the result has been that the impact of technological innovation and modified transportation systems upon military land use policy has been significant.

Increased accessibility through improved transport systems did allow greater choice in the location of military activities within the region. In fact, as new transport systems affected site accessibility, a greater number of sites were considered for military purposes, but only those sites with maximum accessibility to established civilian population centers and transport systems were considered.[34]

Technological innovation hastened the demise of obsolescent transport technology and its attendant hardware, physical structures and route pathways. Military installations that had been highly utilized during an earlier period deteriorated and decayed if the replacement technology and transport system could not utilize that installation. When a specific installation was retained for use during later periods, obsolescent structures and functions often impeded, obstructed and made more costly the logical development of the site's new function and transport system.[35] For a military installation to have survived the influence of more than one transportation epoch, it must have been able to absorb the social and economic costs involved in the transition to new transport systems without having compromised mission efficiency. The specific example of the dominance and decline of the influence of waterways on regional military activity for the period 1849 to 1875 will suffice to illustrate the basic thesis of this paper.

The Dominance and Decline of Waterway Influence From 1849 to 1875

With headquarters at Fort Vancouver, the primary objectives of military forces from 1849 to 1875 were to: (1) establish a military presence in the Oregon Territory (Pacific Northwest); (2) patrol, survey, and defend the new (and not completely finalized) international boundary; (3) establish and maintain a peace-keeping military buffer between Indian and White settlements; and (4) control the Indian and White communication and travel routes.

An efficient system of navigable waters allowed the Army to garrison its largest force at Fort Vancouver on the lower reaches of the Columbia River where it could be efficiently provisioned from sea-going vessels, while the force could still be dispatched to trouble spots anywhere in the region with a minimum time loss. In the meantime, small garrisons were strategically positioned to protect and support main supply routes and established White settlements or mining activities that were distant from the population and commercial centers in the lower (northern) Willamette River Valley. This pattern was immediately established upon the Army's arrival in 1849, and was successfully continued without major modification through the subsequent years while water transportation was dominant.[36]

In 1850, 380 officers and men were assigned to the Oregon Department for the protection of the regional interests of the United States and the population of the Oregon Territory. In a territory that included some 280,000 square miles, it was decided to station 254 men, or two-thirds of the garrison, at Fort Vancouver.[37] Of the remaining men, 59 were stationed at Astoria, and 67 were stationed at Fort Steilacoom. From this modest beginning, a pattern was established which dictated that most personnel would be garrisoned at a primary post adjacent to a population and transportation center, while the remainder of the men would be assigned to a varying number of sub-posts strategically situated throughout the remainder of the region.

Originally established by the Hudson's Bay Company, Fort Vancouver was situated on a Columbia River site which was at the approximate head of seaborne navigation. By following the lead of the British trading company, the Army was taking advantage of the trading company's previous thirty years of experience with the established communications

patterns within the region.[38] Dependent as it was upon trade, the Hudson's Bay Company had placed its posts at points where transportation routes of native Americans, trappers and migrant homesteaders converged. Situated just upstream from the confluence of the Willamette River with the Columbia, the site was admirably suited for the control of the entire Columbia River drainage. The Fort possessed lesser, but acceptable, access to Puget Sound, via the Cowlitz River Valley, and to the southernmost part of Oregon, via either the coast or overland from the head-waters of the Willamette River. Fort Vancouver was acceptably situated with respect to regional centers of commerce and population to perform its function as the command headquarters and logistical center for military activities in the Pacific Northwest.

By such judicious placement of garrisons, the Army could also maximize its effective defense and use of these primary transport routes. This site selection rationale allowed the Army to be readily re-supplied by sea at a location contiguous to the primary population centers of the Willamette Valley.

> Colonel Loring, still in command of this department, declared reserve of four miles square at this place. . . It is the spot first selected as garrison and depot on the arrival of troops here, and it is still believed to be far the most eligible site in the territory. It has more resources for a military depot than any other known to any of us who have been here longest. It answers well as a depot for army stores and a rendevous for troops, and starting-point to any place in the interior.[39]

By 1860, there were 1,848 officers and enlisted men assigned to the Department of the Columbia (the original Oregon Territory). Of this total, 428 men, 23 per cent, were present for duty at Vancouver. Large contingents were at Forts Walla Walla (318) and Colville (375). The remaining 675 men were fairly equally distributed among eight other posts. The striking fact is that all posts, with the exception of Fort Walla Walla, were located adjacent to navigable bodies of water.[40] In 1860, Portland and Walla Walla were dominant population centers, and the military population reflected that fact. In that year, military population comprised 3 per cent of the population of the Oregon and Washington Territories which totalled 64,059.[41]

TABLE 1

Military Population in the Pacific Northwest,[42]
December 31, 1860

Post	Officers	Enlisted Men	Total
Ft. Cascades	4	56	60
Camp Chehalis	4	52	56
Ft. Colville	15	360	375
Ft. Dalles	9	142	151
Ft. Hoskins	8	132	140
Camp San Juan	4	68	72
Ft. Steilacoom	3	28	31
Ft. Townsend	7	73	80
Ft. Vancouver	14	414	428
Ft. Walla Walla	22	366	388
Ft. Yamhill	4	63	67
TOTALS	94	1754	1848

By 1870, there were 1,291 military personnel in the Pacific Northwest, of which 164, 18 per cent, were stationed at Fort Vancouver. Whereas there was one military man for every thirty-five citizens in 1860, there was only one soldier for every eight-nine persons of a civilian population of 114,878 in 1870 (TABLE 2).[43]

TABLE 2

Military Population in the Pacific Northwest[44]
December 31, 1870

Post	Officers	Enlisted Men	Total
Ft. Boise	5	73	78
Ft. Canby	4	90	94
Ft. Colville	4	55	59
Ft. Hall	3	117	120
Camp Harney	9	193	202
Ft. Klamath	2	66	68
Ft. Lapwai	4	84	88
Camp San Juan	3	85	88
Ft. Stevens	4	82	86
Camp Three Forks Owyhee[a]	3	47	50
Ft. Vancouver	4	160	164
Ft. Walla Walla	Not occupied (Depot for wintering animals).[45]		
Ft. Warner	12	182	194
TOTALS	57	1234	1291

Camp Harney had the largest contingent of soldiers in the Department of the Columbia in 1870. They were there to quell Indian uprisings in the basin and range lands of southeastern Oregon and northern Nevada. If the military population figures of 1870 were accepted at face value, it might be postulated that the center of all military activity had shifted to a remote post in the region, some seventy-five miles from any white settlement. A careful review of the post returns for the period indicates that Camp Harney was, in fact, the tactical center for encounters with the Indians, but that the concentration was only temporary. The command and logistical center for the region remained at Fort Vancouver.

Post returns reflect both temporary and permanent assignment of personnel. If, in the judgment of the Commander, the hostilities were expected to be of relatively long duration, the Commander reassigned units to the appropriate post on a permanent basis. If the military response was to be in the form of an extended march for a reasonal campaign, then the units continued to be assigned to their permanent post, and a notation was made as to the number of troops that were in the field. Post Returns of the preceding and succeeding years record that Fort Vancouver had a normal complement of approximately 250 officers and men, and that certain units were reassigned to Camp Harney for the duration of the Indian threat.[47]

Fort Vancouver remained the headquarters and logistical center for the Department. As such, there were many permanent buildings, many of which were warehouses dedicated to the storage and dispersal of supplies for the entire Department. In contrast, Camp Harney possessed, in 1872, one permanent quartermaster and commissary storehouse, eighty by forty feet, and one granary, seventy by thirty feet, both

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[a]Camp Three Forks Owyhee consisted of four reserves declared by the President and published in General Order 29, Dept. of the Columbia, Series 1869, Latitude 42° 51' North, Longitude 116° 50' West, about 50 miles south of the present Nampa, Idaho in the shadow of the Owyhee Mountains. Returned to the Interior Department by General Order 801 of 1884, it is not precisely clear why the camp was established, but it may have been intended to protect the Silver City mining camp from hostile Indians. It was garrisoned from April 30, 1867 through June 1871.[46]

constructed of logs. Fort Vancouver possessed several frame buildings capable of holding supplies for one thousand troops, their horses and livestock, for a full year.[48] Camp Harney's strength was reduced to 123 men by the end of 1871. Fort Vancouver's strength was 245 men, which was 26 per cent of the Department's diminishing total strength of 935 (See TABLE 3). For the remainder of the decade, it is apparent that men were moved from Fort Vancouver to wherever temporary reinforcement was required in the field.[49]

TABLE 3
Military Population in the Pacific Northwest[50]
December 31, 1871

Post	Officers	Enlisted Men	Total
Fort Boise	3	22	25
Ft. Canby	2	16	18
Ft. Colville	4	57	61
Ft. Hall	3	59	62
Ft. Harney	8	115	123
Ft. Klamath	5	91	96
Ft. Lapwai	4	85	89
Camp San Juan	4	56	60
Ft. Stevens	3	27	30
Ft. Vancouver	13	232	245
	9	117	126
TOTALS	58	877	935

Fort Vancouver was not well suited to maintain contact with the basin and range lands at the southeastern extremities of the region. These latter lands were more convenient to San Francisco or Salt Lake City, particularly after the central rail route was completed in 1869. Prior to 1869, Camp Three Forks Owyhee was forty miles from Silver City, Idaho, and 518 miles, or forty days, from Fort Vancouver. After the railroad was completed to San Francisco, the 672 mile trip to Silver City was mostly by rail from Winnemucca, Nevada, and took only fourteen days.[51] Supplies were thereafter obtained for this particular post from San Francisco. Military authorities were quick to take advantage of improved transport connections, and this is but the first example of the impact of rail transport upon military land use and transportation policy in the region.

The first regional and transcontinental rail lines in the Pacific Northwest by-passed Vancouver and centered on Portland, which had become the regional commercial and transportation center. Properly sited for water dominated transport routes to the interior, Fort Vancouver became more and more off-center to sea-borne arrivals and transhipment functions at Portland. It is important to remember that:

> . . .steamboats were able to play a vital role in the economic life of the West only so long as population, industry, and trade were concentrated along the trunk lines of the river[52]

Rail lines eventually reached Fort Vancouver, but military authorities increasingly expressed their dissatisfaction with being so inconvenient to the hub of commercial and transportation activity in Portland.

During this initial period of military settlement, the Army determined the permanence of all of its posts on the basis of their role in keeping the peace, stabilizing relationships between Indian and White, and in patrolling important transport routes.[53] The dominant factor in determining the location and permanence of a post was, therefore, primarily determined by the influences of waterways and trail, sailing ship, steamboat, horse and foot. That situation changed dramatically between 1875 and 1880, when military site selection policy was revised by the wholehearted adaptation of overland and continental movements to rail transport systems.[54]

The Pacific Northwest rail system was, by 1888, physically tied to a national network which responded to national economic interests, markets and political trends. The significance of this development for military defense strategy and for military land use in the region was dramatic. Where recently there had been but one regional center at Portland, now the military planners had to account for the defense of Tacoma and Seattle on Puget Sound and for Spokane in the Interior. Further, the population and economic centers of the Nation were now accessible to foreign adversaries via Pacific Northwest ports and rail connections to the East. The Nation was suddenly vulnerable from its farthest reaches, and both War and Navy Department plans were modified to reflect this new circumstance.

Official military correspondence increasingly reflected a desire to move its departmental headquarters and its outlying posts to locations that were more accessible to transcontinental rail routes. Military activity turned from its primary role of quelling intra-regional Indian-White hostilities to the coastal or frontier defense of national interests.

Vestiges of the earlier posts and garrisons were to remain, in some cases for several years, but unless those older facilities could perform some relevant role under the new site criteria they were selected for closure as soon as new facilities could be completed and local political concerns could be neutralized or mollified. The modification of the military settlement pattern cannot, thus, be explained exclusive of the development of a transcontinental rail network.[55]

In 1880, Fort Vancouver, now known as Vancouver Barracks, continued to be the dominant, regional military center, in spite of its increasingly inefficient location to regional rail systems and sea-borne supply routes. Personnel strength reports of December 31, 1880 (TABLE 4) reflect that 19.4 per cent of the Department's strength was assigned to Fort Vancouver, while almost as many men were posted at the interior cavalry sub-post of Walla Walla.

TABLE 4

Military Population in the Pacific Northwest,[56]
December 31, 1880

Post	Officers	Enlisted Men	Total
Boise Barracks	6	102	108
Fort Canby	6	81	87
Fort Colville	5	119	124
Fort Hall	4	40	44
Fort Harney	(abandoned June 13, 1880)		--
Camp Howard	2	37	39
Fort Klamath	4	109	113
Fort Lapwai	7	104	111
Fort Sherman[a]	18	177	195
Fort Spokane	9	109	118
Fort Stevens	2	38	40
Fort Townsend	4	86	90
Vancouver Bks.	14	323	337
Fort Walla Walla	18	314	332
TOTALS	99	1,639	1,738

[a]Initially called Fort Coeur d'Alene.

By 1890, the influence of the new rail system and the shift of forces toward the defense of a national or frontier boundary was becoming evident. Table 5 reflects that of the fourteen active posts in 1880, only eight remained. Departmental and regimental headquarters remained at Vancouver in support of three interior, Indian management posts, one interior cavalry post, and three (two were garrisoned) harbor defense posts.[58] Department strength had been reduced by 12 per cent to 1498 personnel. Of these, 27 per cent or 402 men were assigned to Vancouver, 21 per cent to the cavalty post at Walla Walla, and 24 per cent to Fort Sherman, just east of Spokane. Only 199 personnel, or 20 per cent, were stationed at posts not on rail lines.

TABLE 5

Military Population in the Pacific Northwest,[57]
December 31, 1890

Post	Officers	Enlisted Men	Total
Boise Barracks	7	119	126
Fort Canby	7	70	77
Fort Sherman	27	324	351
Fort Spokane	11	147	158
Fort Stevens	(Caretaker status)		--
Fort Townsend	4	60	64
Vancouver Bks.	21	381	402
Fort Walla Walla	16	295	311
TOTALS	93	1,396	1,489

To maximize the effectiveness of available troops the effort was continued to consolidate Departmental personnel at existing or new posts that were most accessible to regional rail routes. The final result saw the closure of Forts Townsend on the Olympic Peninsula, Spokane at the confluence of the Spokane with the Columbia River, and Sherman on the nothern shore of Lake Coeur d'Alene. New posts were established at Seattle (Fort Lawton) and Spokane (Fort George Wright), and construction was also authorized for new harbor fortifications at the mouth of the Columbia River and at the entrance to Puget Sound. Boise Barracks was not significantly enlarged, but because of its location on a transcontinental rail line it was retained to provide ready military access to, and presence in, southern Idaho and southeastern Oregon.

These changes, while interrelated, can be best explained by dividing them, as did military authorities, into two categories: regional cavalry and infantry posts and frontier or coastal defense posts. The former were primarily designed to maintain and provide for domestic tranquility within their assigned region, whereas the latter posts had as their primary mission the assurance of the territorial integrity of the frontier boundaries and ports of the Nation. The cavalry and infantry posts reflected a consolidation and continuation of the forts and policies that developed out of the Army's Indian containment role, whereas the frontier posts were a new development and function for the Army which recognized the increased economic and military significance of the Pacific Northwest for the Nation.

Summation

The placement and utilization of domestic, Pacific Northwest military installations reflected a strong policy commitment to the accessibility that is provided by preferred civilian transport systems. Military authorities always sought to maximize their accessibility to the region they were assigned to serve. Military logistical and command activities have always been placed in or contiguous to regional population and transport centers where they were able to take advantage of the transport and communication accessibility provided by these centers to points both inside and outside the region.[59] Tactical military activities which have had a greater dependence upon military transport capability have still been placed near civilian transport systems in order to receive logistical support. Only self-contained defense installations which required minimum logistical and command support have been relatively independent of regional transport systems. These latter facilities possessed maximum military transport accessibility, but only to points where hostile forces were expected to mass or concentrate.

The following table illustrates some typical installations and the pattern or hierarchy of transport and communication accessibility which existed for those specific years.

TABLE 6

Typical Military Transport and Communication Linkages
for Selected Pacific Northwest Installations

Year:	1870	1920	1970
Regional Center:	Portland	Seattle	Spokane
	↓	↓	↓
Accessibility to:	Ft. Vancouver	Puget Sound Naval	Fairchild AFB
	↓	↓ Station	↓
	Ft. Klamath	U.S. Navy Ships	Missile Site
	↓	↓	↓
	Indian Populations	No. Pacific Ocean	Foreign Soil

As civilian population centers and transport systems have changed or adjusted, so has the placement of military installations. The introduction of new transport modes and pathways, and/or adjustments in civilian (including Indian) settlement patterns always dictated a re-evaluation of military site selection and land use policies. An installation remained active only if it retained or increased its relative accessibility to required objectives.

FOOTNOTES

[1]Data from General Services Administration real property inventory records for agencies as of June 30, 1968, with minor adjustments.

[2]John Borchert, "American Metropolitan Evolution," Geographical Review, LVII (July, 1967), p. 301.

[3]Lancaster Pollard, "The Pacific Northwest," in Merrill Jensen (ed.), Regionalism in America (Madison, 1965), p. 188.

[4]Edward L. Ullman, "The Role of Transportation and the Bases for Interaction," in William L. Thomas (ed.), Man's Role in Changing the Face of the Earth (Chicago, 1956), p. 867.

[5]Walter G. Hansen, "How accessibility Shapes Land Use," Journal of the American Institute of Planners, XV (1959), pp. 73-76; Richard L. Morrill, The Spatial Organization of Society (Duxbury Press, 1974), pp. 8-9.

