NUREG/CR-0973

Social and Economic Impacts of the Trojan Nuclear Power Plant

A Confirmatory Technology Assessment

Prepared by E. Wenk, Jr., P. L. Bereano, J. Douglass, M. Glover, R. H. Watson, G. M. Zemansky

University of Washington

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Office of Nuclear Reactor Regulation
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FOREWORD

CONFIRMATORY TECHNOLOGY ASSESSMENT

Confirmatory technology assessment (CTA) is the identification of the various impacts of a technology after it has been introduced. It is the process of identifying the actual or potential secondary and higher-order effects of a technological development or a technological delivery system on all sectors of society, including the economic, social, political, legal, environmental, and institutional effects. The purpose of a confirmatory technological assessment is to enrich the empirical data base so that the quality of technological impact analysis may be improved, thereby fostering a more constructive evolution of technology and society. As defined by the National Academy of Science in the report, Technology: Processes of Assessment and Change,

> The choice. . .is between technological advance that proceeds without adequate consideration of its consequences and technological change that is influenced by a deeper concern for the interaction between man's tools and the human environment in which they do their work.

While technology assessment is primarily concerned with the identification of the impacts that might occur from the introduction of a new technology into the social or physical environment, confirmatory technology, on the other hand, focuses on the impacts created by an operational technology. A confirmatory technological assessment may, in fact, provide the basis for measuring the accuracy of forecasting impacts in technology assessment projects and providing the empirical base which will permit more accurate assessment in the future. While technology assessment is a process of anticipating higher order and secondary impacts, confirmatory technology assessment is the analysis of the impacts that, in fact, exist or which the evidence suggests may develop.

The U.S. Nuclear Regulatory Commission (NRC) faces increasing demands to prepare credible and accurate impact studies that include a broad spectrum of social and economic effects as well as significant effects on the physical environment. To meet these demands, the NRC has let a series of contracts to private and public research institutions to assess the social and economic impacts caused by nuclear power plants. The Program in Social Management of Techno-

logy (SMT) of the University of Washington submitted a proposal to the NRC to perform a post-licensing impact analysis of the Trojan nuclear power plant, located along the Columbia River at Prescott, Oregon. Trojan, operated by Portland General Electric (PGE), is an example of a major energy facility introduced into a small, semi-rural community. To some extent, Trojan's community impacts should be typical of similar situations. In other instances, however, the impacts or lack of impacts are unique to Trojan, conditioned by the community characteristics of the Trojan area.

This proposal was accepted by the NRC. Original contract period of performance was from September 15, 1976 through December 30, 1977. During this time, there were three faculty members and two graduate students involved in the project. They were:

Dr. Edward Wenk, Jr., Professor of Engineering and Public Affairs; Director, Program in Social Management of Technology; Principal Investigator.

Mr. Phillip L. Bereano, Associate Professor, Program in Social Management of Technology (Acting PI during Dr. Wenk's sabbatical leave).

Mr. Richard H. Watson, Research Assistant Professor, Program in Social Management of Technology.

Mr. John Douglass, Graduate Research Assistant.

Mr. Morris Glover, Graduate Research Assistant.

At the completion of the period of performance a draft report was submitted to the NRC for review. Review comments were transmitted via Darrel A. Nash's letter of March 29th, 1978, in which it was stated that:

> "... the draft report is a substantial contribution (to) our knowledge on post-licensing social-economic impacts."

Nevertheless, there were areas in the report where additional information was deemed desirable. A new contract was let to gather additional data on housing, school enrollment, transportation, and local taxes. This additional information was gathered during the time frame of September 21st, 1987 through January 21, 1979 by G.M. Zemansky, Graduate Research Assistant, working under the supervision of Dr. Wenk. The report was also revised to incorporate NRC comments on the draft.

This report is an update of the draft report which incorporates NRC comments, ere appropriate, and the additional information which was gathered. It is a nfirmatory impact assessment of Trojan. Research was directed at assessing e primary and higher-order social and economic impacts of Trojan on the local mmunity. The analysis performed, impacts identified, and recommendations for proving the assessment process and the management of impacts are described. is hoped that this analysis will provide new insights into the possible impacts such energy facilities and indicate actions for the avoidance and mitigation those impacts which are adverse in similar future projects.

RODUCTION

The U.S. National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190) ovides that an environmental impact analysis shall be prepared for all federal ojects that might significantly impact the natural, social, or economic vironment. The NRC, by virtue of its responsibilities for licensing and otherwise regulating commercial nuclear power plants, has the responsibility for insuring that an adequate environmental impact statement (EIS) is prepared prior to construction and operation of each plant.

The EIS is prepared by the NRC, based largely on information submitted by the entity applying for NRC licensing. Section 102 (2) (C) of the NEPA defines the depth and scope of information that must be provided:

> Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on--
>
> (i) the environmental impact of the proposed action;
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;
>
> (iii) alternatives to the proposed action;
>
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
>
> (v) any irreversible or irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

It is generally acknowledged that the primary function of the EIS is to

insert consideration of environmental concerns into the decision-making process, bringing about, where possible, the avoidance or mitigation of unwanted future impacts. Over the years, scope of environmental impacts required to be covered in the EIS has been interpreted more and more broadly by the courts and practitioners.

Dr. Miller B. Spangler of the Nuclear Regulatory Commission, in an address to the First International Congress on Technology Assessment,[1] interpreted the expression "man's environment" to include both natural and man-made features, the latter involving the proposed nuclear facility as well as other man-made facilities or property whose value may be positively or negatively affected by the nuclear plant during its construction or operation. Spangler went on further to explain that the impact of the proposed nuclear development on the natural environment will also affect, to some degree, social values, including recreational, aesthetic, cultural, and historical as well as economic and community values.

Impact analyses covering a broad range of effects are relatively new, and the opportunity to improve these analyses certainly exists. Confirmatory technology assessments (CTA's) provide a framework in which this can be accomplished. CTA's provide information which can be used to evaluate directly the accuracy of those impacts forecast by the EIS. By so doing, they may lead to improvements in the forecasting mechanism and the empirical data base, thus increasing the accuracy and credibility of the EIS for similar projects. Moreover, CTA's may lead to the identification of previously unrecognized or incipient impacts, thereby providing the basis for actions designed to mitigate or avoid them.