[6]Ullman, op. cit., pp. 862-63. See also J.R. Whitaker, "Regional Interdependence," Journal of Geography, XXXI (1932), pp. 164-65.

[7]See Samuel Stouffer, "Intervening Opportunities: A Theory Relating Mobility to Distance," American Sociological Review, XV, pp. 845-67; Ullman, op. cit., p. 868; Ronald Abler, John S. Adams, and Peter Gould, Spatial Organization, The Geographer's View of the World (Englewood Cliffs, New Jersey, 1971), p. 194.

[8]Ibid.

[9]This policy is evident in virtually all of the relevant Army and Navy correspondence for the period, 1849-1900.

[10]Ullman, op. cit., pp. 867-68. Such adjustments, or substitution of defenses, is a form of Ullman's "intervening opportunity" substitution of areas.

[11]Ibid.

[12]Borchert, op. cit., pp. 301-32. The title of Borchert's epochs have been changed to reflect a greater title consistency, and the "air" segment of his "Auto-Air-Amenity Epoch" has been made into a separate category.

[13]Numerous sources are relevant here. See: Borchert, Ibid., pp. 303-07; John W. Oliver, History of American Technology, (New York, 1956); Harlan Gilmore, Transportation and the Growth of Cities (Glencoe, Illinois, 1953); Louis C. Hunter, Steamboats on Western Rivers (Cambridge, Mass., 1949); Robert W. Fogel, Railroads and American Economic Growth (Baltimore, 1964); John Rae, The Road and Car in American Life. (Cambridge, Mass., 1971); Kenneth R. Sealy, The Geography of Air Transport (Chicago, 1957, 1968).

[14]Borchert, Ibid.

[15]Ibid., pp. 307-08; D.W. Meinig, "American Wests: Preface to a Geographical Interpretation," Annals, LXII (June, 1972), pp. 172-76.

[16]Senate Exec. Doc. No. 1, 32nd Congress, 1st Session, op. cit. See also Robert M. Utley, Frontiersmen in Blue. The U.S. Army and the Indian, 1848-1865 (New York, 1967), pp. 65-66. Documents and journals of the march are reproduced in Raymond W. Settle (ed.), The March of the Mounted Riflemen From Fort Leavenworth to Fort Vancouver, May to October 1849 (Glendale, California, 1940).

[17]Senate Exec. Doc. No. 1, Part II, 32nd Congress, 2nd Session (Quartermaster General's Report, Appendix B-1, Chief Suartermaster, Pacific Division to Quartermaster General, San Francisco, Aug. 31, 1852). p. 89.

[18]Passenger costs were reduced proportionately. Per pound costs were computed from a report of the Quartermaster General to the Secretary of War, Vol. 3, p. 82 (Nov. 16, 1854), Records of the Office of the Quartermaster General, Record Group 92, National Archives, and as cited in Erna Risch, Quartermaster Support of the Army: A History of the Corps, 1775-1939 (Washington, D.C., 1962), p. 308.

[19]Senate Exec. Doc. No. 1, Part II, 32nd Congress, 2nd Session, (Quartermaster General's Report, Appendix B-L), op. cit., p. 91.

[20]Secretary of War, Annual Report (1866), p. 56. Passenger totals by mode were not given; a breakdown was derived by figuring a ratio on the basis of annual expenditures for such travel. The rest of the data was obtained from: Secretary of War, Annual Reports (1870), pp. 247-49; (1871), pp. 85-107; (1930), pp. 370-75. Quartermaster General, Annual Reports (1878), pp. 85-107; (1884), p. 110; (1879), p. 38; (1900), p. 46; (1910), p. 41; (1911), p. 336. Chief of the Transportation Service, Annual Reports, (1920), pp. 16-51.

[21]Ibid.

[22]Ibid.

[23]Ferry Traffic to Coastal defense fortifications such as those on Staten Island in New York harbor and between Forts Worden, Flagler and Casey at Admiralty Inlet were tabulated separately. See Report of the Quartermaster General (1910). op. cit., p. 41.

[24]Annual Reports, Quartermaster General, op. cit., (1870, 1900).

[25]See Footnote No. 20.

[26]See William H. Freeman Jr., "An Analysis of Military Land Use Policy and Practice in the Pacific Northwest: 1849-1940," (Unpublished Ph.D. Dissertation, University of Washington, 1974), Chapters 4 and 5.

[27]Only a detailed and lengthly research of correspondence sent and received by the Quartermaster General of the Army, and of various other War Department sources might unearth additional information.

[28]Rail Traffic: A.E. Highland, Carrier Representative, Assn. of American Railroads, Military Traffic Management Terminal Service, Dept. of the Army, Falls Church, Virginia. Air Traffic: Unit Histories, McChord AFB, Washington; Air Force Archives, Maxwell AFB, Alabama; Directorate of Passenger Traffic, Military Traffic Management Terminal Service, Dept. of the Army, Falls Church, Virginia. It is not possible to differenciate between domestic and international air travel. Bus Traffic: Transport Economics Section, Traffic Control Division, Office of the Chief of Transportation as quoted in Chester Wardlow, The Transportation Corps: Movements, Training, and Supply (Washingtion, D.C., Dept. of the Army, 1956), p. 30.

[29]A.E. Highland, op. cit. Recent records of the Military Traffic Management Terminal Service do not completely agree with railroad records. Since railroads received reimbursement on the basis of their record, the railroad figures were used exclusively.

[30]Wardlow, op. cit.

[31]Reference air traffic data in Footnote No. 28.

[32]Ibid.

[33]Ibid.

[34]See: Edward L. Ullman, American Commodity Flow (Seattle, 1957), pp. 4-13, 28-33, 50-60; Edward L. Ullman, "Regional Development and the Geography of Concentration," Papers and Proceedings of the Regional Science Association, IV (1958), pp. 179-83, 196-98.

[35]Borchert, op. cit., pp. 328-29.

[36]This conclusion is based primarily upon original military correspondence and documentation filed in Records Groups 49, 77, 92, 94, 107, 108, 153, 393, National Archives.

[37]Post returns for Camp Astoria, Fort Steilacoom and Fort Vancouver, as of December 31, 1850. Returns from U.S. Military Posts, 1800-1916, Records of the Adjutant General's Office, Record Group 94, National Archives. Some Vancouver troops were temporarily billeted in private homes in Oregon City, some twenty-eight miles south of Fort Vancouver on the Willamette River. Utley, op. cit., p. 98; Secretary of War, Annual Report (1850), pp. 284-88.

[38]The site offered all of the communication advantages of Portland. As a post of the Hudson's Bay Company, the post lands offered the advantage of not having been settled by homesteaders or private claimants. The land parcel was large enough to provide forage, fuel and garden needs, and once financial settlement had been made with the Hudson's Bay Company, the land was immediately available for assignment to the War Department. In the interim, the post was shared with the Hudson's Bay Company, although the Army built its own barrack structures. See: Robert V. Hine, and Savoie Lottinville, Soldier of the West. Letters of Theodore Talbot During His Services in California, Mexico, and Oregon, 1845-1853 (Norman, Oklahoma, 1972), pp. 124-31.

[39]The report goes on to explain that encroachment upon military posts by squatters or well-meaning homesteaders occurred from the outset. By the act of reserving a military reservation of four square miles, it was apparently hoped to control the encroachment by use of a "buffer zone" under the aegis of military authorities. Senate Exec. Doc. No. 1, Part II, Serial 612, 32nd Congress, 2nd Session, op. cit., pp. 122-26.

[40]Post returns, op. cit., for posts and years specified.

[41]Post returns, op. cit., as of Dec. 31, 1850. Census data from decennial census of 1850.

[42]Post returns, op. cit., as of Dec. 31, 1860.

[43]Dorothy O. Johansen and Charles M. Gates, Empire of the Columbia, A History of the Pacific Northwest (New York, 1957, 1967), pp. 274-75.

[44]Post returns, op. cit., as of Dec. 31, 1870.

[45]Robert W. Frazer, Forts of the West (Norman, Oklahoma, 1965), p. 177; Post returns, Fort Walla Walla for the years 1866 through 1873.

[46]Inspector General, Outline Descriptions of the Posts and Stations of Troops in the Geographical Divisions and Departments of the United States (Washington, D.C., 1860, 1872).

[47]Post returns, op. cit., 1869-1872.

[48]Posts and Stations of Troops. . ., op. cit., 1872, Fort Vancouver, p. 313, and Camp Harney, p. 299; War Department, Surgeon General's Office, A Report on the Hygiene of the U.S. Army with Descriptions of Posts (Washington, D.C., 1875), pp. 457-93.

[49]Post returns, op. cit., as of Dec. 31, 1871. Many of the smaller posts were located at the perimeter of the region, but contiguous to Indian populations or reservations.

[50]Ibid.

[51]The same general situation existed for Fort Hall in south central Idaho, and for Camp Warner on the Oregon-California border. Posts and Stations of troops. . ., op. cit., 1870-1872.

[52]Hunter, Steamboats on Western Rivers, op. cit., pp. 604-05.

[53]D.W. Meinig, The Great Columbian Plain: A Historical Geography, 1805-1910 (Seattle, 1968), p. 157.

[54]An effort was made, in 1881, to build a road from Vancouver to Portland in order to gain better access to Portland and the regional rail network. Departmental Commander to Asst. Adjutant General of the Division of the Pacific, Vancouver Barracks, Dec. 5, 1881, Vancouver Bks., Reservation File, Record Group 94, National Archives.

[55]The physical environment provides constraints, but does not determine the form or process of the human culture which has chosen to relate to that environment. The railroad reflects increasing effectiveness with which man is able to minimize the constraints of the physical and natural environment. See: Meinig, The Great Columbian Plain: . . .,

op. cit., Chapter 15, and the June, 1972 edition of Annals, LIV, No. 2.

[56]Post returns for affected posts, Dec. 31, 1880.

[57]Post returns for affected posts, Dec. 31, 1890.

[58]Ibid.

[59]A.F. Burghardt, "A Hypothesis about Gateway Cities," Annals of the Association of American Geographers, LXI (June, 1971), p. 269. Geographers generally use the term "spatial interaction" to reflect this relationship.

TERMINUS: TRANSPORTATION AND THE GROWTH OF TACOMA, 1870-1970

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With construction of transcontinental railroad lines in the mid and late nineteenth century, a number of new urban places were founded in the American West. These places ranged from tiny villages along sidings to large cities. Some were de novo creations, while others were superimposed on pre-existing nucleii. The importance of rail transportation in the future history of the towns was taken for granted, and places without rail connections were expected to wither and die. The railroad terminal cities, serving important functions as nodes in the larger transportation system, were seen as potential rivals to Chicago, New York, and even Paris or London.

Among the places expected to rival the older metropolises was the city of Tacoma, selected as the western terminus of the Northern Pacific in 1873. At that date, the area surrounding the terminal site was virtually devoid of settlement, and while two plats for the town or city of Tacoma had been filed, they included only a few lots and even fewer residents.[1] In retrospect, it is somewhat difficult to determine why the railroad selected the site on Commencement Bay, for other, already settled, places had similiar locational advantages and an existing infrastructure. Perhaps the lack of development was the chief advantage of the Tacoma site, for it allowed the railroad, and the speculators who controlled it, to mold development to their purposes.

From 1873 onward, the growth and expansion of Tacoma was erratic. There were years in which thousands of new jobs were added, the population grew by nearly ten thousand new inhabitants, and tens of thousands of lots were platted. There were also whole decades of urban stagnation, and the rate of change was seldom constant for more than a few years. Table I illustrates the fluctuation in population growth with total population and intercensal percentage increase from 1870 to 1970 for Tacoma and Pierce County. The corresponding data for Seattle have also been shown for comparison and to support a discussion later in this paper. It is the overall goal of the paper to examine some of the aspects of the variant rate of development and to illustrate the importance of transportation in the growth of the Tacoma urban area.

Table I

POPULATION AND PERCENTAGE CHANGE BY CENSUS YEARS: TACOMA, PIERCE COUNTY, AND SEATTLE, 1870 TO 1970

Census Year	Tacoma*		Pierce County**		Seattle*	
	Number	Percent	Number	Percent	Number	Percent
1870	73	---	1409	---	1107	---
1880	1098	1404.1	3319	135.6	3533	219.2
1890	36006	3179.2	50940	1434.7	42837	1112.5
1900	37714	4.7	55515	9.0	80671	88.3
1910	83743	122.0	120812	117.6	237194	194.0
1920	96965	15.8	144127	19.3	315312	32.9
1930	106817	10.2	163842	13.7	365583	15.9
1940	109408	2.4	182081	11.1	368302	0.7
1950	143673	31.3	275876	51.5	467591	27.0
1960	147979	3.0	321590	16.6	557087	19.1
1970	154581	4.5	411027	27.8	530831	-4.7

* No adjustment has been made for changes in the political boundaries of the city.

** Pierce County includes the population of Tacoma.

Source: U. S. Censuses.

Economic historians have frequently noted the importance of staple exports in the development of frontier regions. It is rather easy to illustrate this dependence in the Pacific Northwest, for until World War II most of the region's economic life revolved about staple commodities, notably wheat and timber. The demand fluctuations for those commodities on the world market reflected directly on the economic status of the region, and the pattern of regional development was (and remains) strikingly cyclical.[2] The erratic pattern of Tacoma's development must, in part, be tied to fluctuations in demand for the commodities of the Pacific Northwest. As a center for the processing and export of the commodities, the city enjoyed rapid expansion during demand booms and stagnation or decline during periods when demand was depressed.

The relationship between development in Tacoma and stages in the national economic cycle can be easily traced. On doing so, one finds that rates of expansion correspond with periods of national boom and depression.[3] Such comparison is enlightening but a bit facile, for it suggests an inevitable relationship between national and regional economic fortunes. In the Pacific Northwest, and in Tacoma, ability to participate in the national economy has been a direct function of transportation development. Isolated from mid-continent and Atlantic markets, the region would have remained a peripheral part of the economy with total dependence on a limited number and quantity of staple exports without the improvement of transportation. In 1870, the region shipped out only three commodities in substantial quantity; minerals, timber, and wheat. The Puget Sound region was dependent on timber alone, for the land around its shores was deficient in precious metal deposits and not competitive with the interior for the production of wheat. The export of timber was largely oriented to California, which, in turn, was an exporter of staples. The linkage between Puget Sound and the national economy was a two step one, and few commodities were sent to markets east of the Rocky Mountains.

The evolution of Tacoma can be directly tied to reduction in the cost of transportation and the increased flow of goods it induced. In 1870, settlement on Puget Sound was limited to a number of small ports from which lumber and raw timber were dispatched to California. None of the ports exceeded 2,000 residents, and most had populations of only

a few hundred. Timber was available throughout the Puget Sound area, small saw mills could operate at competitive efficiency, the cheap water transportation offered from any point on Puget Sound to California made concentration of timber processing in one location unlikely. Without the railroad, the sawmill at the head of Commencement Bay would have attracted a few hundred residents. When the local timber supply was depleted, an event which contemporary logging practices made inevitable, the place would then most likely be abandoned. It would be easier to build a new town closer to the timber than to transport the trees over long distances to fixed millsites.

Development of rail transportation within and to the Pacific Northwest between 1870 and 1910 drastically reduced the cost of movement to the outside world. Time costs for passenger travel were reduced from weeks to days as the slow and tedious forms of overland transportation were replaced by railroad service.[4] While the reductions were less dramatic, improvements in ocean going vessels and navigational improvements such as the Panama Canal also reduced the travel time from Puget Sound to the world's ports. The marked reductions in travel time were usually accompanied by equally dramatic reductions in passenger fares and freight rates for both rail and ocean transportation.

The advent of rail service radically altered the prospects for urbanization in the Puget Sound area. Offering cheaper transportation, the rails greatly expanded the market area for timber and timber products. Pacific Northwest timber could be offered on the Chicago market at prices competitive with those for lumber from Michigan and Wisconsin.[5] As the market for timber expanded, the demand for labor in the forests and mills increased, and in a classic example of multiplier effects, the increase in the export base generated a much larger total growth of the region.

The rails even gave rise to hopes for development not based on timber. Completion of the trans-Cascade line in 1889 allowed wheat from Eastern Washington to be shipped to market through Puget Sound ports instead of down the Columbia River through Portland. This encouraged construction of facilities for wheat transportation and gave rise to a small scale flour milling industry. Perhaps more significant in raising hopes for future expansion was the promise of serving as the entrepôt for trade with Alaska and the Orient. As the terminal of land and sea

routes, the Puget Sound ports were expected to serve as break-in-bulk points for the fabulous trade which was projected.[6]

While reduction in the cost of transportation made large scale urbanization in the Puget Sound area possible, alteration in the geometry of movement served to shape the pattern of urban development. With water transportation on Puget Sound as the major mode, there was little incentive to develop inland resources and even less need to concentrate activities at a small number of points. The restriction of rail movements to specific lines with entry and exit possible at only a few points along the lines demanded a different settlement distribution. Operational efficiency and access restrictions encouraged concentration of activities at a relatively small number of points, particularly at the terminal points where the rail lines met other modes of movement.

It was within this context of transportation development that Tacoma's early development occurred, and it is not surprising that the greatest impetus to its early development was the railroad. The first spurt of growth at the city accompanied selection of Commencement Bay as the terminal site. Only eight days after that decision, however, the Northern Pacific declared bankruptcy, precipitating a major national depression.[7] A rail link to the Columbia River was completed soon after, but direct rail connection of Tacoma and the Pacific Northwest to the remainder of the United States was delayed for nearly a decade. In 1883, a transcontinental link was completed to Portland, and via the long finished line to the Columbia River, Tacoma enjoyed direct rail service to the east. After much delay and debate, in 1888 a line across the Cascades was pushed to completion, providing Puget Sound with its first direct connection to the national railroad system in 1889.