RESEARCH METHODOLOGY

The methodology of confirmatory technology assessment is not well defined. The overall framework chosen here was adapted from the so-called "MITRE methodology" of technology assessment:[2]

COMPONENTS OF A CONFIRMATORY IMPACT ANALYSIS (Adapted from MITRE)

Step 1 DEFINE THE ASSESSMENT TASK

Identify relevant issues and any major problems.

Establish scope (breadth and depth) of inquiry.

Step 2 DESCRIBE RELEVANT TECHNOLOGIES

Describe major technology being assessed.

Describe other technologies supporting the major technology.

Step 3 DEVELOP STATE OF SOCIETY ASSUMPTIONS

Identify and describe major non-technological factors influencing the application of the relevant technology.

Step 4 IDENTIFY IMPACT AREAS

Ascertain those societal characteristics that will be most influenced by the application of the assessed technology.

Step 5 MAKE IMPACT ANALYSIS

Trace and integrate the process by which the assessed technology makes its societal influence felt.

Step 6 IDENTIFY ACTION OPTIONS

Identify options for avoiding or ameliorating adverse impacts and fostering a more socially beneficial evolution of the technology.

Within this framework, several different techniques were employed. The primary technique for gathering data for the assessment might best be termed investigative reporting. During the course of the project, five visits were made in all to the Trojan site and surrounding hinterland. The first visit was made in November of 1976 for the purpose of touring the nuclear facility and observing its physical relationship to the surrounding community. Mr. Robert Dent, Assistant Director, Trojan Visitors Information Center, conducted the tour and explained in great detail the physical operation of the power plant and the functions performed by the staff of the Visitors Information Center.

The second visit was made on March 24th and 25th, 1977, for the purpose of establishing contacts within the local community. During this time, a member of the research team met with community leaders and interested citizens in the Trojan vicinity and the city of Portland. On the 25th, meetings were held with state regulatory agencies in the state capital, Salem.

The third visit was made by two members of the team for the express purpose of gaining access to information on the social and economic impacts of Trojan on the communities of St. Helens, Oregon, located seventeen miles east of Trojan on U.S. 30, and Prescott, located adjacent to the nuclear facility, one-half mile west on U.S. 30. This visit took place on July 12th and 13th. This visit was spent in a series of interviews with local residents and community leaders.

The fourth visit occurred on August 11th for the purpose of attending a preparatory briefing for NAJORT IV, an exercise at Trojan designed to test the emergency preparedness response plans of PGE; Columbia County, Oregon; Cowlitz County, Washington; and those local, state, and federal agencies involved in such activities. A fifth visit occurred on August 18th and 19th for the purpose

of observing the actual exercise and the following critique. A detailed discussion of this exercise is included later in the special section on emergency response impacts, Appendix B.

The sixth and final visit to Trojan was made on August 22nd, 23rd, and 24th. During this time, one member of the team attended several post exercise (NAJORT IV) critiques. Another researcher continued to interview residents and community leaders in the town of Goble, three miles east of Trojan on U.S. 30, and Rainier, four and one-half miles west of Trojan on U.S. 30. A chronology of the interview program is summarized in Table 1.

The research team felt that personal interviews with a broad spectrum of community figures and local residents were a particularly important means of sampling local attitudes toward Trojan and the impacts of the facility in a rural setting. In fact, this particular methodology was highly rewarding in both quality and quantity of information content.

Another benefit that can be derived from in-situ research is the physical understanding researchers can gain from first-hand observation of the community structure, and the daily operation of both the residents and the nuclear facility. Certainly there is a lot to be said in favor of interviewing residents in their homes or at their places of employment. It allows for a more accurate appraisal of the information content of the interview, as well as letting the research group experience, first-hand, some of the social and economic impacts.

In the case of the Trojan nuclear facility, nestled alongside a major river system in a rural community, personal interviews were absolutly invaluable in understanding the lifestyles of the local community and the values, political beliefs, and future desires of the residents. To understand the lifestyle of a small community like Prescott, it is necessary to spend some time with its residents in the privacy and intimacy of their own homes. Without that understanding, a meaningful assessment of the social and economic impacts of Trojan would not be complete. It must be noted, however, that it was not possible to get a "representative sample" through this method. The information gained from these interviews was, and must be continue to be, recognized for the highly subjective information that it is. A list of the interviewees is presented in Appendix A.

Table 1: Trojan Interview Program*

November 1976:	Initial Trojan site familiarization visit.
March 24 and 25, 1977:	Initial community and government agency contact visit to Prescott, St. Helens, Portland, and Salem.
July 12 and 13, 1977:	Followup visit to collect socio-economic information at St. Helens and Prescott.
August 11, 1977:	Followup visit to Trojan for NAJORT IV preparatory briefing.
August 18 and 19, 1977:	Followup visit to Trojan to observe NAJORT IV exercise and attend critique.
August 22, 23 and 24, 1977:	Followup visit to Trojan for NAJORT IV post-exercise critiques and to collect socio-economic information at Goble and Rainier.
November 7, 1977:	Initial visit to federal agency offices in Seattle.
December 5, 1977:	Followup visit to federal agency offices in Seattle.

Another method used heavily at the outset of the project was telephone interviews. While such a line of inquiry is indeed valuable where such distances are involved, it is a method more appropriate to simplify clarification of specific issues, rather than the more intangible pursuit of issues concerning lifestyle, values, and other more sensitive concerns. However, as is often the case in such studies, budgetary and time constraints dictated the use of this method.

The other method employed by the group was the use of questionnaires mailed directly to selected individuals within the community. This method has proven to be the least successful method to acquire information. Perhaps part of the problem is the inability to elaborate or interpret the question to suit the

---

*Key persons interviewed during these visits are listed in Appendix A. In addition to the indicated in-person visits, numerous contacts were made by telephone to gather relevant information.

During the extension of the project to gather additional information in specifically identified subject areas, numerous interviews were conducted by telephone with appropriate government agency and industry personnel.

person being interviewed. Quite often the question may seem ambiguous or irrelevant to the subject who might then completely disregard the questionnaire. Furthermore, the first two methods place the subject in a unique pressure situation; that is, they give the researcher the opportunity to pursue a question or issue to some logical conclusion as the case may be.