The early emergence of Tacoma can be directly tied to these three dates in the transportation history of Puget Sound. Figure I illustrates the filing of subdivision plats in the Tacoma area by year between 1870 and 1930, and it clearly indicates the importance of the three years--1873, 1883, and 1889--in the platting of urban lots. There was limited platting in 1873 because of the impending national depression and because the railroad acquired nearly 10,000 acres of land in the vicinity

of the proposed terminal site. In 1875, the Tacoma Land Company, a subsidiary of the Northern Pacific, filed a plat titled "Map of New Tacoma" which subdivided a substantial share of its lands into lots and streets. The absence of privately held land in the vicinity of the terminal retarded subdivision, but if measured on a per capita basis, the number of lots added between 1870 and 1874 was quite phenomenal. In a city with a hundred inhabitants, 2,600 lots were platted![8]

Completion of the transcontinental link in 1883 generated another subdivision boom, and the decade which followed was crucial in development of Tacoma. Beginning the period with the population of a large village, Tacoma ended the 1880's as a substantial urban place. The growth in population was accompanied by an expansion in the economic base, and while timber remained the dominant commodity, its processing was joined by other manufacturing activities. Secondary timber processing became a particularly important activity which developed during the period, and instead of just shipping raw timber and lumber, the city began to export finished wood products such as matches, doors, and furniture in addition. Most such products were tied to markets in the Pacific Northwest, markets which expansion in export demand had generated, but some were also sent outside the region. For example, doors from a Tacoma factory were widely distributed in the Middle West as early as 1888.[9] Several non-timber manufacturing facilities were also opened, including a large copper smelter, the first unit in a metallurgical complex which later became an important component in the local employment base.

While there was a substantial increase in population and activity in the decade from 1883 to 1893, Tacoma and the Puget Sound area remained a frontier outpost dependent on a staple economy. The cost of transportation had been dramatically reduced, but the friction of distance was still sufficient to discourage manufacture of most market oriented items, and the internal market within the Pacific Northwest was too small to support such industry. As a consequence, when the national economy entered the great depression of the 1890's, the city rapidly followed into a period of economic stagnation and decline. While there is no direct evidence to the point, peripheral evidence suggests that the population of Tacoma actually declined from 1890 to 1895, and it was

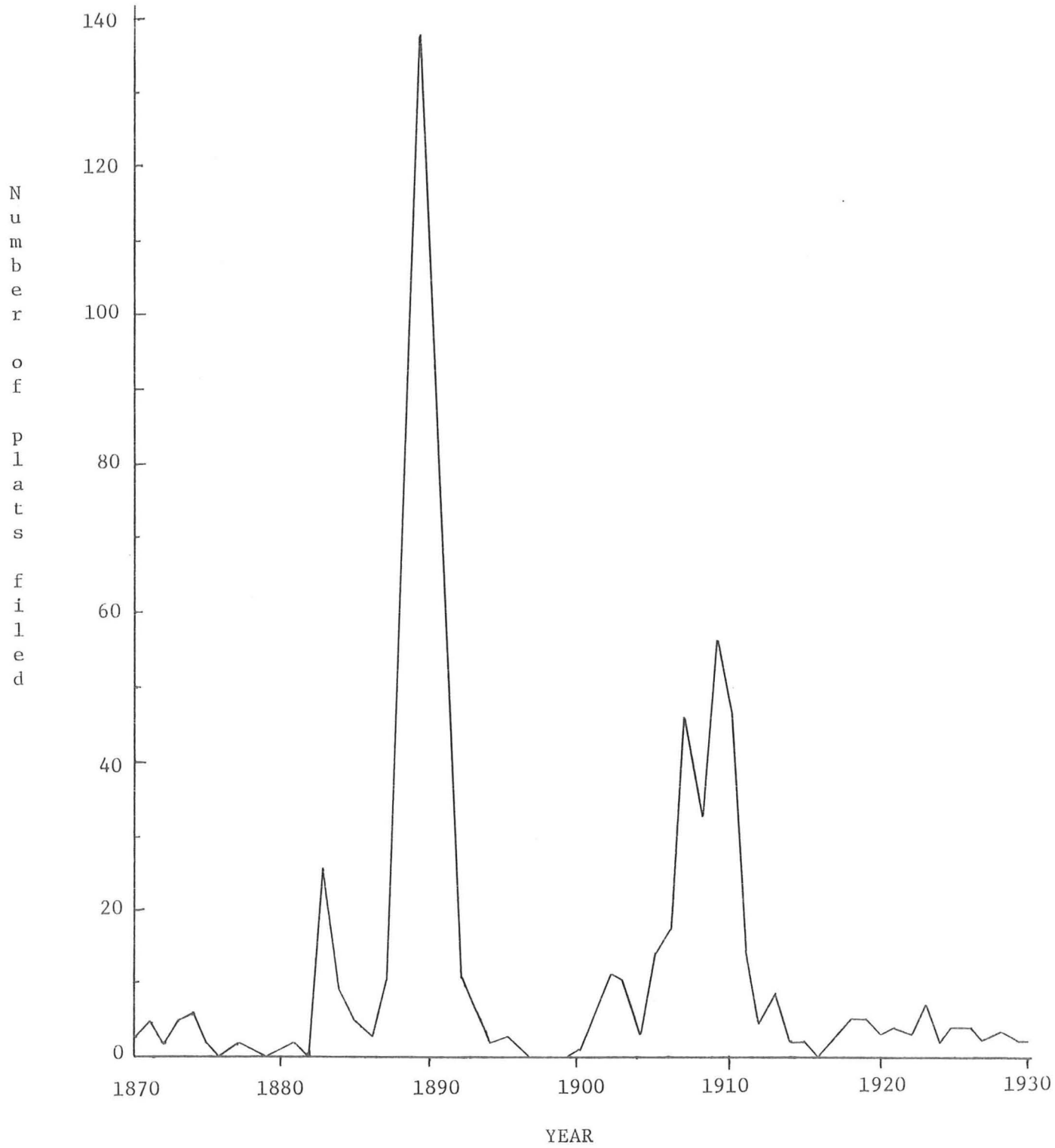
only the Klondike and Alaska gold rushes later in the decade which caused a slight population increase between 1890 and 1900. The employment base of the city contracted as smaller industries went bankrupt or drastically curtailed their activities, and subdivision of land ceased.[10]

As illustrated in Figure I, there was no land subdivision at all from 1896 to 1900. During this period, the gold rushes in the north pumped life into the Puget Sound economy, but it seemed to have little effect on Tacoma. Indeed, the period between 1893 and 1900 provides an interesting example of transportation developments which probably served to retard development of the city. From 1873 to 1890, Tacoma enjoyed accessibility to world markets greater than that of any other Puget Sound port. After 1890, however, the Northern Pacific extended main line service into Seattle, and in 1892 the Great Northern completed its trans-continental line to a Seattle terminus.[11] The combined service of the two railroads gave Seattle a competitive advantage, reflected in its 88.3 percent population growth from 1890 to 1900 compared to a growth of only 4.7 percent in Tacoma (see Table I).

The decade of the 1890's was the most critical in the struggle for regional dominance, and by its end Seattle had capitalized on its newly acquired transportation connections to become the dominant commercial center. Forty miles closer to Alaska ports, Seattle aggressively promoted itself as the transfer point for men and materials destined to the gold fields, while Tacoma managed to capture only a small portion of the trade. During the decade, a variety of new banks, insurance companies, commodity brokers, and similar activities concentrated in the Seattle Central Business District to serve the Alaska trade. A number of shipping lines also opened offices there, in several instances moving from Tacoma.[12] With service from two transcontinental railroads and scheduled shipping to Alaska, California, the Orient, and Atlantic ports, by 1900 Seattle enjoyed greater accessibility to world markets than Tacoma.

It is impossible to understand the development of Tacoma from 1890 onward without reference to the expansion of Seattle. Located only forty miles apart, the two cities are inextricably intertwined in history and present status. Both vied for commercial and industrial dominance in the Puget Sound basin, and from 1870 to 1910, there was a fierce

Figure I



SUBDIVISION PLATS FILED BY YEAR: TACOMA, WASHINGTON, 1870 TO 1930

competition to attract new industry and activity to each. Seattle had the advantage of a "head-start," and by 1870 it had developed at least the superficial trappings of a city. Starting later, Tacoma had the distinct advantage of railroad connections. In cases elsewhere on the continent, the city which was bypassed by the railroad often faded or even died, unable to compete with better connected places along the lines. This did not occur in the Puget Sound area, and Seattle worked hard to recoup the loss of the railroad to Commencement Bay. Going so far as to promote and build its own railroad line, Seattle was still retarded in its growth between 1880 and 1890.[13] At the end of the decade, Tacoma had nearly the same population and was wont to claim greater industrial and commercial importance.[14]

By the end of the next decade, Seattle was clearly the most important place, acquiring during the decade significance as a commercial center for the Puget Sound area and for the larger Alaska and Pacific Northwest market. While this was happening, expansion of Tacoma was increasingly industrial in nature. The copper and timber industries developed during the 1880's were joined in the 1890's by a large repair and manufacturing facility for Northern Pacific equipment, a variety of food processing facilities, and additional forest product firms. By 1900, Tacoma had become an industrial city.[15]

Industrial development in Tacoma accelerated as the new century began, and this was reflected in the growth of population and the subdivision of land. During the first decade of the new century, there were a spate of proposed rail extensions to Puget Sound from the east and south, and three--the Union Pacific, the Southern Pacific, and the Chicago, Milwaukee, St. Paul, and Pacific (the Milwaukee)--completed lines or otherwise acquired trackage into the area. All three initially selected Tacoma as their Puget Sound terminus, and the Milwaukee constructed extensive yard and repair facilities in the city. In addition, the Great Northern began to serve Tacoma when it completed its southern branch from Seattle to Portland.

As new transportation was promised and provided to Tacoma, industrial expansion was seen as the key to the city's growth. This is indicated in the platting of land. Prior to 1900, virtually all subdivision of land had been into 25 by 100, 110, or 120 foot lots without

designation of eventual use. After 1900, general purpose subdivision was replaced, in part, by subdivisions intended specifically for industrial development. While lot sizes were not affected, 25 by 120 feet being the dominant size, the width of streets and alleys both reflected the intended industrial use as did the words "factory and warehouse sites" which appeared in most of the titles. In part this shift reflects changing legal requirements for subdivision and the availability of tidal overflow lands for platting.[16] At the same time, it also seems reflective of subdivider attitudes toward the future of the city. Combined with platting for worker housing (identifiable through such plat names as "Mechanic's Home Addition"), industrially oriented subdivisions form a significant component of lands platted between 1900 and the beginning of World War I.[17]

Subdivider decisions to prepare for an industrial future were rational in view of the actual expansion of the employment base. By 1930, Tacoma had a substantially larger percentage of its labor force employed in manufacturing and a smaller portion in "white collar" occupations than either Seattle or Portland. Table II illustrates this with data drawn from the 1930 Census for employment in 1929. In that year, nearly 39 per cent of Tacoma's labor force was employed in manufacturing, while only 36 per cent engaged in what could be considered white collar occupations (trade, public service, professional, and clerical occupations). In Seattle and Portland, approximately 30 per cent of the labor force engaged in manufacturing, while about 45 per cent were in the white collar category.

In some ways it is difficult to explain the emergence of Tacoma as an industrial center while Seattle developed as a more broadly diversified city. If Tacoma is to be treated as an industrial satellite, then it is a rather precocious example of the genre. Large industrial satellites were uncommon around major cities until well into the present century, and one is hard pressed to find a city in the same size class as Seattle with a large industrial appendage prior to World War II. Seattle and Tacoma seem to have developed reasonably independent and competitive industrial bases, thus their development does not seem to have been coordinated in the fashion one would expect if Tacoma

Table II

OCCUPATIONAL STATUS OF EMPLOYED WORKERS:
TACOMA, SEATTLE, AND PORTLAND, 1930

Occupation	Percent of Labor Force*		
	Tacoma	Seattle	Portland
Primary industry**	3.2	3.4	3.2
Transport	10.5	9.4	9.6
Manufacturing	38.7	29.6	30.0
White Collar	36.5	44.6	44.2
Trade	17.3	19.6	19.7
Public Service	2.0	2.4	1.8
Professional	7.9	9.2	9.4
Clerical	9.4	13.4	13.2
Domestic Service	11.0	13.0	12.8

* Totals may not add to 100 due to rounding.

** Includes agriculture, forestry and fishing, and extraction of minerals.

Source: U. S. Bureau of the Census, 15th Census of the United States: 1930 Population, vol. IV "Occupations by States" (Washington, D. C.: U. S. Government Printing Office, 1933), 1358, 1692.

were the dependent industrial satellite of its larger neighbor.

Treating Tacoma as an independent manufacturing center, one is faced with an illogical location in terms of Weberian industrial location theory. Tacoma cannot claim superior access to natural resources, for the delivered price of Pacific Northwest resources was virtually identical at Seattle and Tacoma. A claim to superior access to markets might be pressed by Tacoma, given its location closer to Portland and California, but the difference between the cities on that account is minor. For the national and international markets upon which the region was dependent, both places were at a disadvantage in comparison with cities in the Middle West and along the Atlantic. Further, as a frontier area with a small population, labor costs were high both in terms of wages and in terms of industrial conflict.[18]

To examine the evolution of Tacoma as a manufacturing center, competition for dominance and maintenance of position in the regional urban hierarchy seems to be a key. In particular, the utilization of transportation as a tool for competition seems important. The model of transportation expansion in underdeveloped countries proposed by Taaffe, Morrill, and Gould is particularly enlightening in this context, for it illustrates on the national scale how the emergence of the transportation system relates to the evolution of the urban hierarchy.[19] Development of transportation linkages favors accessibility in a few locations and propels the growth of those places at the expense of others. Generally the place with the greatest number and highest quality of transportation linkages emerges as dominant, but there may be a considerable period of conflict for dominance. Even after one place achieves a dominant position, other places may attempt to capitalize on their transportation connections to avoid total eclipse and to maintain important, if secondary, positions in the hierarchy.

This process of competition with transportation has been recurrent in the history of the United States, beginning with the competition for dominance among the cities of the newly independent nation in 1790. Later, as a series of linear urban frontiers marked the inland penetration of the nation, the same type of competition for transportation linkages led to the emergence of dominant regional centers. In many

ways, the competition between Seattle and Tacoma, in a race which also included Portland and perhaps Spokane, was the last. When the regional hierarchy of places in the Pacific Northwest had been determined, the national urban hierarchy had more or less acquired its present structure.

Beginning the study period as a string of tiny places scattered along the shore of Puget Sound, by 1930 a clearly demarcated hierarchy had arisen with Seattle as the urban dominant and Tacoma as a large, but clearly less important place. In the early stage of the competition, there was little reason to expect differential growth of the places, or to expect any growth for that matter. The interjection of the railroad changed that, for it gave Tacoma advantages over the other places. Reacting to its loss of the railroad terminal, Seattle countered with a variety of measures, and the two cities were placed in head-to-head competition for dominance, removing from competition all of the other settlements along Puget Sound. There was, however, but a single dominant position to be had, and it was the resolution of that conflict which led to the pattern of Tacoma's development.

By 1900 it was probably clear to astute observers, as it is in retrospect, that the dominant regional center was to be Seattle. At the same time, those with a vested interest in Tacoma were unwilling to see the place shrink into a total obscurity. The fixed investment was too great to be lost by allowing the city to die. As a consequence, industrial development was aggressively promoted as the means of maintaining Tacoma as an important place in the region. This shift in emphasis from diversified urbanization toward industrial expansion is apparent when comparing the promotional literature prepared by real estate brokers, railroad companies, and chamber of commerce type organizations before 1900 with materials distributed after that year. In subtle but significant ways, those responsible for advertising Tacoma changed the view of its future from one of dominance as a regional (or even national) metropolis to one of a manufacturing center.[20]

Without superiority, Tacoma was still competitive as a location for the processing of Pacific Northwest resources. With completion of the Milwaukee and Union Pacific rail lines, with acquisition of trackage by the Southern Pacific, and with construction of the Great Northern branch

to Portland, Tacoma was provided with excellent rail connections to the east and to California. The rails also provided good access to Tacoma for the wheat, timber, and mineral resources of the Pacific Northwest, allowing the city to compete as a collection point for those staples.

Suffering from the dual disadvantages of greater distance from the ocean and fewer scheduled shipping lines, Tacoma had poorer access to ocean transport than Seattle. At the same time, Tacoma was graced with a somewhat better harbor, a larger quantity of potential industrial land, and lower real estate prices.

The different advantages of Seattle and Tacoma for industrial development are reflected in dissimiliar patterns of industrial development. As fitting a larger city, by 1929 Seattle had developed a more diversified industrial base with a substantially larger number of manufacturing establishments. The differences between Seattle and Tacoma relate to more than scale, however. Table III illustrates some of these differences with data drawn from the 1930 Census. The greater dependence on manufacturing in Tacoma is suggested by the greater value added per city resident, while the larger scale of manufacturing establishments is indicated by both the greater number of employees and the higher value added.

The differences between the industrial bases of Seattle and Tacoma are further illustrated by Table IV. Comparing data on industrial types which were reported for both cities, the table accounts for slightly more than a third of value added in each. The percentage share of animal food manufacture is approximately the same in both, but there are substantial differences in virtually every other category. Seattle is dominated by consumer oriented industries such as fabricated metals, food processing, and printing, while Tacoma has a striking dependence on lumber and timber processing. Furniture manufacture, a producer of consumer goods, is more important in Tacoma, but traditionally that activity has been allied to the location of raw materials, and it further strengthened the dependence of Tacoma on raw material processing. Indeed, the dependence on raw materials is understated by the table, for two major categories--pulp and paper and metalurgical industries--are not included due to disclosure regulations. Both were important in Tacoma, but neither seems to have been significant in Seattle.

Table III

SELECTED CHARACTERISTICS OF MANUFACTURING:
TACOMA AND SEATTLE, 1929

	Tacoma	Seattle
Total number of establishments	329	1,219
Total number of employees	15,013	28,202
Employees per establishment	45.6	23.1
Total value added	$38,049,400	$91,326,950
Value added per establishment	$115,650	$74,920
Value added per city resident	$360	$250

Source: Compiled from U. S. Bureau of the Census, Fifteenth Census of the United States: 1930, Manufactures 1929, vol. III, "Reports by States," (Washington, D. C.: Government Printing Office, 1933), 550-551.

Table IV

PERCENT OF VALUE ADDED BY TYPE OF INDUSTRY:
TACOMA AND SEATTLE, 1929*

Type of Industry	Tacoma	Seattle
Animal feed	1.1	1.4
Fabricated metal products	4.0	8.3
Food products	5.4	11.6
Printing and publishing**	1.2	3.3
Furniture	4.4	1.9
Lumber and timber products**	19.7	8.6
Total of listed industries	35.8	35.1

* Includes only industries reported for both cities.
** Job and book printing only; does not include newspaper printing.
*** Does not include pulp and paper products.

Source: Compiled from U. S. Bureau of the Census, Fifteenth Census of the United States: 1930, Manufactures 1929, vol. III, "Reports by States," (Washington, D. C.: Government Printing Office, 1933), 550-551.

The emphasis on resource processing in Tacoma can be related to two basic factors, its competitive location on the transportation network, and the lower costs of industrial sites. While Seattle was better connected to world markets, and while the delivered price of resources at Seattle was similiar to that at Tacoma, there was a greater competition for industrial sites in Seattle. Many resource processing activities demanded large quantities of land, and such units could be obtained at a lower cost in Tacoma. Thus, while there was a slight transportation disadvantage due to poorer market access, Tacoma could still capitalize on its transportation connections and attract a substantial quantity of manufacturing.

By 1930, Tacoma's place in the regional urban hierarchy had been firmly established, and its importance was as an industrial center. While a variety of products came forth from its factories, the chief orientation was to the processing of Pacific Northwest resources with an emphasis on timber. From 1930 to the present, development of Tacoma has proceeded to further emphasize the importance of resource processing, but the variety of resources has increased. A major transportation improvement, long distance transmission of electrical energy, played a very significant role in the process. After 1940, cheap electrical energy became available in Tacoma, and the processing of this raw material attracted a variety of chemical, nonferrous metal, and ferro-alloy industries to the city.

In the meantime, World War II, military bases, and war industries also served to influence the industrial and employment structure of the city. Proximity to the Pacific Theatre plus availability of various input materials for the manufacture of military equipment, and especially ships, led to large scale expansion of employment and population in Tacoma after 1940. The relationship between military decisions and transportation is clear enough, and in addition, the expansion of the local population and industrial base generated a demand for better transportation to Tacoma and the Puget Sound area. Left as remnants of the war were a shipbuilding industry and a number of small manufacturers of military equipment.

Since World War II, the major transportation development to influence the city has been the construction of the regional highway system. Improvement of highways and construction of express highways has led to an integration of the once separate local economies of Puget Sound cities. The single airport built to serve both Seattle and Tacoma was the first evidence of the integration, but far more important was highway improvement and construction. As the economy of the region has become more integrated, Tacoma has lost considerable importance both as a retail trading center and as a financial and office location. As examples, a major timber firm moved its headquarters to a median location between Seattle and Tacoma, and various bank mergers and expansions have relocated most of Puget Sound's financial headquarters to the Seattle Central Business District.

Losing commercial and bureaucratic importance, Tacoma has grown as a manufacturing center. Indeed, during the roller-coaster days of the 1960's in Seattle's economy, Tacoma's experience was far less prone to boom and bust. While not diversified by national standards, Tacoma's industrial expansion has depended on a number of firms, no one of which can create a boom or depression. The linkages between industries available in Tacoma attracted different types of manufacturing, and these gave the city much greater stability in employment than its northern neighbor.

While it might easily be overemphasized, in some measure this relative stability relates to a recent transportation development, the improvement of shipping facilities for ocean freight in Tacoma. To facilitate the movement of bulk commodities, the city and its port commission built a number of facilities including wharves for alumina, log, and grain transfer. To capture a part of the expanding containerized cargo trade, a general purpose facility with container capability was built. As a consequence, Tacoma has become one of the more important export centers in the United States. It is hard to assess the impact of this on the local economy, but it would seem likely that such improvements have stimulated growth and caused activities to expand.

Over the course of a century, Tacoma grew from two virtually uninhabited subdivision plats to a city with a metropolitan area of more

than 400,000 residents. In the process, the city passed through a number of stages, and it would seem that the nature and improvement of transportation facilities was critical to the evolution. Beginning the period with hopes of becoming the dominant urban place in the region, after thirty years the enthusiasm was toned down and industrial growth was seen as the key. From that point to the present, industrial development has characterized Tacoma's expansion, creating, in the process, a substantial urban population and infrastructure. Much of this industrial development was possible only because Tacoma was provided with excellent transportation connections for the collection of Pacific Northwest resources and for their distribution to the world market. Continued improvement of the transportation facilities has made the city increasingly attractive as an industrial center, and improvement has led to the integration of the Puget Sound economy. If current trends persist, Tacoma can expect a future position in the Puget Sound urban complex comparable to that of Jersey City in the New York area or Camden in the vicinity of Philadelphia. A grim projection, perhaps, but at the same time one which promises continued employment and a relatively stable economic base.

-Notes-

[1]In 1869, two members of the Carr family and a group of their associates filed plats on land they owned in an area now called "Old Tacoma." One of the plats contained 18 lots, and the other defined 279 lots. In 1870, the Census enumerated 73 persons living in the area which had been platted.

[2]Richard L. Pfister, "External Trade and Regional Growth: A Case Study of the Pacific Northwest," Economic Development and Cultural Change, 11 (1963), 134-151; and James N. Tattersall, "Exports and Economic Growth: The Pacific Northwest 1880 to 1960," Papers and Proceedings of the Regional Science Association, 9 (1962), 215-234.

[3]Ibid. See also Figure I and Table I.

[4]For a discussion of travel costs to and within the Pacific Northwest in the nineteenth century, see Oscar O. Winther, The Old Oregon Country: A History of Frontier Trade, Transportation, and Travel (Bloomington: Indiana University Publications, Social Sciences Series No. 7, 1950), 273-283.

[5]Dorothy O. Johansen, Empire of the Columbia: A History of the Pacific Northwest (New York: Harper and Row, 1967), 310-312.

[6]The promotional materials published by the Northern Pacific emphasized the importance of the Oriental trade, and the railroad actually had a silk train which provided express freight service, via Tacoma, from the Orient to the eastern United States and Europe.

[7]The fall of the Philadelphia banking house of Jay Cooke, the major backer of the Northern Pacific, is often considered to have precipitated the depression of 1873. For an interesting, if biased, account of the events surrounding Cooke's bankruptcy, see Eugene V. Smalley, The History of the Northern Pacific Railroad (New York, G. P. Putnam's Sons, 1883), 425-430.

[8]There is no evidence to indicate that the population of Tacoma expanded much from the 73 persons enumerated in 1870 until after the final decision on the location of the railroad terminal in late 1873. While the population of Tacoma grew to over 1,000 by 1880, much of that growth appears to have occurred toward the end of the decade.

[9]Thomas Emerson Ripley, Green Timber: On the Flood Tide to Fortune in the Great Northwest (Palo Alto, California: American West Publishing Company, 1968), 35.

[10]Ibid., 87-106.

[11]Johansen, op. cit., 313.

[12]Ibid.

[13]Seattle attempted to promote a transcontinental railroad of its own named the Seattle, Lakeshore, and Eastern. Some miles of track were built, and the city mounted an aggressive promotional campaign, but the railroad was more useful as a device to encourage the Northern Pacific to provide mainline service to Seattle. In 1890, the Northern Pacific purchased the line and extended mainline service into that city.

[14]The near equality of Seattle and Tacoma in 1890 can be illustrated in several ways. Table I indicates that Tacoma was a smaller city, but the gap in population size was small, and Tacoma was growing at a faster rate. Manufacturing employment in both cities was about 4,000 with a total value of product of slightly more than $10 million in each. U. S. Bureau of the Census, Eleventh Census 1890: Report on Manufacturing Industries in the United States (Washington, D. C.: Government Printing Office, 1895), 549, 573.

[15]This point is not totally supported by Census materials, for there had been but a modest increase in manufacturing employment, number of firms, and value of product in Tacoma from 1890 to 1900. On the other hand, the percentage of the labor force employed in manufacturing continued to increase through the decade.

[16]After 1900, the State of Washington opened the tidal overflow lands around Commencement Bay for sale and platting. E. W. Ross, State of Washington Laws Relating to School, Granted, and Tide Lands (Olympia, Washington: C. W. Gorham, Public Printer, 1907.)

[17]There were 197 plats filed between 1906 and 1910, and 50 of those plats were industrial subdivisions, including all but 2 of the industrial subdivisions filed between 1870 and 1930.

[18]Tacoma, like other communities in western Washington, has a long history of labor unrest, and all evidence suggests that wage rates in the city have been and are high by national standards.

[19]Edward J. Taaffe, Richard L. Morrill, and Peter R. Gould, "Transport Expansion in Underdeveloped Countries: A Comparative Analysis," Geographical Review, 53 (1963), 502-529.

[20]These statements are based on examination of a mass of promotional pamphlets in the collections of the Bancroft Library of the University of California at Berkeley, the Tacoma Public Library, and the Washington State Historical Society. From grand boulevards and commercial advantages, after 1900 most pamphlets tended to stress water supply, low land cost, access to resources, and cheap labor.

THE RISE AND DECLINE OF ELECTRIC RAILWAYS IN NORTHWESTERN WASHINGTON: 1890-1938

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The electric railway occupies a unique and frequently overlooked position in North American transportation development. Electric railways were a technological stepping-stone between steam railroads and the earliest automobiles and busses. In the Puget Sound region, where geographical factors such as heavy timber, rugged topography, and sheltered deep water favored water transport until almost the turn of the century, the electric railway was also an important phase in the shift to dependence on land transport. There were two types of electric railways involved in this transportation revolution--urban street railways and interurban railways. Since the street railways preceded the first interurbans on Puget Sound by almost twenty years, it is with them that this account will begin.

The basic technical knowledge needed for electric railways was available by 1880, but a number of problems arose in adapting this knowledge to a workable and profitable transportation system. Although small electric cars had been built and successfully operated for public demonstration by several inventors, most notably Leo Daft of Baltimore and Charles Van Depoele of Chicago, neither of these systems proved commercially feasible.

It was the work of a young naval officer, Frank J. Sprague, that led to the creation of successful American electric railways. Sprague had graduated from the U. S. Naval Academy in 1878, but left the service five years later to work as an assistant to Thomas A. Edison. It was as a result of this association that Sprague was successful in designing and building in 1888 the Richmond Union Passenger Railway in Virginia--the United States' first true electric street railway. Practically all subsequent lines built in North America were based on Sprague's original patent. The Richmond line was an immediate success and drew interested observers from major cities all over the world. "Few inventions have ever received a more rapid and complete acceptance... By 1902 97 per cent of street railway mileage was electrically operated; only twelve years earlier, 70 per cent of street railways had used animal power. In 1901 there were some 15,000 miles of electric railway in the United States."[1]

At the time that Sprague was building the Richmond electric railway, the future cities of Whatcom and Skagit Counties were little more than brawling frontier villages. Settlement in Whatcom County was centered on the Nooksack Valley and the bustling Bellingham Bay communities of Whatcom, Sehome, and Fairhaven. To the south lay Anacortes on Fidalgo Island, Mount Vernon near the mouth of the Skagit River, and the tiny farm and logging towns of Burlington and Sedro-Woolley.

The speed with which Sprague's idea spread across the United States is exemplified by the fact that it was only several months after the first car had run on the Richmond Union Passenger Railway that the idea of a similar system for each of the three Bellingham Bay towns was being proposed. Little was accomplished other than legal maneuvering over franchises and rights-of-way until 1890, when the rumor that Bellingham Bay would be the terminus for the new Great Northern Railroad precipitated a tremendous real estate boom. Fearful of competition from the newer town of Fairhaven, Whatcom and Sehome consolidated to form New Whatcom in 1891, and immediately thereafter granted a franchise to a group of local businessmen headed by John Stenger to build an electric street railway.

New Whatcom's streetcar line was called the Bellingham Bay Electric Street Railway and went into operation March 28, 1891. The tracks extended for a distance of almost three miles, from New Whatcom's western limit near Squalicum Creek east along Holly Street, then south on Elk Street (now State Street) to a point near the southern city limit. The rails were nailed directly to the planked streets, and power was provided by an overhead wire suspended from bracket arms on the power poles. It should be noted that the Bellingham Bay Electric Street Railway's original streetcars were single-truck, two-man cars purchased from the Northwestern Car Company of Minneapolis.[2]

The founders and promoters of Fairhaven were not to be outdone, however, for soon after they granted a franchise to the Fairhaven Electric Railway Company. Due to financial problems this line collapsed several months later, so Fairhaven passed the torch to the Fairhaven Street Railway Company. Service was begun on October 19, 1891, the line running from the Ocean Dock up Harris Avenue to 21st Street. The first car on the run was so heavily loaded with enthusiastic passengers that

it required three attempts to make the top of the Harris Avenue hill.

Added shortly after this was a line which ran north from Harris Avenue via 11th Street and Front Street (now South State Street), but due to legal technicalities it did not reach the terminus of the Bellingham Bay Electric Street Railway. This gap was immediately filled by "wagonette" service provided by Stenger to connect the two lines.[3]

A third company was formed in June, 1891 by a group of New Whatcom businessmen led by Hugh Eldridge, and construction was begun the following month. The new line was known as the Lake Whatcom Electric Railway Company; it consisted of a main line running from New Whatcom out to Silver Beach on Lake Whatcom, with a branch line that ran south along Garden from Holly Street. In September, 1891, while the Lake Whatcom line was still being built, a merger with the Fairhaven line was approved, and thus it became the Fairhaven and New Whatcom Street Railway. The first car over the new line ran on January 22, 1892, from New Whatcom out to Lake Whatcom in 23 minutes. The following month saw the completion of a link between the Garden Street branch and the Fairhaven portion of the line, giving the two towns an 11-1/2 mile system of modern street railways. To encourage further business on the Fairhaven and New Whatcom line, a large amusement park called White City was constructed on the shore of Lake Whatcom at the eastern end of the line.

With his hopes of a Fairhaven connection dashed by the merger of his two rivals, Stenger leased the Bellingham Bay Electric Street Railway to the Fairhaven and New Whatcom line in June, 1892. On completion of several minor adjustments of trackage the Bellingham Bay area possessed a first-rate urban streetcar system. Unfortunately, the economic boom which had brought about this flurry of electric railway construction was gradually waning. With the selection of Seattle as the terminus for the Great Northern, followed by the nationwide "Panic of 1893", Bellingham Bay was plunged into a major depression. Streetcar revenues dropped sharply in subsequent years, and on March 20, 1896, the Fairhaven and New Whatcom went into receivership. One year later the line "was sold to the General Electric Company for $75,000 to satisfy debts of $380,485."[4] Soon afterward, General Electric offered the road for sale at a still

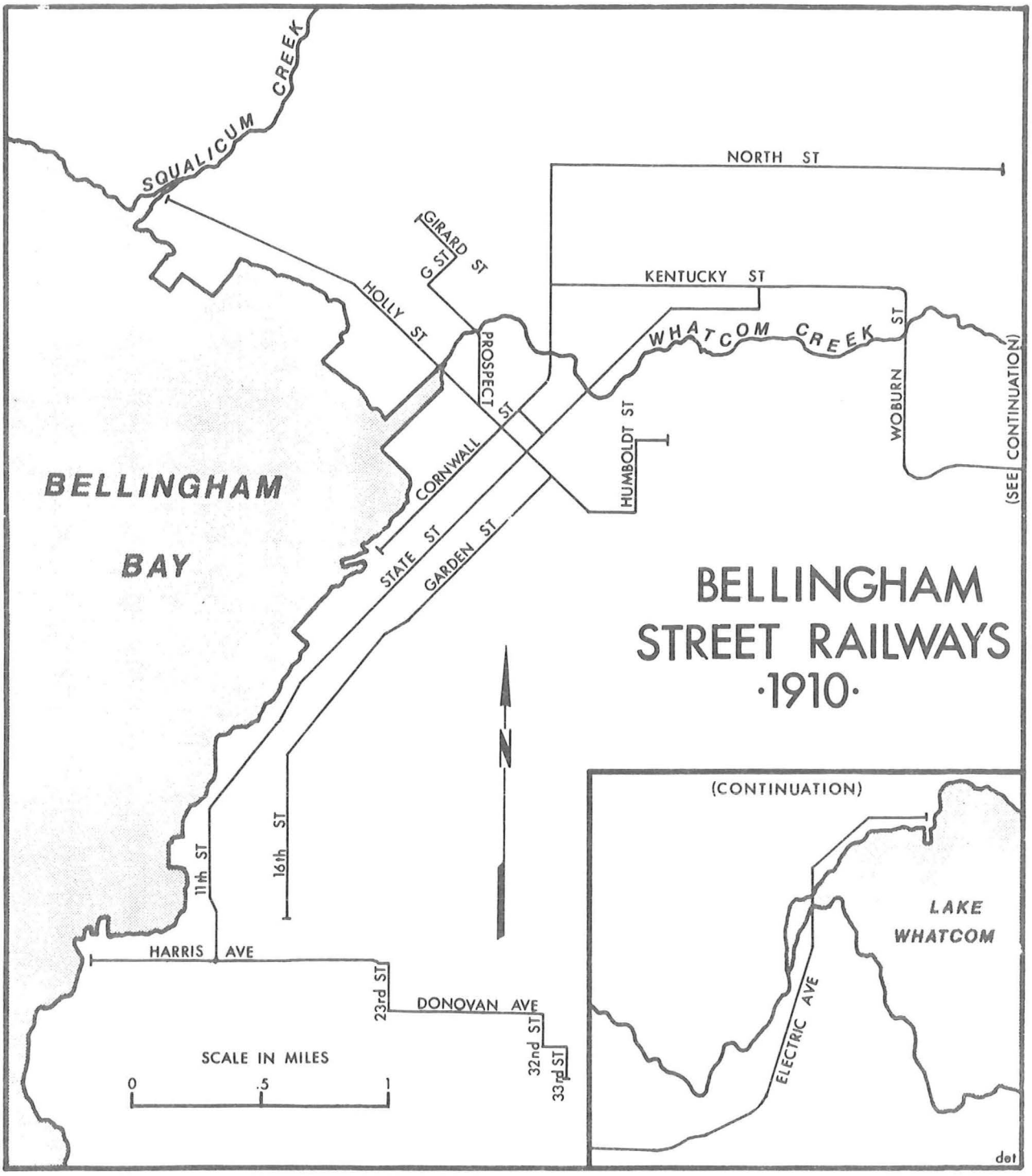
lower figure but was unable to find a buyer until April, 1898, when it was purchased by the Northern Railway and Improvement Company of Portland, Oregon. The new owners made several improvements, most notably a reorganization of schedules to provide better service and the addition of several new cars, but the Fairhaven and New Whatcom continued to lose money. Despite these financial troubles, the street railways remained an important factor in the economic development of the Bellingham Bay communities. It was, in fact, a direct result of the mutual dependence fostered by the Fairhaven and New Whatcom line that the two towns voted to merge in 1903, so bringing into being Bellingham, at that time the state's fourth largest city.[5]

A new era of prosperity and growth for Bellingham's street railways began in December 1902 when the Fairhaven and New Whatcom was acquired by the Whatcom County Railway and Light Company, a subsidiary of the Stone & Webster Management Association of Boston, Massachusetts. Stone & Webster was a progressive organization that combined engineering and management skill with Eastern capital to build or revitalize a number of Puget Sound street railway properties.