Another important "method" employed in this analysis involved a review of the literature dealing with impacts of major energy facilities. Throughout the analysis, the history of nuclear power plant development was reviewed and a compendium of case studies was established. While each study focused on a specific nuclear facility, almost all of them attempted to assess in some manner the social and economic impacts on the local community. Several of the studies were performed by the Division of Site Safety and Environmental Analysis staff, Cost-Benefit Analysis Branch, NRC, while others were contracted to private research companies and institutions.

We found three assessments to be of particular relevance. The first and most noteworthy was a report published by Battelle Memorial Institute, Pacific Northwest Division in January, 1977. The final report, entitled State and Local Planning Procedures Dealing with Social and Economic Impacts from Nuclear Power Plants,[3] was conducted under contract with the Office of State Programs, NRC. The major emphasis of the study was to evaluate the state and local agency planning procedures for dealing with those social and economic impacts caused by construction and operation of nuclear facilities. Six sites in California, Oregon, and Washington were analyzed from a comparative case study approach. Since Trojan was chosen as one of the six sites, this report proved to be of particular interest to our study. It, in fact, afforded us an opportunity to familiarize ourselves with some of the impacts and procedures used to assess those impacts prior to our own initial definition of the problem and formulation of strategy and methodology.

A second report that proved to be of special value was prepared by Suzanne Keblusk of the Division of Site Safety and Environmental Analysis, NRC. This study, entitled A Confirmatory Assessment of Local Social and Economic Impacts from Nuclear Plant Construction: A Case Study of the Arkansas Nuclear One, Units 1 & 2,[4] was conducted in December of 1975 and was the second in a series of in-house confirmatory impact assessments being conducted by the Cost-Benefit Branch of the NRC. While this report lacks the substance and detail of the Battelle

study, it does reiterate some of the key issues presented in the Battelle study. Furthermore, the methodology employed in this assessment generally parallels the methodology we chose to use in our own assessment. This proved to be of value later in the project during the impact analysis stage. We were able to directly compare our findings with those of the Arkansas Nuclear One assessment.

The third study we felt had particular significance to this project was prepared by Harbridge House, Inc., Boston, Massachusetts, in November of 1974. This report was entitled The Social and Economic Impact of a Nuclear Power Plant upon Montague, Massachusetts and the Surrounding Area.[5] This study was conducted by a private organization under contract to the City of Montague, Mass., and the Franklin County Planning Department. The funding for the study was made available to the city by the Northeast Utilities. The City of Montague was responsible for determining the parameters of the study; they managed the conduct of the study and represented the sole point of contact and contractual authority for the investigators. Although this was a prospective rather than retrospective analysis, the analysis did employ case studies of other "nuclear towns." The study was extremely useful in suggesting types of impacts which might prove significant in the case of Trojan.

The major disadvantage of the retrospective approach is that relevant information may not have been recorded in the past and therefore it would be unavailable for collection and analysis. This disadvantage was a handicap to this project. Appropriate quantitative information was simply unavailable in some areas. For example, the lack of housing indicators for Columbia County makes it difficult to analyze retrospectively what impacts occurred during Trojan construction from other than a qualitative standpoint, which must necessarily be somewhat speculative in nature. Ideally, relevant indicators would be selected and data recording established several years prior to initiation of the project under assessment. In this way, accurate "baseline" information would be obtained. This information would, of course, be fruitful in preparation of the required EIS. Data recording would then be continued throughout the project and for at least several years beyond completion of construction for ultimate retrospective analysis. Retrospective assessment provides an invaluable feedback to the system of critical information to improve performance so that more socially satisfactory outcomes will be possible; however, that function cannot be optimally accomplished without preparation.

DEFINITION OF THE ASSESSMENT TASK

In this assessment the major issues were seen as involving the impacts of both construction and operation of the Trojan plant on the well-being of the local community. A working definition of community is that offered by Warren:[6]

> Community is that combination of social units and systems which perform the major social functions needed to afford people daily local access to those broad areas of activity which are necessary for day-to-day living.

For the purpose of this analysis, local community was defined as that area of such proximity to Trojan that it did or was likely to experience a change in the supply and/or demand for public services as a result of Trojan. Geographically, that area is made up of the northern-and easternmost portions of Columbia County, Oregon, and the southernmost portions of Cowlitz County, Washington, which surround Trojan. By mutual agreement with the NRC, impacts on the broader community (e.g., the PGE service area) were not included in this research.

The analysis was limited to social and economic impacts wholly or partially attributable to Trojan over the period from the immediate pre-construction period through construction and initial operation to the present. In the broadest sense, "social impacts refer to all changes in the structure and functioning of patterned social ordering that occur in conjunction with an environmental, technological, or social innovation or alteration."[7] As defined by Finsterbusch, the kinds of impacts which may be important can be classified as follows:[8]

A. Impacts on Individual Quality of Life:
   1. Economics - e.g., employees who gain or lose income or jobs;
   2. Environmental - e.g., residents whose habitats are altered or lost;
   3. Commercial - e.g., consumers affected by higher or lower prices for goods and services;
   4. Transportation - e.g., drivers, riders, or pedestrians who gain or lose accessibility;
   5. Social - e.g., persons whose social and leisure patterns are altered;
   6. Biological - e.g., persons made vulnerable to disease, injury, and other bodily insults;
   7. Psychological - e.g., persons who experience stress, deprivation, etc.;

B. Impacts on Organizations:

1. Impacts on ability of organizations, public or private, to achieve goals and objectives;

2. Impacts on the structure of organizations;

C. Impacts on Communities:

1. Impacts on community resources and demands on those resources;

2. Impacts on the organization of the community and its institutions (see B);

3. Impacts on the amounts of activities of various types;

4. Impacts on the quality of life which the community can provide for its citizens (see A).

A theoretical model which relates a hypothetical development project to a variety of social and economic impacts is shown in Figure 1.[9] The impacts represented in this model are only a subset of the impact types just discussed. Nonetheless, this model outlines many of the basic casual paths which were felt to be more important to this analysis and largely defines our view of the impact process in the Trojan community.

It should be noted that possible future impacts are considered only insofar as there is evidence indicating the likelihood of their occurrence. Impacts on the natural environment are considered only insofar as they lead to social or economic impacts on the local community.