The Whatcom County Railway and Light Company made a number of badly needed improvements between 1903 and 1909, including the expansion of the original New Whatcom steam generating plant on York Street, and the replacement of the light 40 and 56 lb. rail of the earlier lines with heavier 60 lb. rail. Where the original rails had been simply nailed to the planked streets, the new ones were laid on conventional railroad ties in a 12-inch deep gravel bed. New equipment was acquired from Eastern car builders and several new units were built locally. In 1907, Whatcom County Railway and Light built the Nooksack Falls hydroelectric plant as an additional power source. The company name was changed in 1912 to Puget Sound Traction, Power and Light.

As a result of a much-improved economic situation in the Pacific Northwest, the Bellingham street railways did well until the early 1920's. According to Bruce B. Cheever, "...the high point of traffic was reached in 1913 when the average revenue per citizen (population 27,850) for the year was $6.84."[6] Although the lines managed to remain profitable during

Figure 1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the lumber and shipbuilding boom days of World War I, the postwar years saw the beginning of a gradual decline. In March, 1920, Puget Sound Traction, Power and Light became simply Puget Sound Power and Light, and the streetcars were operated as the "Bellingham Division" until rail service was finally suspended in December, 1938.

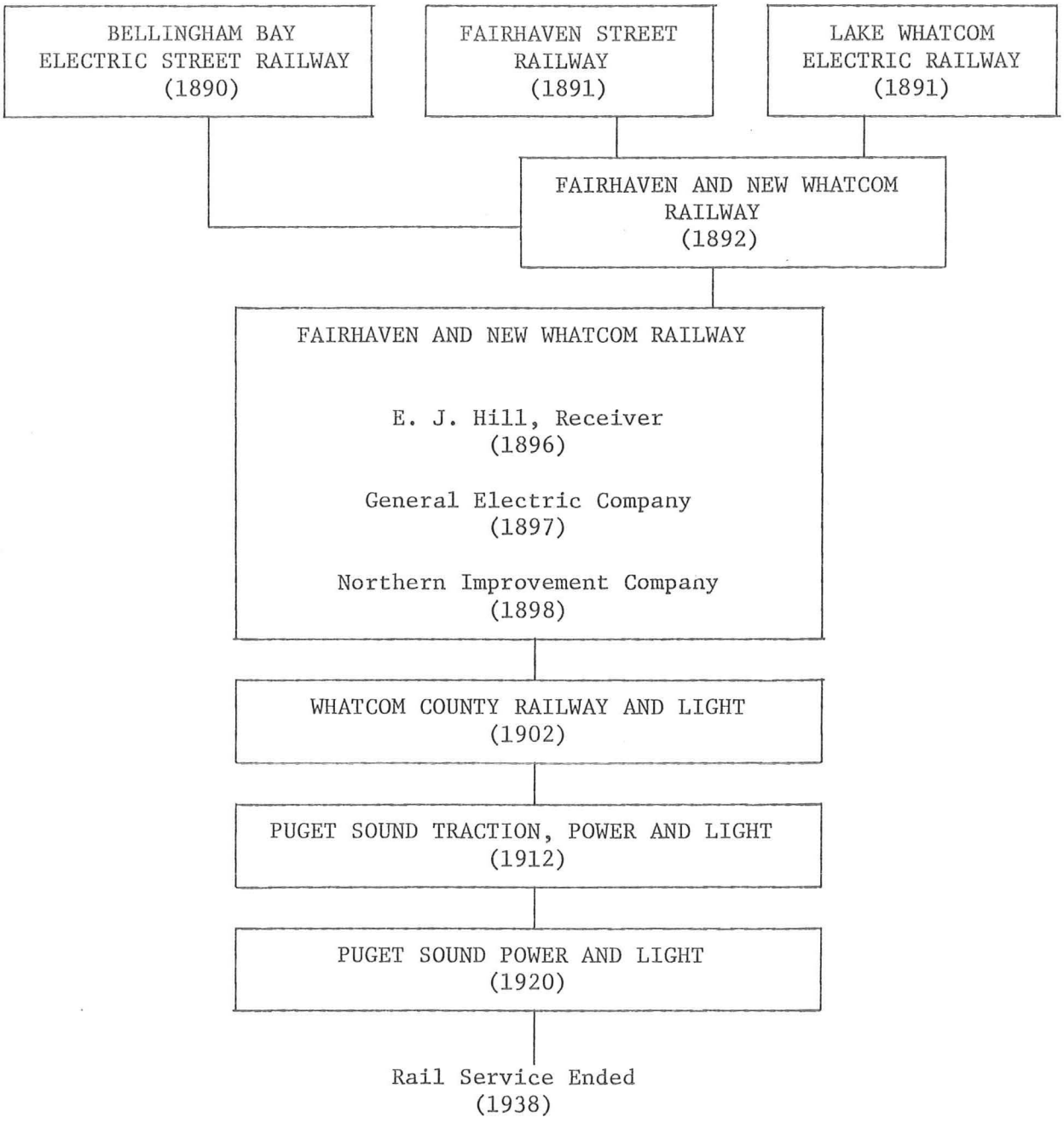
Before leaving street railways to discuss the interurban lines, there remains one unusual electric railway that was a strange mixture of both. During the great real estate boom of 1890, the town of Anacortes in Skagit County also had dreams of becoming the terminus of the Great Northern. A group of ambitious Anacortes businessmen chartered an electric street railway in June of that year, calling it the Fidalgo City and Anacortes Railway. Their plan was to build a small electric line south from Anacortes to the newly-platted village of Fidalgo City (now Dewey Beach) on Deception Pass as rapidly as possible in order to secure a large land grant along the right-of-way. The Fidalgo City and Anacortes had to be completed by January 1, 1891 to secure the grant, but because of delays in receiving equipment the line was granted an extension. The first car eventually was put into service on March 29, 1891, over a thirteen-mile road built at a cost of $200,000. "Although...built under such favorable auspices, the reaction following the boom so affected business that the road was abandoned as soon as the land subsidy had been safely procured."[8] There also appeared to be defects in the electrical power system that the Fidalgo City and Anacortes could not afford to remedy, and the line never ran again.

In the first decade of this century there began a second phase of the great technological revolution which the electric street railways had begun. Two new rivals to the dominance of steam railroads and passenger vessels appeared on Puget Sound at almost exactly the same time: the first electric interurban railways and some of Henry Ford's early Model "T's", the first mass-produced automobile. The ultimate victory of the automobile over the electric railways was an event foreseen by only a handful of far-sighted men. The greatest investment boom in early twentieth century transportation was not in automobile factories, but in electric interurban railways. In describing the results of this serious financial miscalculation, George W. Hilton and John F. Due have noted:

Figure 2

CORPORATE EVOLUTION OF BELLINGHAM'S

STREET RAILWAYS: 1890-1938



> Few industries have arisen so rapidly or declined so quickly, and no industry of its size had a worse financial record. The interurbans were a rare example of an industry that never enjoyed a period of prolonged prosperity.[8]

The study of the rise and decline of the interurbans in American transportation history has been even more neglected than that of the street railways. Since most studies tend to concentrate on either successful or well-known subjects, this is quite understandable. Nonetheless, it should be remembered that the study of failure is no less illustrative of the processes of development in modern transportation.

The remarkable success of electric railways in urban service soon led to the extension of lines into rural areas and ultimately to the linking of urban areas. The interurban boom began in the Midwest around 1900 and spread rapidly to the Pacific Coast. Some of the more important reasons for the quick success of the interurban included: (1) widespread agricultural prosperity between 1900 and the end of World War I, (2) greater rural contact with urban ideas fostered by such innovations as rural free delivery, land-grant colleges, and farmer-oriented rural newspapers; (3) subsequent demand among farmers for greater mobility and access to urban areas for both cultural as well as economic reasons; (4) ready availability of electric railway technology as a result of more than a decade of street railway experience; and (5) availability of excess capital for this type of financial investment. One characteristic that the Puget Sound interurbans did not share with their Midwestern counterparts was the relative ease with which the latter could put down inexpensive track for their light interurban cars. The Puget Sound lines were built very close to steam railroad specifications and the engineering problems caused by Washington's rugged landscape frequently made construction extremely expensive.

The interurban era on Puget Sound began in 1902 when the Stone & Webster Company began investing heavily in electric railway properties in the region. By 1907 the company had acquired the street railway systems of Tacoma, Seattle, Everett and Bellingham, giving it a virtual monopoly in this form of transportation. After linking Seattle and Tacoma in 1902 with an exceptionally well-engineered third-rail interurban,

Stone & Webster began work on a system that was planned to ultimately connect Vancouver, British Columbia, with Portland, Oregon.

Through its various subsidiaries, Stone & Webster began surveys of possible rights-of-way between Vancouver and Seattle in 1906, and in the same year began construction of a line from Seattle to Everett. A group of Bellingham businessmen, anxious about the delay in beginning a line to their city, formed the Nooksack Valley Traction Company in 1908 to build north and connect with the British Columbia Electric Railway. This plan never got further than the drawing board, and it was shelved completely in 1910 when Stone & Webster made the long-awaited announcement that they would begin construction of an interurban line from Bellingham to Mount Vernon. The division of Stone & Webster responsible for this project was chartered as the Bellingham & Skagit Interurban Railway in the same year.

From the beginning the Bellingham & Skagit Railway was controlled by the Whatcom County Power and Light Company, and it was in the name of the latter that the various right-of-way purchases were made. In 1911 another Stone & Webster property, the Pacific Northwest Traction Company, acquired controlling interest in the Bellingham & Skagit, and in 1912 the line's official name was changed to Pacific Northwest Traction Company, Northern Division (the Southern Division being the Seattle-Everett line). However, the interurban continued to be referred to as the Bellingham & Skagit line.

Actual construction on the interurban commenced on November 10, 1910, and "by the following May it was reported that 600 men were working on the line."[9] In order to secure the franchise offered by the city of Bellingham, the track had to reach the southern city limits by July 1, 1911. To do this successfully, one of the major engineering obstacles on the route--a bridge over Chuckanut Creek--had to be completed in record time. Constructed entirely of wood, this bridge was 700 feet long and 130 feet high. In order to save time, the framework was built in 32-foot sections on the north end, and lowered into place by a five-ton capacity overhead cable.[10] The bridge was completed in advance of the deadline and the franchise secured, but at tremendous expense. During the construction of this bridge, the Whatcom Reveille estimated that Stone & Webster was

spending $7500 a week in Bellingham on provisions alone for the work crews.[11]

Later in the summer of 1911 work was begun on a four-mile trestle from Clayton Bay to Blanchard. Since the Great Northern Railroad already occupied the only available right-of-way along the shoreline, Stone & Webster had decided that the overwater trestle would be much cheaper than attempting to dynamite another route across the face of Chuckanut Mountain. 5000 cedar piles and 3,000,000 board feet of lumber went into the construction of this trestle, most of which was towed to the site by barges at high tide. Lifting of the trestle into place was done by a small gasoline-powered derrick.[12]

The third and final engineering obstacle confronting the Bellingham & Skagit line was the Skagit River, and again the speed with which it was spanned set a company record. This bridge consisted of a 240-foot draw span, three 150-foot through spans, two 50-foot deck spans, and 1430 feet of pile trestle approaches.[13] Construction was begun in January, 1912 to take advantage of low water conditions. The race against the slowly-rising waters became serious in early May, but by the 15th of the month the concrete foundations and the steel spans were safely in place. The approaches and track-laying were completed during the summer and the bridge was ready in time for the September 1 opening date.

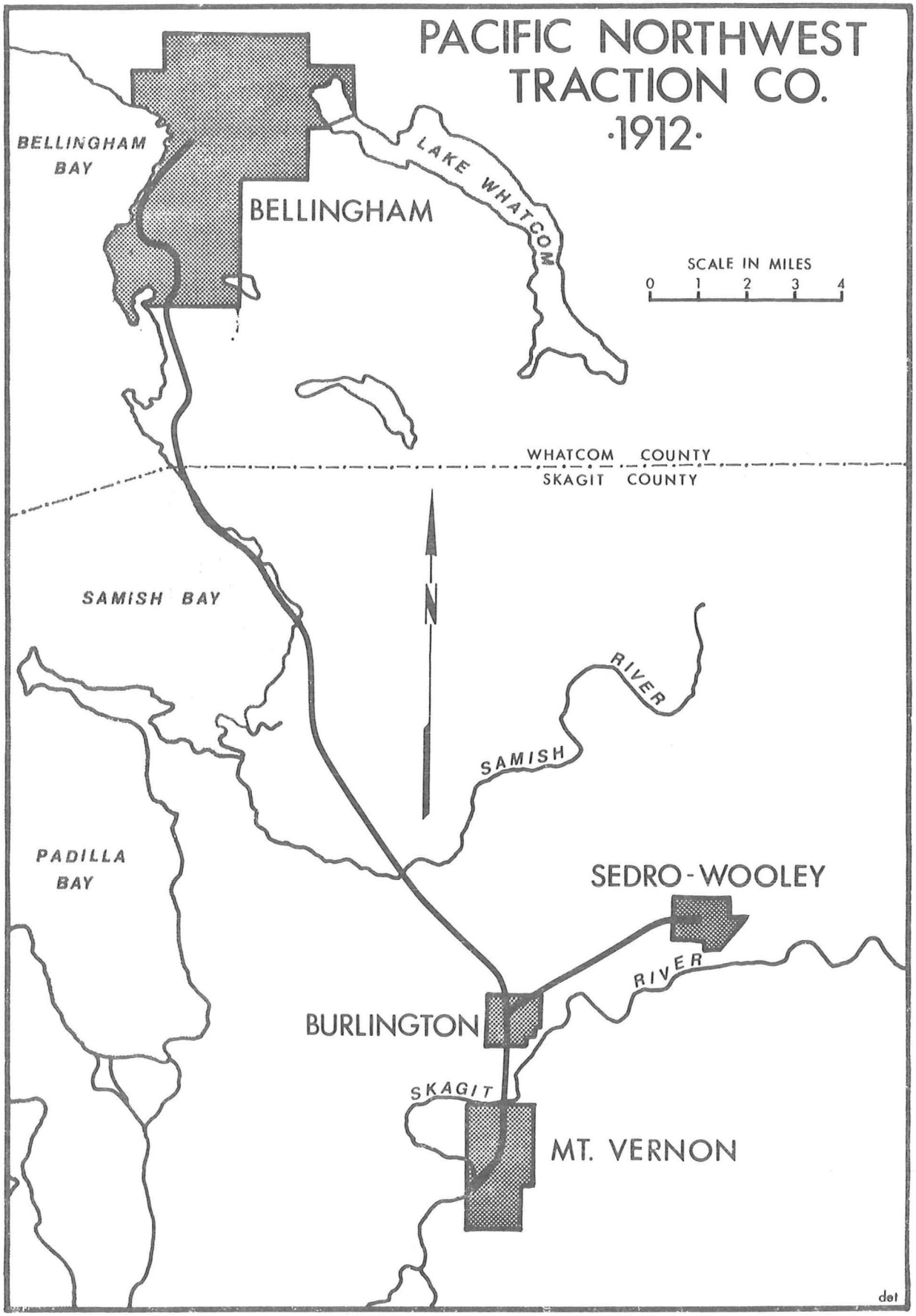
The Bellingham terminal chosen for the completed interurban was the Pike Block, a handsome three-story building of Chuckanut sandstone at the corner of State and Holly, which also served as Stone & Webster's regional office. From here the line ran south on State Street on the streetcar tracks of Whatcom County Railway and Light. At Ivy Street the interurban right-of-way left the streetcar tracks and followed Boulevard and State Streets into the Fairhaven district. Through Fairhaven the line followed 9th Street, then turned east along Padden Creek on the old Fairhaven & Southern right-of-way, under the present-day 12th Street bridge and along the northern edge of Fairhaven Park. At 23rd Street in the Happy Valley area the line turned south again. From Fairhaven to the Chuckanut Creek bridge was an ascending grade of about two miles. The southern end of the trestle was, at 200 feet above sea level, the highest point on the line.

For the next two miles, the roadbed was literally carved out of the side of Chuckanut Mountain, and passengers were treated to a sweeping view of Chuckanut Bay and the distant San Juan Islands. From here the line began a gradual descent to sea level, crossing the Great Northern at Clayton Bay, then out onto the trestle along the shoreline of Samish Bay. After reaching Blanchard at the end of the trestle, the line ran due south to Edison Station, then turned southeast for an eight-mile run into Burlington. From Burlington, the main line ran another four miles into Mount Vernon, crossing the Skagit River midway between the two towns. A branch line left the main line at Burlington and paralleled the Great Northern for five miles into Sedro-Woolley.

As was the case with all of Stone & Webster's Puget Sound interurbans, the Bellingham & Skagit line was built to steam railroad specifications, and no expense was spared on engineering details. The total cost of construction approached $2,000,000--a figure which a mathematically-inclined Bellingham newspaper reporter further estimated as "$57,000 per mile" or "almost $12 a foot of $1 for every inch of rail in the line."[14] The main line from Bellingham to Mount Vernon was 27-1/2 miles long, and the Sedro-Woolley branch 5 miles. During the course of construction a steam locomotive was used to carry supplies to the eighteen camps established for the work crews as well as rails, power poles, and land fill. A rail-mounted steam shovel was used for excavation. The entire line was constructed of 60 foot, 70 lb. "T" rail, except within the Bellingham city limits and on the Samish Bay trestle, where lighter 60 lb. rail was used. Rail was laid with a locomotive crane.

The system was powered by 600 volt direct current from the Whatcom County Railway and Light power station on York Street, which was rebuilt in 1910 to handle the increased load. Power substations were located at Clayton Bay and Burlington. The feeder wire was suspended directly over the track by steel bracket arms attached to the power poles. Cars were equipped with a spring-loaded trolley pole topped by a copper shoe which contracted the overhead wire. Although the Bellingham streetcars used trolley wheels rather than sliding shoes, the interurban cars were able to use the same overhead wires with no difficulty while running on the

Figure 3


PACIFIC NORTHWEST
TRACTION CO.
·1912·
BELLINGHAM BAY
BELLINGHAM
LAKE WHATCOM
SCALE IN MILES
0 1 2 3 4
WHATCOM COUNTY
SKAGIT COUNTY
N
SAMISH BAY
SAMISH RIVER
PADILLA BAY
SEDRO-WOOLEY
BURLINGTON
SKAGIT RIVER
MT. VERNON
del

downtown section.

The main rolling stock of the Bellingham & Skagit line consisted of four 58-foot steel interurban passenger cars purchased from the St. Louis Car Company in 1911. These cars were powered by four Westinghouse interpole electric motors of 75 horsepower each, and also had a Westinghouse air brake system. All four cars were equipped with Baldwin trucks. They were originally painted olive green with black tops and trim, and the name "Bellingham & Skagit Railway" lettered in gold on either side. Freight operations were handled by two electric locomotives which were built entirely (except for powerplants) in the Bellingham shops on Kentucky Street using plans borrowed from the British Columbia Electric Railway. Local craftsmen also built a number of boxcars and flatcars for freight operations, and they performed all maintenance and rebuilding work for both the interurban and street railways.

Passenger service on the Bellingham & Skagit Railway commenced on August 31, 1912, with special cars carrying officials from the Stone & Webster Company and from the towns of Bellingham, Mount Vernon, Burlington, and Sedro-Woolley the entire length of the new line. The cars were decorated with flags and banners, and each town greeted their arrival with special festivities. An unfortunately typical summer rain lasted most of the day but the Stone & Webster Public Service Journal reported that it had "little effect in dampening the enthusiasm of those participating."[15]

The new rail service was well received and was vigorously patronized by Whatcom and Skagit County Residents. The line was of particular importance to businessmen traveling between the towns of the region, and to farm families living near the 27 stops along the line, most of which were in rural areas of the Skagit Valley. Weekends produced crowds of college students from the State Normal School at Bellingham--in fact, many college students were able to commute to school from Skagit Valley homes. School children under 18 were allowed by Pacific Northwest Traction to travel at half-fare.

Interurban cars operated hourly from 6:00 A.M. to 8:00 P.M., with late cars at 10:00 and 11:00 P.M. Northbound and southbound cars met at

Blanchard where a siding allowed them to pass. Passengers going to or from Sedro-Woolley made connections at Burlington, where another car made the five mile trip every two hours. Dispatching was done by means of telephones located at every stop. In emergencies, a telephone inside the car could be connected to an overhead telephone wire by means of a long pole.

Another important service rendered by the new interurban was local freight delivery. At 4:30 A.M. a southbound freight motor with several boxcars left Bellingham, providing Skagit Valley farmers with an inexpensive means of delivering their milk and dairy products to the Carnation and Darigold plants at Mount Vernon and Burlington. Equally important was the delivery of wholesale groceries to stores in the smaller towns and stations along the line, such as Blanchard, Edison, and Allen. Since the passenger cars also had to carry baggage, they seldom carried freight, but occasionally they would load milk cans or sacks of oysters from Samish Bay oyster producers. A considerable amount of lumber and shingles was moved on flatcars, particularly from the Clear Lake Lumber Company near Mt. Vernon to Bellingham for shipment. All of the interurban freight moved at night.

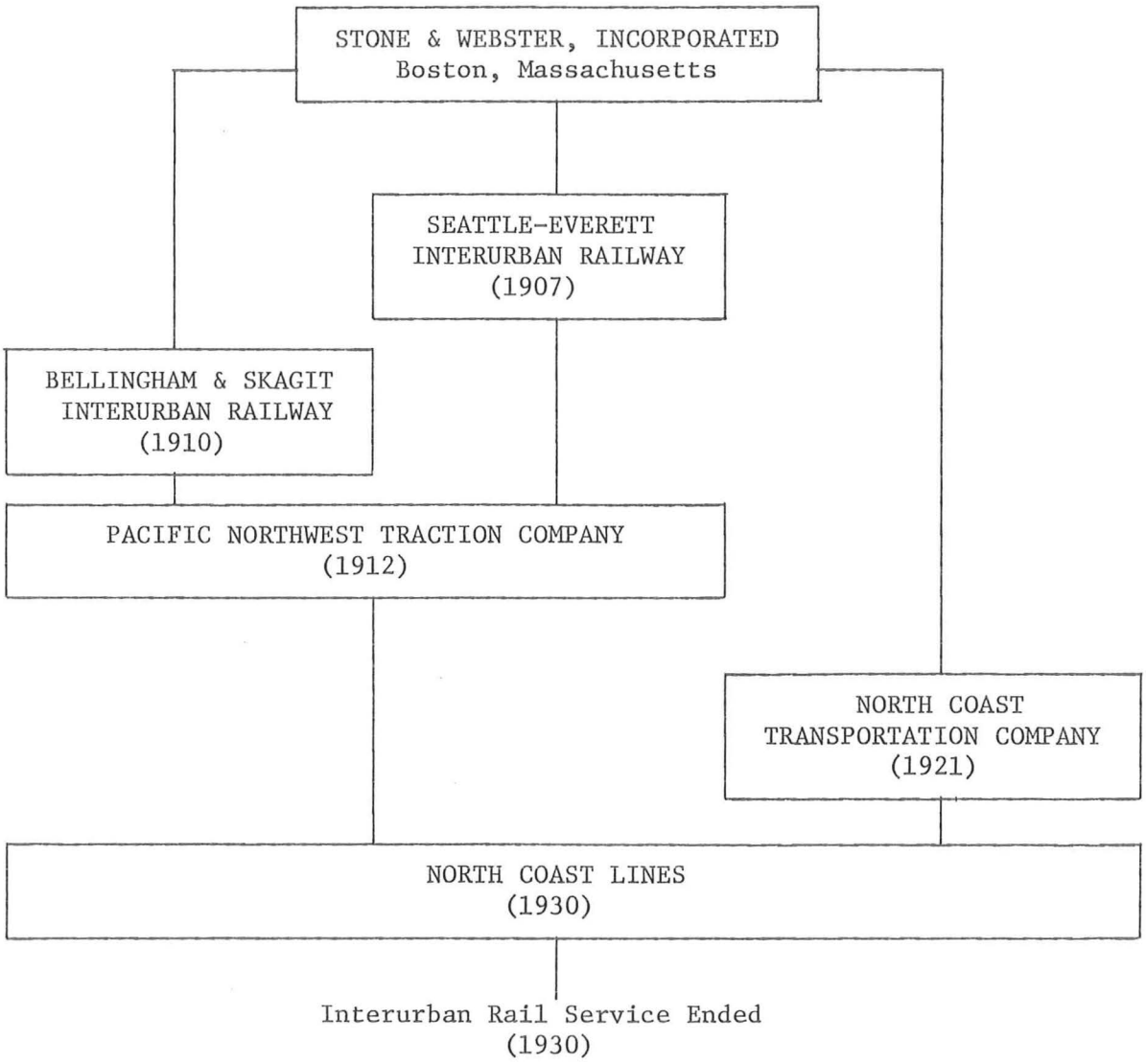
By 1914 business factions in Mount Vernon and Bellingham were beginning to pressure Stone & Webster to construct the "missing link" over the 30-mile gap between Mount Vernon and Everett, since passengers going to or from Seattle had to take a private bus, or "jitney", over the gap to complete their journey. British Columbia Electric at the same time was planning a line south into Bellingham and it seemed that the dream of direct service from Vancouver to Portland was soon to be realized. But in 1914, war broke out in Europe and further construction plans were shelved by both B. C. Electric and Stone & Webster.

Although the war years were busy ones for Pacific Northwest Traction, especially during Bellingham's shipbuilding boom in 1917 and 1918, it was World War I which began the decline of electric railways all over the United States. The diversion of capital and materials needed for upkeep of equipment, and also the great advances made in automobile, truck and bus technology during the war resulted in a downward trend in profits that ended eventually in financial collapse.

Figure 4

CORPORATE EVOLUTION OF BELLINGHAM & SKAGIT

INTERURBAN: 1910-1930



Stone & Webster made determined efforts in the early 1920's to improve interurban service. The cars were modified in 1921 to cut the time between Bellingham and Mount Vernon to 50 minutes, and speeds over the flats south of Edison reached 65 miles per hour. In 1925 the Chuckanut bridge was rebuilt with concrete and steel at a cost of approximately $30,000, and expensive modifications were made on the Skagit River bridge in 1929. The original 60 lb. rail was replaced with 90 lb. rail, and for better passenger service, nine new stops were added to the original 27.

Three spectacular and widely-publicized accidents occurred during this period, one in 1924, another in 1928, and a third in 1929. No one was killed, but adverse publicity did little to help declining passenger revenues. In 1926 passenger service was ended on the Sedro-Woolley run, and on June 1, 1930 all passenger service was suspended and the properties sold to the North Coast Transportation Company, another subsidiary of Puget Sound Power and Light Company. Freight service was continued for two more years, then it too was abandoned.

The consolidation of Pacific Northwest Traction with the North Coast Lines emphasized the shift in Puget Sound Power and Light's transportation policies to buses. North Coast was primarily a bus line, with the interurban lines becoming appendages of steadily decreasing importance. North Coast was created in 1921 when Stone & Webster secured a franchise to operate buses between the Mount Vernon and Everett sections of the interurban line. As highways were improved, the bus became more and more popular, and ultimately came to offer better, more frequent and more localized passenger service than the interurban could. In a similar manner, trucks gradually captured the local freight business from the electric railways. Finally, the private automobile came to dominate the passenger weekend excursion business, and eventually began to threaten the bus lines for daily passenger service.

Some authorities have attempted to lay the blame for the demise of the interurbans on the steam railroads as well as the automobile, but this does not appear to be true in the case of the northern Puget Sound lines. Although the Bellingham & Skagit paralleled the Great Northern (as the great majority of electric interurbans tended to parallel previously existing steam railroads), relations between the two were remarkably cordial. The most plausible reason for this would appear to be that the

interurban took only the least profitable freight and passenger business from the Great Northern: the local, short-haul type traffic.

Despite their relatively short lifetimes, electric railways made very important contributions to transportation development in northern Puget Sound. The early street railroads encouraged, if they did not initiate, the physical growth of the region's urban centers, especially Bellingham. In turn, the Bellingham & Skagit Interurban was a direct result of the success of these street railways, and it greatly aided agricultural development in the Skagit Valley. Together with steam railroads, the electric lines ended Northwest Washington's reliance on the horse and the steamboat for carrying passengers and freight. However, the interurban was the first to fall in competition with the bus and the truck, and within a few more years, the private automobile and bus finished off the street railways. The downfall of both types of electric railways foreshadowed the decline of the steam and later Diesel railroads, a process which has continued to the present.

-Notes-

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[11]Whatcom Reveille, April 28, 1911.

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[14]Reveille, April 28, 1911

[15]Stone & Webster, Inc., p. 261.

THE RAILROAD TO MONTE CRISTO

Harvey E. Heiges
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Monte Cristo! When I was a boy Monte Cristo meant the Count of Monte Cristo and I was a fan of the Count and his feats. Nearly a decade ago I was pouring over a U.S. Forest Service map showing part of the western slopes of the Cascades; there to my surprise was a place called Monte Cristo. Naturally my curiosity was greatly aroused to know why a place would have that name.

To find out first hand what the place was like I persuaded my wife that we needed a trip to the mountains. Yes, in March! After what seemed an endless drive on a dirt road, although one of great scenic beauty, we came to the place that according to our map was Monte Cristo. But what a disappointment. The road had ended in the parking lot of a dilapidated lodge closed for the winter.

Ah, but not all was lost; for as we wandered around the place we came upon a weather-beaten railroad sign announcing that indeed a railroad, the Hartford & Monte Cristo, had at one time terminated here; we were at that very moment standing on the skeleton of the locomotive turntable! As we had traveled along the road to Monte Cristo I had observed at times what appeared to be the remnants of a railroad roadbed. What more could a transportation geographer and fan of the Count of Monte Cristo ask for than a railroad to a place called Monte Cristo! Immediately I began a search for information as to how and why a railroad was built to such an isolated area. The fascination with this particular rail line and its colorful history culminated a few years ago in my naming my own model railroad in the back room of my home, the Granite Falls & Monte Cristo.

Discovery of Monte Cristo

On July 4, 1889, two prospectors, Frank Peabody and Joseph Pearsall, came across a pass in the Cascades, later called Poodle Dog Pass, from Index to Silvertip Peak. As the two looked across the South Fork of the

Sauk River they saw a ledge of gold ore. Exclaimed Prospector Peabody, also a student of Alexander Dumas, as he attempted to express the extent of mineral wealth lying before them, "There's enough gold in that mountain to make the Count of Monte Cristo look like a pauper." (4) Thus the fabulous sounding name of Monte Cristo came to be associated with the prospectors' discovery and was thought most fitting for the soon to be bustling mining camp tucked away in these western Cascades.

Success of this newly discovered remote mining district would depend upon accessibility--specifically a railroad. First supplies were packed in by men along a trail hacked out in April of 1890. By August, a horse trail was completed. Without a wagon road, however, the minerals of the district would never be exploited. A fifty-mile tote road was built between Sauk City on the Skagit River and Monte Cristo in 1891. The entire trip from Mount Vernon to Monte Cristo via the tote road took five days (4). However, the road deteriorated rapidly due to the hard winters.

To develop the district the promoters needed substantial financial backing; extracting the ore would be expensive although rewarding. Eastern capital was secured on the basis that the success of the enterprise required a railroad to tap the resources.

Building the Railroad

The Everett & Monte Cristo Railroad was incorporated in March, 1892, with a capital of $1.8 million. Railroad engineers proposed two alternative routes: one via the north fork of the Sauk River through the mining camp of Darrington; the other via the south fork of the Stillaguamish River past the mining camp of Silverton (see map). Although more difficult and expensive, the latter route was chosen because of the greater potential for traffic to be derived from the rich minerals and resources of the valley. The railroad would be sixty-three miles long from Everett to Monte Cristo.

On March 26, 1892, the construction contract was let and work on the right-of-way commenced soon thereafter. Much of the railroad would run through canyons requiring numerous bridges, trestles, and tunnels, including one 900 feet long. Grading commenced at Granite Falls; a

connection with the Northern Pacific Railroad was made south of Hartford.

Work progressed rapidly in spite of the difficult terrain, as Italian and then Chinese workers were brought in to build the railroad. A twenty-seven mile cedar plank supply road was pushed from Hartford to Gold Basin and stage service initiated. In July, 1892, rails finally arrived by train from the East and track laying began immediately. More rail equipment followed by ship in November via the Horn. By October track laying had reached the summit of Barlow Pass, just five miles from Monte Cristo.