In addition to this general examination of social and economic community impacts, one impact area was chosen for in-depth study. The area chosen was the area of emergency preparedness. This analysis is described separately in Appendix B.

RELEVANT TECHNOLOGIES

The primary technology in this assessment is the Trojan Nuclear Power Plant located at Prescott, Oregon, and the associated systems (soft as well as hard). Trojan is situated on the banks of the Columbia River approximately 31 miles downriver from Portland, Oregon, and 6 miles upriver from the cities of Longview and Kelso, Washington. Trojan employs a pressurized water reactor and

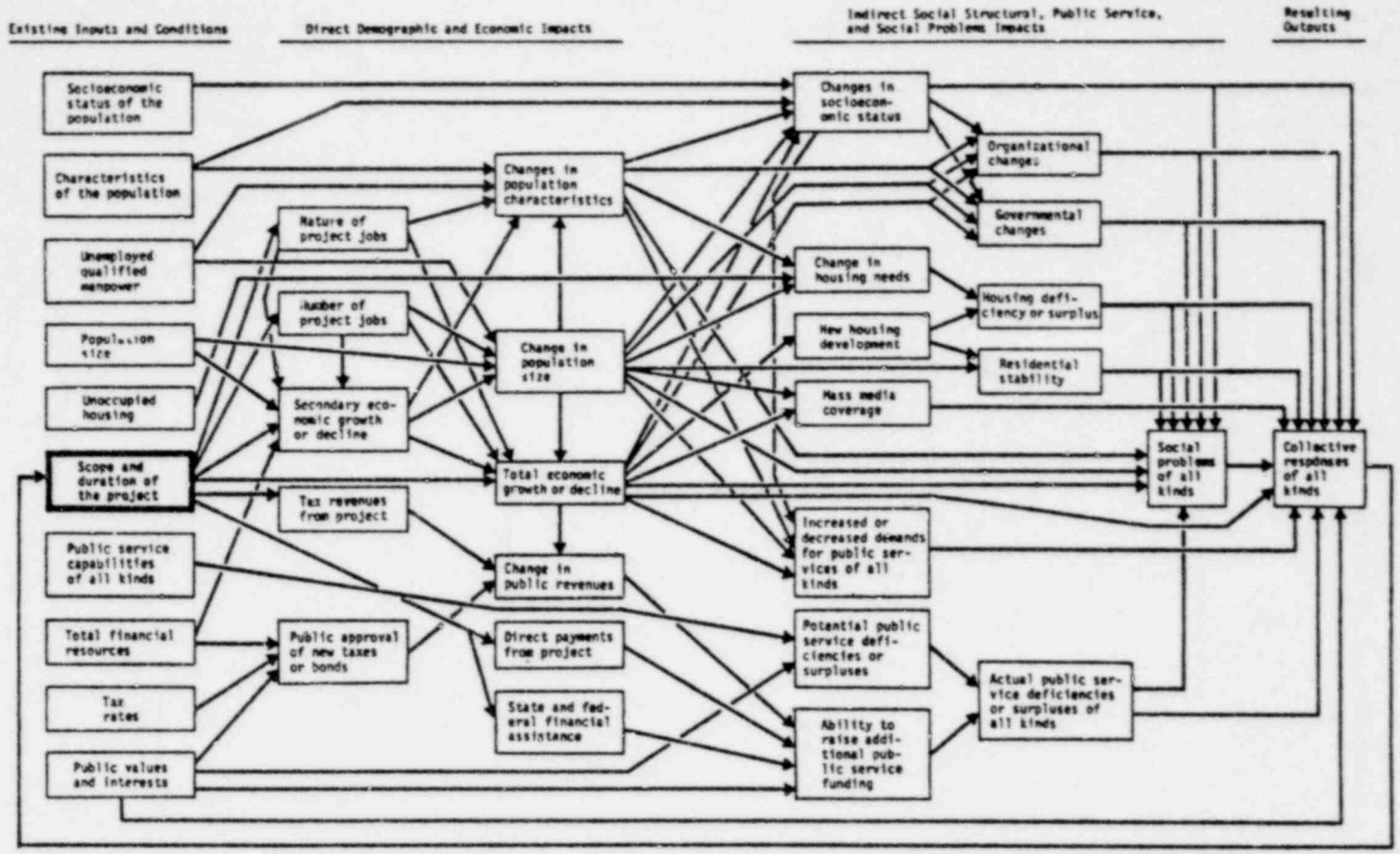

Figure 1: Process Model of Social Impacts of Development Projects

Source: Reference No. 9, Olsen and Merwin (1977).

has a rated capacity of 1130 MWe. Site preparations for the plant began in February of 1970 and it first "went critical" in December of 1975. At the peak of the construction activity, Trojan employed 1600 workers. During normal operation the plant employs approximately 100.

A schematic layout of the plant is shown as Figure 2. To the casual observer, the most striking aspect of Trojan is the natural draft cooling tower which looms almost 500 feet above ground level. Depending on the atmospheric conditions, the water vapor plume from the cooling tower can create a man-made "cloud" marking the Trojan site.

The next most visible aspect of Trojan, at least to the ordinary citizen, is the Visitors Information Center, which is operated by P G E This complex, located at the south (main) entrance to the plant, just off U.S. Highway 30, features displays of nuclear technology, archaeological and cultural artifacts of the vicinity, and an array of displays and shelters featuring the flora and fauna indigenous to the area. P G E is also responsible for maintaining the parks and wildlife refuge which surround the plant. For a description of the Trojan plant the reader is referred to the Final Environmental Impact Statement.[10]

Although not typically thought of as technologies, the supporting technologies in this assessment are the mechanisms for the provision of private and public services in the local community. These technologies were, to one degree or another, in place prior to the advent of Trojan and were, therefore, impacted by Trojan. They include:

1. Local mechanisms for the collection and disbursement of tax revenues;
2. The local education system;
3. The local health care delivery system;
4. Local mechanisms for the provision of social services (e.g., unemployment benefits, family counselling, etc.);
5. Local mechanisms for the provision of transportation facilities and services;
6. Local mechanisms for the provision of emergency services (e.g., police, fire, plant-related accident response, etc.);
7. Local mechanisms for the provision of housing; and
8. Local mechanisms for planning and regulating land use.

Each of these "supporting technologies" will be described in greater detail in the course of the impact analysis.