Railroad engineers had not listened to the tales of old homesteaders about the rampaging Stillaguamish; what they thought was a mere trout stream soon became a rising flood that washed away a mile of track and caused a tunnel cave-in. But the worst was yet to come as more heavy rains descended followed by a snow-melting warm chinook wind. During the second flood the Stillaguamish washed out all the bridges between Granite Falls and Silverton; reconstruction would require at least six months. Opening day would not come until August 5, 1893; the day on which the first locomotive whistle was heard in the valley of Monte Cristo (4).

By means of a switchback the Everett & Monte Cristo Railroad climbed the last steep grade one mile from town and reached the terminal at Monte Cristo. The yard, turntable, and locomotive facilities were located on the flat, west of town. The mining boom could now begin in earnest.

Passenger train service was initiated on a tri-weekly schedule with trains leaving Everett on Monday, Wednesday and Friday and returning the same day. Trains left Everett at 8:15 a.m. and arrived at Monte Cristo at 12:45 p.m., a four and a half hour trip. The return train left at 2:15, making the downgrade return trip to Everett in only three hours and forty-five minutes (2).

Mining Activities and the Railroad

Equipment for construction of the ore concentrator, ore tramways, and other projects began arriving by rail. Track was laid north of town to the large five level mill by means of another switchback. Finally, on January 4, 1894, the first carload of ore left Monte Cristo for the

smelter at Everett (4).

Upon completion of the railroad, investors in the district expected the riches of Monte Cristo to be theirs. Nature, however, was not very obliging. Each fall and spring storms brought heavy rains and renewed flooding with track wash-outs, demolished trestles, and tunnel cave-ins along the railroad. In winter continual plowing and shoveling of snow was necessary, and even then service was frequently interrupted. Maintenance and winter operation costs were far more than expected.

Mining companies also encountered difficulties as ore veins proved to be complex and refractory. Costs rose rapidly as ore bodies ended at faults and miners searched for new veins. However, new claims were continually discovered and new districts started in the nearby areas of Goat Lake, Deer Creek and Silverton. People continued to pour into the mining areas confident that riches were soon to be had. Business on the railroad grew, and to accommodate the added traffic, the Monte Cristo terminal was expanded: yard tracks were increased, a roundhouse built and a car repair shop constructed. The summer of 1897 saw ore concentrates leaving town at a record level.

The First Passing of the E. & M. C.

October, 1897, saw week after week of rain come to the region. Once more the Stillaguamish River took its toll on the railroad washing out sections of track. This time the railroad was not repaired. Without rail transportation, ore shipments stopped.

The demise of the Everett & Monte Cristo Railroad was temporary, however. In the minds of many, the Monte Cristo mining district had yet to reach its fullest potential. The fabulous wealth was still there somewhere and only required additional capital to extract the fortune. In 1900, a new corporation reopened the mines and rebuilt the railroad. Revival was in full swing.

The Northern Pacific Purchases the E. & M. C.

In 1902 the Northern Pacific Railroad Company purchased the line to Monte Cristo and began an extensive rebuilding program designed to put the railroad on a solid foundation to better withstand the ravages of

the Stillaguamish River. The tri-weekly schedule of passenger train service was resumed. Once again prosperity returned to the railroad and to Monte Cristo.

Other mining districts, lumber camps and settlements then developed along the rail line. Again the railroad's facilities at the Monte Cristo terminal were enlarged to accommodate the increase in traffic. The old concentrator was rebuilt and modernized. This second boom had the appearances of a more solidly based mineral development.

Second Passing of the E. & M. C.

In January, 1907, just ten years after the disastrous floods of 1897, nature again bedeviled the railroad. A huge rockslide blocked the line near Tunnel 2. As fast as the line was cleared more rocks slid down the mountain. Service continued on the line however with trains east of the slide meeting with westbound trains coming from Everett and transferring passengers around the slide area.

Just three weeks later, before the slide was completely removed, the old timbers at both ends of Tunnel 1, the longest on the line, caught fire from the sparks of a passing locomotive. The tunnel collapsed trapping the locomotive east of the cave-in and west of the slide. This was the worst disaster to hit the line since of floods of 1897 (4). Mining and logging operations then closed with a cessation of railroad service. The Northern Pacific discontinued formal service beyond Silverton; however, for the benefit of the few remaining residents and miners the railroad provided a small handcar on which provisions, mail and a couple of passengers could be transported the thirteen miles to Monte Cristo.

One Last Revival

Promoters were certain however that handsome profits could still be realized if mining activities could only be resumed. New interests took over the mining properties; but the mines did not reopen in 1910 as expected. Later, yet another company, the Boston American Mining Co., bought out the claims in 1912 and reactivated Monte Cristo. Since much of the town was by then beyond repair, new buildings including an ore concentrator, were constructed on the site of the former railroad terminal tracks on the flat below the town.

The Northern Pacific once more began restoring the line to Monte Cristo. However, only temporary repairs were made pending assurance of sufficient ore traffic to justify a complete rehabilitation. The coming of World War I spelled the end to mining activities at Monte Cristo and consequently a major overhaul of the railroad (4).

A New Railroad Appears

On May 15, 1915, the Hartford Eastern Railroad was incorporated to operate over 42.1 miles of Northern Pacific tracks from Hartford to Monte Cristo. Equipment was given as one locomotive, six passenger cars, and two freight cars (1). In addition there were gas cars that carried tourists from the Northern Pacific connection at Hartford to the Big Four Resort and then continued on to Monte Cristo. The Hartford Eastern later purchased this branch line from the Northern Pacific, serving the tourist trade with modest success during the 1920's and early 1930's. Control of the railroad passed to the Puget Sound Pulp and Timber Company in 1929, and three years later to the Soundview Pulp Company (1).

The End of the Line

In August, 1932, the company asked the Interstate Commerce Commission for authority to abandon operations until January 1, 1935, on grounds that the railroad was unable to meet expenses. Revival of service never came, for on April 22, 1933 the I.C.C. authorized abandonment of the entire 42 mile line from Hartford to Monte Cristo with the argument that the line had been built originally to serve a mining district that was no longer active (1).

And so after 1933 the fabulous mining district of Monte Cristo was once more only accessible by foot or by horseback. Under the weight of heavy winter snows and humid summers the abandoned town of Monte Cristo soon disappeared with few traces remaining. The Iron Trail to Monte Cristo soon followed the two into oblivion as scrap hounds removed the rails in the early 1940's, leaving behind a road bed, parts of which were later used as a primitive road maintained by the Forest Service and providing limited access to the old town site. There are still those who believe that Monte Cristo will yet reappear as a prominent mining center. But today all that remains is the old, weathered Monte Cristo Lodge, which was once the cookhouse of the Boston American Mining Company, a few deserted mine shafts, and the beauty of the Western Cascades.

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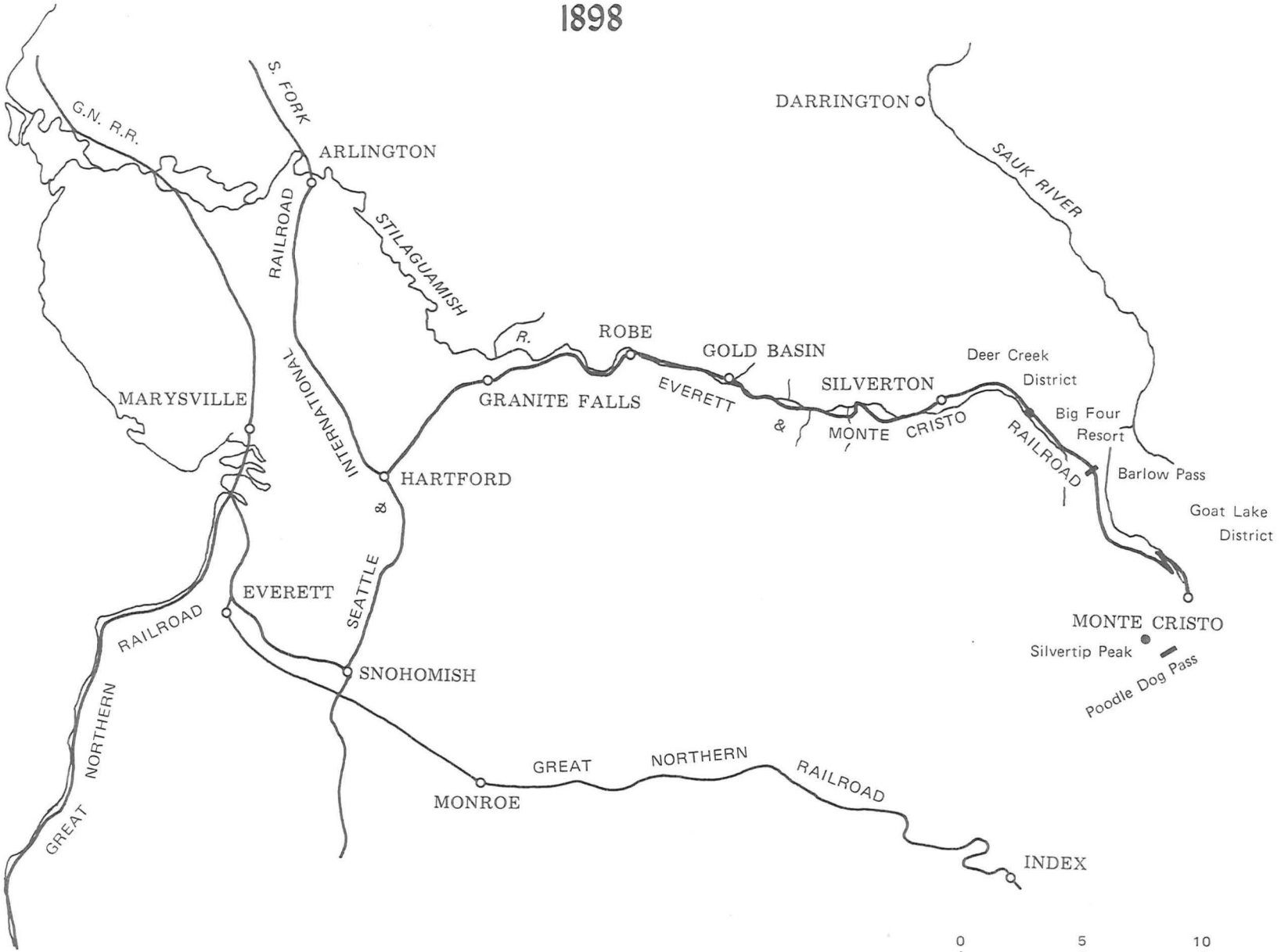
Note: The paper as presented included a number of slides illustrating equipment, right-of-way and buildings of the railroad and towns served by the railroad.

THE EVERETT & MONTE CRISTO RAILROAD
1898



SOURCE. U.S. GEOLOGICAL SURVEY, TWENTIETH ANNUAL REPORT PART 5 PLATE II, 1898

ENVIRONMENTAL CONSIDERATIONS IN PLANNING AVIATION SYSTEMS FOR THE 21ST CENTURY

by

Carl V. Robart and Alan K. Hogenauer
R. Dixon Speas Associates

Introduction

The objective of this paper is to predict the ways in which environmental considerations will be involved in the planning process for aviation systems twenty-five years from now. (Somehow, putting it this way changes the impact of "the 21st Century!"). Of course, aside from being beyond a relatively unusual milestone, the first years of the next century should not be appreciably different from the last years of this one in terms of planning requirements.

On the eternal calendar, concerted environmental awareness is nothing new, but concerted environmental action surely is. However, even though national concern over the interaction between air transport systems and their "environment" is a relatively recent phenomenon, it seems reasonable to predict that concern over this interaction will continue unabated for the next three decades.

The noise produced by jet aircraft is the most significant environmental issue facing aviation. Citizen concern with aircraft to be designed with acceptable noise characteristics. Even after the emergence of quieter aircraft, compatibility of land use in airport environs will continue to be the most important facet of environmental planning, and the inevitability of conflict (given adjacent incompatibility) will force restrictive zoning and additional land purchases to minimize airport impact, and continuation of the shift away from close-in airports serving long-range markets. Other pollution from aviation sources is and will remain a relatively minor problem.

Solutions to contemporary problems, as well as solutions developed in closing gaps in present air transport systems, will be technologically and environmentally constrained, with cost-effectiveness a common concern to both.

Environmental Planning Problems in Evidence Today

We started out to consider possible environmental planning problems for the 21st Century, and soon found that existing problems had to be noted first, since barring a virtually unrelenting attack on only airport issues, it is unlikely that these issues will be fully resolved before the beginning of the 21st Century. Therefore, a brief recap of current issues seems in order.

Incompatibility between aircraft noise and the land use in the vicinity of airports is the principal concern of environmental impact. Introduction of jet aircraft into commercial service in the late 1950's ushered in a new era of fast, safe and economical travel. Although the number of airports has increased only slightly since that time, the number of air travelers and aircraft movements has grown many times over. During the same period, new residential development has occurred in the vicinity of nearly all busy airports. This rapid expansion of air travel and residential growth near airports has created a significant noise problem between the airport and the community surrounding it. Across the nation, in fact worldwide, community objections to airport development have become sufficiently strong so as to have virtually stopped major expansion of air carrier airports.

Within the aviation industry there has been a recognition, albeit belated, of the need for quieter airplanes. Considerable progress has been made in this area. One sign of this progress is the new wide-bodied 747, DC-10, L1011 and A300 aircraft which are powered by engines that produce over four times the net thrust of the first commercial jet engines and yet are significantly less noisy.

The engines on these aircraft were designed to meet the stringent noise level requirements of Part 36 of the Federal Aviation Regulations. Part 36 set levels for all new types of aircraft and mandated that after January 1, 1974, all jet aircraft manufactured, new or old, must not exceed the limits set.[1]

There are, however, approximately 2,000 aircraft currently in operation which do not meet the present FAR 36 noise certification standards for sub-sonic turbo-jet airplanes. For several years the Federal Aviation Administration has considered additional rulemaking to establish noise reduction requirements that would involve modification

(retrofit) of these noisy airplanes as a condition to their further operation.

The promulgation of a retrofit requirement is considered a necessity by the vast majority of the public affected by aircraft noise and by a large segment of the aviation industry itself. Under these circumstances, the implementation of such a rule is widely considered a virtual certainty.

Last year, Speas Associates was asked by the Department of Transportation to evaluate the cost impact that three different retrofit programs would have on the aviation industry. The study concluded that retrofit requirements would probably not accelerate materially the retirement of "noisy" aircraft since the replacement costs for new aircraft with comparable productivity were estimated to range from 5 times to 20 times the cost of retrofit. The cost of retrofit programs will range from 4 percent to 15 percent of the $11 billion total investment in flight and ground equipment forecast for the principal U.S. carriers during the retrofit period, 1975 through 1978.

Public financing by methods similar to the present tax structure would pay purchase and installation costs of retrofit hardware with a 1 percent tax as follows:

Retrofit Program	Total Cost	User Tax
	$ Millions	Period
Nacelle Treatment	$ 396	3 years
Nacelle/Jet Suppressor	987	6 "
New Front Fan	1,598	9 "

The acoustic effectiveness and benefits of the various retrofit programs increase with cost - the most costly also being the most effective. Which will be selected is uncertain at this time.

Neither is the basic question of who will pay for quieter aircraft fully answered or answerable as yet, although a battleline posture between operators, users and "the general public" is already evident.

U.S. aviation policy, implemented through the Civil Aeronautics Board, has essentially been one of permitting gradual fare increases to reflect increased operating costs. However, fare increases are uniformly applied, and the impact of retrofit upon individual carriers will

vary widely, so that a fare "solution" is likely to be supported by the most affected carriers and resisted by the unaffected carriers.

Retrofit is, of course, not the only means available for improving the compatibility relationship between airports and their environs. A 1972 HUD study listed 54 different "strategies" for noise abatement which can be broken down into the following categories:

Operational strategies, primarily related to maneuvering aircraft so as to avoid flying over noise sensitive areas.	12
Operational strategies, primarily related to restricting use of runways or entire airports during certain or all hours of the day or night	6
Technological strategies, primarily rendering existing aircraft less noisy	7
Technological strategies, primarily physically modifying structures subjected to noise	3
Land Use Compatibility strategies, primarily managing land nearby airports, minimizing conflicting uses	18
Mode Substitution strategies, seeking alternative methods of transportation	2
Legislative strategies, resolving conflicts through legislation	6

Operational strategies related to aircraft maneuvering are already in the process of implementation. Seattle-Tacoma International Airport is one of 56 airports nationwide under consideration for implementation of a two-segment approach procedure, intended to provide relief principally for areas located from 3 to 8 miles from the runway under the approach path.

Operational restrictions in the form of reduced frequencies or air carrier type prohibitions are extremely negative measures and to date have been adopted only as interim measures in crisis situations, e.g., the quota system among New York's three air carrier airports. (Restriction of general aviation traffic at air carrier airports must not be considered as an environmental prohibition, but rather as a traffic control expedient.)

Technological adaptations on the ground are essentially lastditch defenses, and do not appear likely to dominate in future planning. These include noise barriers - only a partial solution - and building soundproofing - an interesting approach but a high cost and isolating solution.

Until aircraft are much quieter, compatibility of land use in airport environs, as we noted earlier, will continue to be the most important facet of environmental planning for airports.

Perhaps the most promising development of the last decade is the formal introduction of environmental considerations into the airport master planning process. Airport master plans have long been concerned primarily with developments within the confines of the airport boundaries while the real threats to airport survival have been lurking outside their boundaries.

The form that environmental considerations take in the planning process is critical. Future planning for airports must differ from most existing planning in that a primary goal must be to preserve existing airports wherever feasible, and yet still assure future harmony with their environment. In order to accomplish this, the area contiguous to the airport must be included in the master planning. For a major air carrier airport, 100 square miles or more would be a reasonable and realistic area to include; for smaller fields, the impact area would be proportionately smaller.