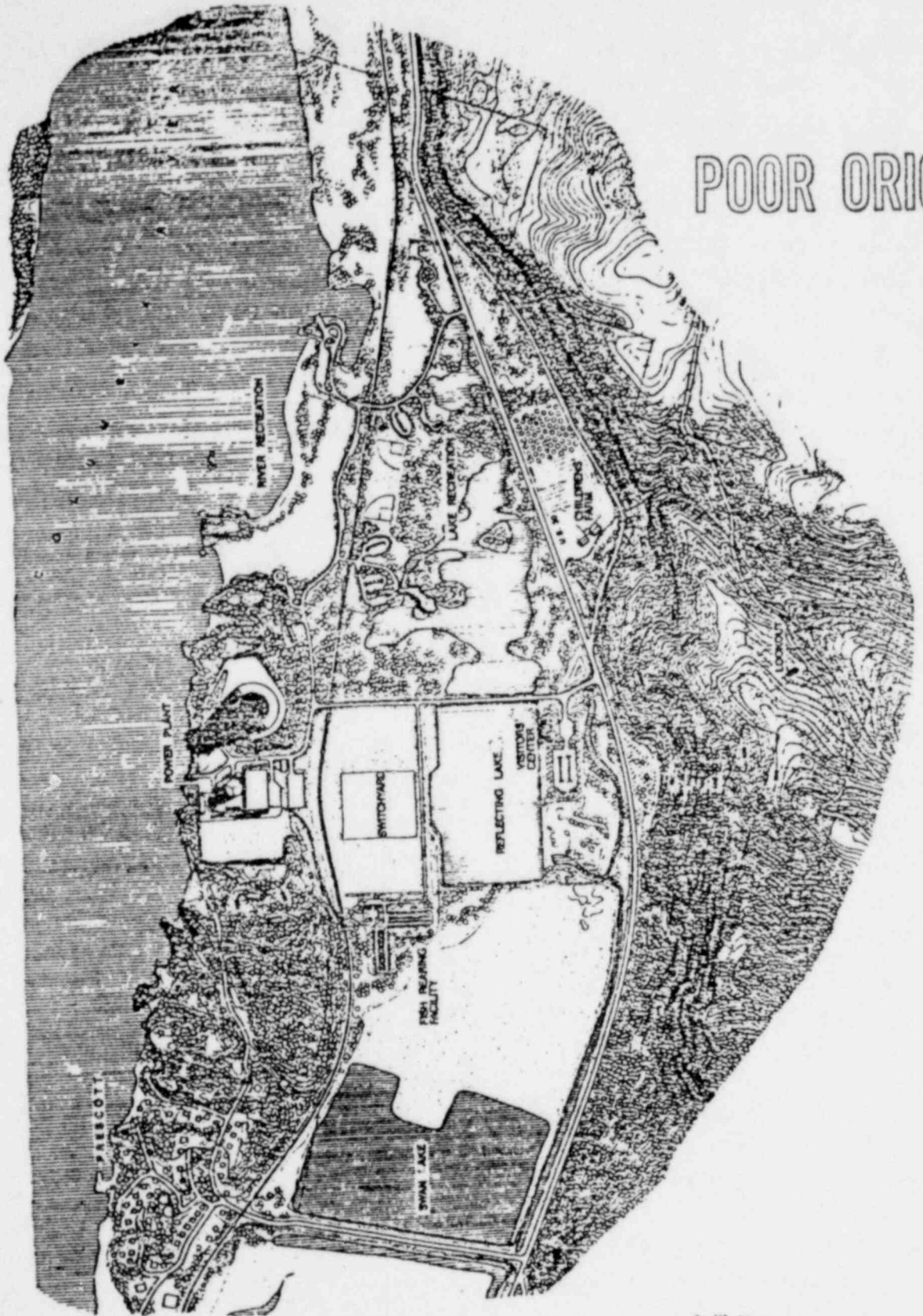

Figure 2: Trojan Nuclear Power Plant - Site Plan

STATE OF SOCIETY ASSUMPTIONS

In the more usual context of prospective technology assessment, state of society assumptions define the social, political, economic, institutional, and environmental context into which the technology being assessed is to be embedded. Similarly, in this application, the state of society "assumptions" attempt to define the local community context for the Trojan plant. In a sense, many of these statements about the Trojan context must really be treated as assumptions since it was necessary to extrapolate backwards in time to define the pre-Trojan context. Some of the important characteristics of the Trojan context are described in the following pages.

The Physical Context

The Trojan nuclear facility was constructed adjacent to the Columbia River on a 634-acre site, purchased by P G E from the Trojan Powder Company in 1967. The site is located 72.5 miles upstream from the mouth of the Columbia River in Columbia County, Oregon. The Columbia River at this location represents the border between the states of Oregon and Washington. U.S. 30, the major arterial, tends to parallel the Columbia River en route from Astoria, Oregon, at the mouth of the river to Portland, Oregon, 32 miles south-southeast of Trojan. Situated along this highway is Rainier, Oregon, 4 1/2 miles northwest of Trojan; Goble, Oregon, 3 miles southeast of Trojan; Columbia City, Oregon, 12 miles southeast of Trojan; and St. Helens, Oregon, 17 miles southeast of Trojan (Figure 3).

Across the Columbia River in Washington is Interstate 5 (I-5), the major north-south arterial between Seattle and Portland. Adjacent to I-5 and directly across the river from Trojan is the town of Carrolls, while just 4 miles southeast off I-5 is the town of Kalama. Longview/Kelso is located off I-5, 7 miles northwest of the site. The nearest bridge crossing the river is between Rainier, Oregon, and Longview.