Since it is highly unusual for an airport operator to have direct power to zone or regulate development within the airport influence area, the goals of an airport plan can be accomplished only through cooperation and coordination with appropriate jurisdictional bodies. Only through this approach, will it be possible to develop plans for airports which are not only compatible with future development and use of the airport, but also compatible with future plans of these jurisdictional bodies. To be successful, any airport master plan must be capable of implementation, which in turn means that the acceptability of the plan is essential. The key to plan acceptability is involvement by as many governmental bodies, agencies and members of the general public as possible. In this way the plan can become more than a master plan for the airport; it can become the community's plan for airport operation and improvement.

Implementation of such an improved method of planning is underway now at at least three major airports in the U.S. - Seattle-Tacoma International Airport is one of these. We note that the Transportation Policy Advisory Committee of your own Puget Sound Governmental Conference has called for an expanded air transportation system planning approach for

the Puget Sound Region.

Another airport where this concept is being employed is Baltimore-Washington International Airport, where Speas Associates is finalizing the work program for a master plan which is truly an environmental assessment. Huntsville-Maddison County Airport in Alabama is a third. So the trend is becoming clearer coast-to-coast.

Restrictive zoning and additional land purchase are also methods of attacking the land use problem. While restrictive zoning can be effective, it is limited in that it does not resolve the problem of existing incompatibilities. Additional land purchases are costly, but are a definite solution in some areas. Major examples of this strategy's use are Los Angeles International's purchase of off-runway homes worth hundreds of thousands of dollars, and even closer, Seattle-Tacoma's recent acquisition of noise impacted land at the cost of several million dollars.

The shift away from close-in airports serving long-distance flights has been implemented, but sporadically. Among others, Kansas City and most recently Dallas-Fort Worth have taken this route, acknowledging in the latter case the importance of avoiding duplication. It is not unlikely that this strategy will be attempted again in the future. Successful implementation of land use decisions involving the dedication of up to 30 thousand acres for the establishment of a new major jetport will depend upon the concern afforded environmental factors. This will mean that the site selection process for a major new jetport should involve a comprehensive analysis of all of the costs and benefits involved. The environmental costs are not an insignificant component of this analysis. After all, a major facility may cost upwards of a half billion dollars by the time it is fully operational. It is inconceivable that an environmental study involving a few tens of thousands of dollars, hurriedly contracted for a few months before the final decision is to be made, could possibly be adequate. The National Academy of Sciences study of proposed runway expansion at Kennedy International Airport occupied the full-time attention of several dozen scientists, engineers, and administrators for one month and cost in excess of a third of a million dollars. Even at this, in some areas the study group had to satisfy itself with an admittedly superficial examination. However,

they did identify the major factors involved and made a most useful analysis of alternatives and costs. Any major airport expansion should receive this kind of detailed scrutiny, but it should be started long before decisions are made, and should be spread over a longer period of time.

There is an additional major concern. As planners we recognize that the expansion of air transportation facilities can only be done rationally as part of a national transportation policy on the one hand and comprehensive national and regional land-use plans on the other. At present this cannot be done, inasmuch as there exists no operative national transportation policy. But even in the absence of this, there is no excuse for not developing regional land-use and transportation plans that could provide interim guidelines. Admittedly these regional plans would prove unsatisfactory in the long run and efforts should be made to force Federal agencies to come up with comprehensive national guidelines.

As in numerous other areas, Federal legislation and programs are increasingly influencing planning activity at the State and local level, primarily because of the financial dependence of the latter on the former. Planning over the next two decades and into the 21st Century is likely to be even further governed by national guidelines.

Of greatest interest to airport planning in the redefined context we have described is the status of national land use planning legislation and its State counterparts. Because the Federal Executive would have the right to withhold funding in the event of noncompliance with national land use directives, and because Federal aid to airports via the ADAP program of the Airport and Airway Development Act of 1970 is increasingly important to local financing (e.g. 75% of the cost of nearly all construction items except terminals, and 82% of the cost of security-related items), the impact of an effective national land use policy would have as far-reaching an effect on airport planning as did the basic funding of such planning under the Planning Grant Program of the 1970 Act.

We rather quickly passed over the questions of pollution in the introduction, and this should be explained further. Our consideration is restricted to air and water pollution. We concluded that the overall impact of aviation on air and water quality is minor relative to other

sources. The following explains the derivation of this conclusion.

In evaluating the contribution of a major air carrier airport to the pollution in the surrounding metropolitan area, it is useful to compare the emissions from the airport with those in the surrounding areas on a unit area basis. This puts the contribution of the airport in the general context of air pollution from all sources. Such an analysis can be performed using the data contained in a report prepared for the Environmental Protection Agency studying the impact of aircraft emissions upon air quality.

We undertook this type of analysis for Washington National Airport. We selected National because much of the surrounding land is open or contains only low density housing; thus, the contribution of the airport would be readily identifiable.

With the figures given in the EPA report it is possible to calculate the total annual pollutant load per square kilometer of airport area and to calculate the same figure for the area within a 15 kilometer radius of the center of the airport, excluding the airport itself. Including ground operations, an appropriate fraction of flight operations, and non-aircraft ground sources within the airport (autos, heating plants, etc.), total pollutant load for National Airport is 1,436 metric tons per square kilometer per year. The comparable figure for the surrounding area is 1,250 metric tons per square kilometer per year. Thus the airport contributes only 15 percent more pollutant per unit area than does the surrounding residential territory. If one looks at all pollutants except carbon monoxide, the airport does contribute 30 percent more than the surrounding area. However, for dry particulates, the airport contribution is 30 percent less than the average of the surrounding 10 kilometers.

Although pollutant concentrations are high in certain parts of the airport, atmospheric dispersal limits the concentrations at airport boundaries to sufficiently low levels that the airport contribution represents less than ten percent of the total on an annual basis. Thus the contribution of an intensively used air carrier airport to total airborne materials in the airport environs is small, and that of an airport with considerably less traffic is to all intents and purposes insignificant.

Essentially similar conclusions derive from an examination of the impact of airport operations on water quality. Sanitary loading from aircraft and the terminal and surface runoff from paved surfaces are the principal sources of water pollution. Since there are effective methods of handling contamination from these sources, degradation of water quality need not be a significant problem.

One possible exception to this situation is the location of an airport adjacent to a body of water. A project funded by EPA is underway at New York's John F. Kennedy Airport, which is situated on the shoreline of Jamaica Bay, to test various means of keeping the contribution of the airport to water pollution to a minimum.

Environmental Planning Problems Foreseeable Tomorrow

Environmental considerations in planning aviation systems for the 21st Century should not be restricted simply to contemporary concepts, as there will undoubtedly be attempts to close current gaps in these systems (e.g. airport surface access; multimodal, mass-transportation interface; new short-haul aircraft).

Until recent times, growth in air transportation has largely been paced by advances in air vehicles. The advances which have appeared in air transport vehicles have derived from either evolutionary development of existing aircraft or the successful introduction of new concepts.

Most transport aircraft advances and new concepts have been brought about to satisfy user demand for improved transportation: faster, safer, more economical air travel. While continuance of demand for increased overall travel speed and lowest relative cost can be comfortably forecast for the years between now and the 21st Century, satisfaction of this demand cannot be so readily foreseen.

It is generally recognized that there are many constraints on our ability to utilize all of the air vehicle technology that is available today. Continued advancement in vehicle technology is essential to overcome the critical problems from which these constraints derive. Aircraft noise is the most significant of these problems.

Although many aircraft concepts will be possible within the technology that is expected to develop over the next twenty-five years, only certain concepts will mature into safe, efficient economical vehicles for air transportation. The historical trend of demand for air transportation

will continue to place the greatest pressure on technology for development of powered lift for short-haul aircraft and for higher speed for long-haul aircraft. Either of these advances must be accompanied by achievement of operating safety, efficiency and economy and by low noise and pollution characteristics.

There are several areas in the total spectrum of air transportation in which the demand for reduced travel time is not well satisfied by a current exploration of the technological potential. These "transportation gaps" are illustrated in the accompanying figure.

Opportunities exist for new air vehicle concepts in both short-haul (under 500 miles) and long-haul (over 1,000 miles) air transportation.

In short-haul transportation generally, and even in long-haul transportation more often than desired, a significant portion of today's total trip time is normally and unavoidably accumulated as a result of factors not influenced by vehicle cruising speed. Therefore, future air travel trip time reduction is more dependent on reduced airport access time, reduced aircraft ground and air maneuver time, and increased frequency of flights than on vehicle technology.

In most metropolitan areas, the possibility for reduced airport ground access time will improve only if additional airports can be located closer to the origins and destinations of travelers. This potential is grossly limited unless vehicle concepts requiring much less land area are developed, not only to allow existing airports to continue, but new airports to be developed in metropolitan areas. The requirement for less land area focuses on two elements: the vehicle's capability for takeoff and landing on short runways, and its propulsion system's ability to perform at low noise and pollution levels.

To realize the benefits of reduced ground and air maneuver time, short-haul vehicle concepts must be capable and free to operate segregated from the congestion and non-productive extra-mileage often required by conventional air traffic control procedures.

Another substantial contribution to reduced travel time (particularly on short-haul routes) can be made by reduced headway between flights offered. This opportunity poses several dilemmas for the

industry. Total segment demand is normally handled most economically by a few flights with large aircraft. But large aircraft at low frequency will generally not attract the same percent of the total market as smaller aircraft at high frequency. Greater flight frequency will add to the potential for airport and airspace congestion and delay, and will be self-defeating as a means of travel time reduction, unless an efficient system is evolved to segregate each class of air traffic into exclusive airspace environments to expedite flows.

In long-haul transportation the travel time delays in airport access, maneuver time and flight frequency are of much less significance. Here the greatest opportunity for future travel time reduction lies in increased vehicle cruising speed. Acceptable "high-speed" vehicles must have adequate range, be comparably commodious and comfortable, and be reasonably comparable in cost in order to penetrate a market by exploiting the "value of time."

An example of the impact environment as an issue has had in shaping future vehicle technology in aviation is the decision not to construct a U.S. supersonic transport. Such a vehicle would have filled the long-haul gap identified in the previous figure. Concern over the environmental impact of high altitude air pollutant emissions and sonic booms was in large part responsible for the decision to suspend the U.S. SST development program. A major factor currently troubling the European SST venture is the high fuel consumption rate of these aircraft, and the resulting high operating cost, as our present energy crisis has demonstrated.

Elimination of all environmental interaction problems is unlikely, even if aviation activity were to be restricted to remote and isolated sites. Even with all foreseen changes instituted, some concern will be voiced as long as there is any noise, any pollution and any land-use incompatibility in the surrounding area attributed to airport operation.

We suggest that it will be harder for new technology to meet existing and foreseeable environmental constraints than for existing technology to be modified to meet existing and foreseeable constraints. New systems to fill existing gaps will continue to find their acceptability challenged, but we cannot predict anything as grim as ultimate failure to achieve acceptance.

A recent "advanced rule-making" concerning noise standards for short-haul aircraft suggests something of the nature of the dilemma. The class of short-haul aircraft has not been defined, although a list of airport concepts can be developed and roughly evaluated.

At airports with primarily conventional aircraft operations, short-haul operations on short-haul runways have been envisioned as potentially having a negligible impact. This is likely under existing conditions, but if the short haul runway approach and departure paths cover airspace presently unutilized by conventional aircraft, and/or conventional aircraft noise levels are markedly reduced, short-haul aircraft without similar noise reduction assets would pose a significant problem and would not be acceptable.

At secondary, reliever, or other general aviation airports, operations of short-haul aircraft in commercial service are likely to have an adverse impact by their incremental presence alone.

Primary airports with predominantly short-haul operations and/or V/STOL ports near or within city centers are the most difficult to envision given foreseeable constraints. We have only to consider the example of Dallas Love Field or the downtown seaplane and rooftop helicopter operations of the present whose future has already been severely challenged by economics.

It is true of course that decisions on aviation facilities are made as a part of or as the result of political processes. In the past, these decisions have been made as the result of the wielding of political power by several groups, each of which purported to represent the public interest or some section of it. However, these groups often represent very narrow constituencies. Thus airport commissions saw their duty to provide expanded facilities in response to projected air traffic demands. Fish and game commissions could see only threats to wildlife, and could be expected to defend the interests of the hunters and recreationists. City administrators often saw airports as a major base for the economic prosperity of the city. The individual citizen's view of the costs and benefits of an airport was rarely permitted an input to early planning stages. Public hearings are often held at almost the last minute, after detailed plans have been prepared and implementation is imminent.

Environmental considerations will reshape this political decision-making process in basic and fundamental ways. One political scientist has classified decisions like those described above as being made in a distributive arena. Typically these decisions are made without regard to limited resources. The politics of every person for themselves prevails. Conflicts are avoided since the supply of resources is presumed to be unlimited. Coalitions are not infrequently required to pass legislation or make policy, but rather than being based on shared interests, they are based on mutual non-interference.

In the distributive arena, there are not winners or losers, only differing degrees of winners. Because of both the decreasing volume of natural resources and an increasing awareness that these resources are finite and in many cases irreplaceable, many decisions involving the consumption of natural resources can no longer be made in a "distributive" arena. They must be made in a new arena which has been termed "regulatory," and where coalitions are formed around shared interest rather than around mutual non-interference.

Plans for airport development and identified future air transportation concepts must fill evident needs. In the regulatory arena, both sides cannot be accommodated. The resolution of conflicts will depend upon which participant is best able to evidence responsiveness to the public interest.

The term "public interest" is so often misused. On the one hand, there is the airport-oriented public interest - in the availability and frequency of service, in the provision of jobs at and related to the airport. On the other hand, there is the airport-affected public interest - in the elimination of any and all side effects from aviation operations. There appears to be little doubt that while some individuals may fall into both categories, the more common occurrence is a sharp delineation between armed camps for each interest category.

Thus, the primary environmental concerns in planning new aviation systems will focus on the harmonious interaction between these systems and the communities they serve, in addition to the minimization of negative environmental impact on the surrounding area.

Summary

In these observations, at least two strong themes are evident. They suggest the likely form of the environmental considerations that will influence the planning of aviation systems in the 21st Century.

Future airport planning will have to recognize environmental constraints as critical and of equal importance to technical and economic constraints, rather than simply as subsequent hurdles once solutions to technical and economic issues have been successfully determined.

New concepts to fill existing gaps in aviation systems will be challenged far more by environmental requisites than by economic or technical constraints. Given a specific problem, there will always be someone willing to pay a monetary cost, and there will eventually be a technical solution, but there may well never be an attainable environmental balance.

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CONTRIBUTORS

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PROGRAM

Friday, April 26

7:30 p.m. Dinner
Dr. Roland L. DeLorme, Chrm. W.W.S.C.
"Transportation in the Pacific Northwest: The Past Speaks to the Present and Future" -- Dr. W. Turrentine Jackson, University of California, Davis

Saturday, April 27

9:00 a.m. Opening Remarks and Welcome -- President Charles J. Flora, W.W.S.C.

9:15 a.m. Dr. James W. Scott, Chrm. W.W.S.C.
Speaker, Mr. Lynn Sutcliffe, Transportation Counsel, Senate Commerce Committee -- Keynote Address

10:15 a.m. Dr. Manfred O. Vernon, Chrm. W.W.S.C.
"Transportation Problems and Prospects in the Lower Mainland of British Columbia" -- Dr. Gordon M. Shrum

11:15 a.m. Mr. Thomas J. Glenn, Manager of the Port of Bellingham, Chrm.
"The Role of the Federal Government in Regional Transportation" -- Commissioner A. Daniel O'Neal, Interstate Commerce Commission

12:30 p.m. Lunch
Dr. Howard J. Critchfield, Chrm. W.W.S.C.
Speaker, Dr. Edward L. Ullman, University of Washington

2:00 p.m. Concurrent Paper Sessions

A. Railroad Themes--Dr. James Hitchmann, Chrm.
"The Historical Development of Urban Transportation in the Puget Sound Region" -- Virginia R. Hetrick
"Railroad to Monte Cristo" -- Harvey E. Heiges
"Electric Railroads of Whatcom and Skagit Counties" -- Dan Turbeville

B. Other Historical Themes, Dr. Robert W. Teshera, Chrm. W.W.S.C.
"Accessibility and Transportation: An Analysis of Military Land Use Policy and Practice in the Pacific Northwest, 1849-1970" -- William H. Freeman, Jr.
"Terminus: Transportation and the Growth of Tacoma, 1870-1970" -- E. O. Pederson

C. Present and Future Transportation Patterns and Modes, Mr. Robert McAbee, Chrm., County Planner San Juan County
"Timing of the Boeing 747 Program" -- Douglas Fleming & John King

"Developing a Rapid Transit System for the Lower Mainland" -- Michael Eliot Hurst
"Environmental Considerations in Planning Aviation Systems for the 21st Century" -- Alan K. Hogenauer and Carl V. Robart

3:15 p.m. Panel Presentation
"Future Patterns and Modes of Transportation in the Puget Sound Region" --
Dr. Michael Mischaikow, moderator, W.W.S.C.
Members: Dr. Michael Eliot Hurst, Chrm., Simon Fraser University, Dept. of Geography
Mr. Mark Holland, Director, Hydrofoil Project, Boeing Aerospace Co.
Mr. W. L. Malone, Asst. V.P. in charge of the Seattle Region, Burlington Northern Railroad
Mr. F. J. N. Spoke, Port Manager, Port of Vancouver, B.C.
Mr. Ross C. Gaussoin, Director, Washington Trucking Assoc.