The Columbia River also provides a further means of access to the site and represents a deep-sea access to ports upstream from the facility. The Columbia River is a major commercial artery to the City of Portland, one of the largest and most important port facilities in the Northwest. Several Northwest states--Washington, Oregon, Idaho, Montana -- rely on the port facilities of Portland

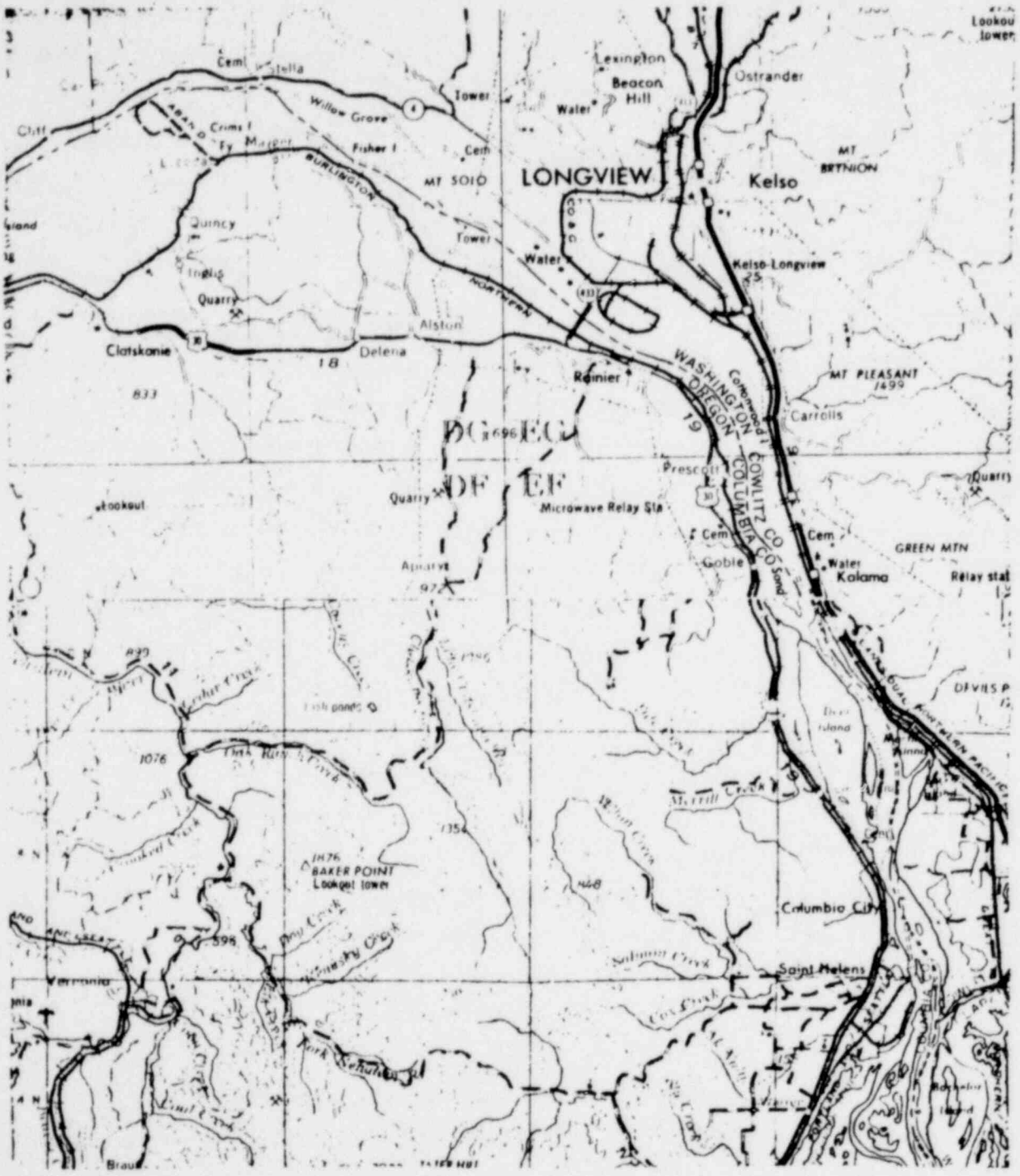

Figure 3: Trojan Vicinity Map

for international commerce. Approximately 1,500 deep-draft vessels, carrying two million tons of cargo upstream and returning four million tons of cargo downstream, pass the Trojan site each year.[11]

The Trojan site and the immediate vicinity is, to most observers, quite pretty. Gently rolling, wooded hills come down to the river on both sides. The plant builders have fenced only a small area of the exclusion zone. Much of the remaining area has been left in or restored to its natural state.

The Demographic Context

There are nearly 70,000 people living in small towns and rural areas within 10 miles of the Trojan plant. Only 7 miles from the plant, are the twin cities of Longview and Kelso, Washington which in 1970 (prior to Trojan construction) had a population of almost 38,700. The total 1970 population of Cowlitz County, Washington was 68,616.[12] On the Oregon side, Columbia County had a 1970 population of 28,790. Within Columbia County, Rainier had a 1970 population of 1,731; Prescott had a population of 105; and St. Helens had a population of 6,212.[13] Portland, which is only 32 miles from the plant, had a metropolitan population of around 800,000. Thus, while the immediate Trojan vicinity is predominantly rural, it is not too far removed from urban influences.

Racially, the Trojan community is very homogenous. Cowlitz County, for example, was almost 99 percent white. The largest non-white minority is American Indians.[14] A similar situation exists in Columbia County.

The Economic Context

While the immediate Trojan vicinity is generally rural, Trojan is not the first industrial intrusion on the scenic landscape along the overall stretch of the River. It is, however, the only major industry between Rainier and Deer Island, a stretch of some 13 miles. In essence, the Trojan facility is book-ended by paper, pulp, and other wood processing mills.

The shoreline of Rainier, Longview, and Kelso is composed primarily of large industry who use the river as their major highway to the rest of the world. Aluminum processing mills, log storage and export companies, lumber mills, pulp and paper mills, and dock facilities comprise the bulk of the heavy industry. They are, in turn, serviced by subsidiary industries and railroad switchyards.

The major aluminum plant at Longview expanded after the construction of Trojan.*

Further up river at Deer Island and Columbia City, there are a series of wood products processing mills fronting directly on the river. A chemical production and processing factory is located on the outskirts of Columbia City. It underwent minor expansion after Trojan construction was completed. A list of major industries in the vicinity and employment levels prior to and after Trojan construction is provided as Table 2.

Prior to the construction of the Trojan nuclear facility the local community was primarily a one-industry community. The bulk of the labor force either worked directly in logging or processing wood products in one of the mills. A large portion of the area within a radius of 50 miles of Trojan is in timber, controlled and owned by the state and federal governments and private industry.

The agricultural industry is primarily restricted to the alluvial flood plains along the course of the Columbia River, spreading into the hills along some of the stream basins. Of all the land area in Columbia County around Trojan, less than 20% is classified as suitable for agriculture.[15] Even for this 20%, however, the costs inherent in building dikes, draining the flood plain, leveling and fertilizing the soils, are prohibitive to the average crop producer. Most of this land is currently used for foraging.

In Cowlitz County, the majority of non-urban land is in forests. Only a very small amount of land is in crops.[16]

Compared to nearby population centers, the Columbia County portion of the Trojan community was economically disadvantaged prior to construction of Trojan. In 1971, the average household effective buying income (EBI) in Columbia County was 21 percent less than the average for the Portland area (Multnomah, Clackamas, and Washington Counties, Oregon; and Clark County, Washington). Cowlitz County,[17] however, with a more substantial industrial base, is more prosperous. The 1971 median household effective buying income for Cowlitz County was 3 percent greater than that of metropolitan Portland.

Similarly, per capita retail sales in Columbia County were almost 32 percent less than that for metropolitan Portland.[18] Part of this may, however, be due to Columbia County residents doing some of their shopping in the Portland area and in Cowlitz County.

The 1971 EBI and retail sales data for the Trojan community are summarized in Table 4.

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*Personal communication with Ralph Haight of Reynolds Aluminum Company.

Table 2: Major Industry in Trojan Vicinity

Location and Company	Approximate Employment Level Before Trojan (Circa 1970)	After Trojan (Circa 1979)
Longview -		
1. Weyerhauser Company (Wood Products)	5,000	5,000
2. Reynolds Aluminum Company	450	1,300
3. Pacific Lumber and Shipping Company*	15	15
Rainier		
4. Crown Zellerbach Corporation (Wood Products)	265	265
Columbia City		
5. Reichold Chemicals, Inc. (Fertilizer)	60	65
St. Helens		
6. Boise Cascade Corporation (Wood Products)	120	50
7. Multnomah Plywood Corporation	240	350
Total	6,150	7,045

*Although direct employment by this company is minor, indirect employment is uncounted but major.

Sources: Individual Company Local Offices.

Table 3: COLUMBIA COUNTY VALUE OF SALES FOR 1969

Crops	Thousands of Dollars	Livestock	Thousands of Dollars
All grains	69	All cattles and calves	1,978
All hay crops	100	Hogs	113
All grass and legume seeds	36	Sheep and lambs	31
Specialty field crops	45	Dairy products (milk and cream)	1,107
All tree fruits and nuts	39	All chickens	307
Small fruits (all berries)	523	Turkeys	34
Vegetables for fresh market and processing	76	Eggs - chicken	233
All potatoes	111	Other livestock and poultry	283
Specialty horticultural crops	100		
Farm forest products	504	All livestock	4,086
All crops	1,603		

Total crops and livestock 5,689

Livestock Inventory, January 1, 1969 (number of head)

All cattle	23,000
Dairy cows	3,100
All sheep	3,000

Source: "Agriculture in Oregon Counties, Farm Sales and General Characteristics," Oregon State University, Cooperative Extension Service Special Report 330; June, 1971.

Table 4: BASELINE ECONOMIC CONDITIONS IN THE TROJAN COMMUNITY

	Columbia County	Cowlitz County	Met. Portland
1971 Median Household Effective Buying Income - $	6,264.00	8,817.00	8,554.00
1971 Per Capita Retail Sales - $	1,407.00	1,852.00	2,055.00

Source: Reference 18.

The Political and Institutional Context

For all intents and purposes, the local community political and institutional context for Trojan is defined by Columbia County government. Cowlitz County government has no jurisdiction over Trojan and receives no direct tax benefits (indirect tax benefits such as sales tax from commodities purchased by Trojan workers would be experienced in Cowlitz County). Therefore, its influence on Trojan and vice versa, is much more limited than Columbia County's.

The organization of Columbia County government is as indicated in Figure 4. Other public services are provided by smaller jurisdictions such as school districts, fire districts, hospital districts, and so on.

Forest products industries have always been a major political force in the Trojan community. They were and remain both the major land holders and employers in Columbia County. As such, they are also a major component of the Columbia County tax base.

Perhaps one of the most important aspects of the Trojan institutional context is the apparatus for managing and directing growth which might be associated with Trojan. It is safe to say that Columbia County residents and politicians have had a very conservative attitude toward planning, believing firmly in principles of individual property rights. A "comprehensive" planning effort was undertaken in response to the Oregon State Land Use Act of 1969. The plan was not adopted until 1973 but zoned only two relatively small areas of the county. The Trojan site itself was unzoned and remains so today. This situation may eventually change in response to state requirements for comprehensive land use planning.

Historical Significance of Trojan

The Trojan site first gained recognition because of Coffin Rock, a small basalt intrusion offshore from what presently constitutes the recreation area immediately south of the cooling tower. Coffin Rock was so named by Lt. W.R. Broughton, Commander, H.M.S. Chatham, in 1792. Broughton was dispatched by Capt. George Vancouver to chart the Columbia River in search of a northwest passage to the Atlantic Ocean. The rock outcrop was pointed out to Broughton as a burial place of the Indians, primarily the Cathlamets and Chinooks. The Indians would place the body of the deceased in a carved and decorated canoe, place it on the

COLUMBIA COUNTY OFFICIALS

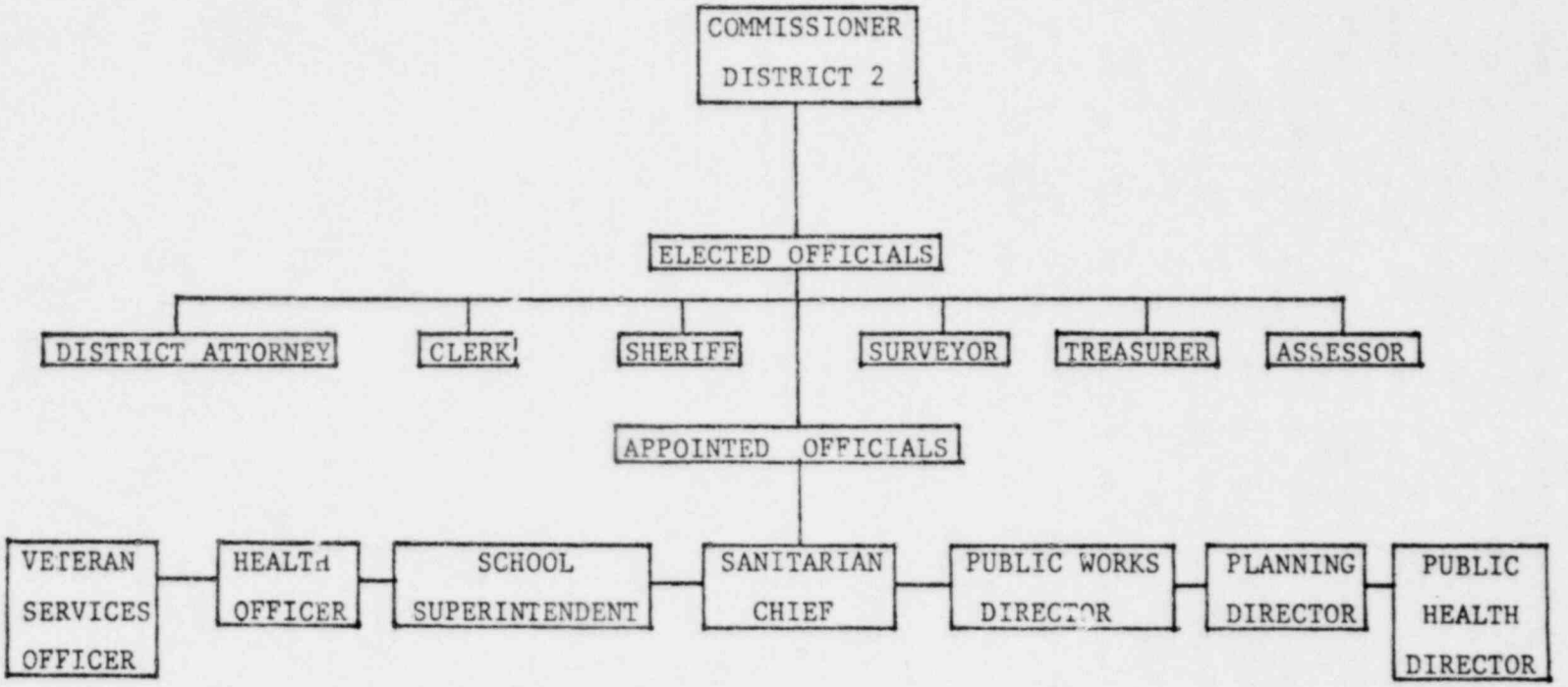

Figure 4: Source: Oregon Blue Book

rock outcrop, exposed to the elements.

Later, early settlers used the site as a fishing platform and logged the bulk of the Trojan site. Artifacts from this period, along with some skeletal remains, arrow points, personal ornaments, net sinkers, etc., were unearthed by a team of archaeologists from the Oregon Archaeological Society. Some of these artifacts can be seen on display in the Trojan Visitors Information Center.

Coffin Rock and vicinity was proposed for consideration for inclusion in the Statewide Inventory of Historic Sites and Buildings in 1972 on the basis of archaeological potential. Evaluation of the property for purposes of the National Historic Preservation Act of 1966 was deferred, pending further testing of archaeological values to the area.

The name "Trojan" was first applied to the site during World War I, when the Trojan Powder Company first acquired the site, to use as a storage area for distribution of dynamite and other explosives. For over 20 years, the explosives were transported by barge to the site from a manufacturing plant in San Francisco. The Trojan Powder Company phased out its operation after World War II, and most of the land reverted back to a natural state, with just a few acres reserved for grazing cattle.

The site is also well known as the breeding grounds of the whistling swan and a variety of other birds and animals. It is important to note here that P G E has gone to great lengths to minimize the intrusion on the environment. Members of the public can observe the animals in their natural domain from refuge shelters constructed by P G E. A tape and slide presentation at the visitors' center provides the visitor with a complete background on the animals' behavior.

IMPACT ANALYSIS

The next two steps in the assessment methodology, "identification of impact areas" and "impact analysis" in practice coalesced into a single iterative process. The first step was to hypothesize several types of impacts which, on the basis of our review of other impact studies (pages 8 & 9), seemed also likely to occur in the Trojan community. The intent of these hypotheses was to guide our initial data gathering and analysis. These initial hypotheses are shown on the following page.

Preliminary Hypotheses

Construction and operation of the Trojan nuclear power plant would result in or contribute to:

1) A higher tax base in Columbia County;
2) A lower tax rate in Columbia County;
3) Increased tax revenues in Columbia County for public schools and other public services;
4) Relocation of a transient construction work force;
5) Decreased unemployment during construction;
6) Increased unemployment after operation begins;
7) Housing shortage during construction;
8) Increased property values in the community in general;
9) A secondary influx of industry due to the lower tax rate;
10) More rapid growth of communities due to the lower tax rate;
11) Increased demand for public and social services (e.g., school enrollment increase, increased police service requirements);
12) Gradual replacement of rural settings by industrial-urban settings;
13) Gradual change in the rural life style within the community;
14) Concern about health and safety risks associated with the plant;
15) Concern about environmental impacts of the plant;
16) Recognition of inadequate capacity for planning and controlling growth.

Based on these preliminary hypotheses and the research team's initial impression of the Trojan situation, data gathering and analysis were directed toward several major impact areas. These were:

1) Demographic impacts
2) Local economic impacts
   a. Tax revenues
   b. Employment
   c. Income
   d. Business activity

3) Public utility and transportation impacts
   a. Water impacts
   b. Sewage and solid waste impacts
   c. Transportation impacts
4) Land use impacts
5) Housing impacts
6) Recreational impacts
7) Cultural impacts and life style
8) Public safety impacts
   a. Police service
   b. Fire service
   c. Emergency procedures
9) Educational impacts
10) Health service impacts
11) Political and institutional impacts
12) Community relations

Given these impact areas, a preliminary impact analysis was prepared using an input matrix approach. Matrix methods have been used extensively in impact identification activities. One of the better known techniques was proposed by the U.S. Geological Survey. Another matrix approach has previously been applied by one of the investigators in this study.[19]

In this application, the matrix was used as an impact check list. The matrix rows denoted characteristics of or activities in construction and operation of the Trojan plant. These may be thought of as causal factors in the impact analysis. The matrix columns were assigned to the various impact areas. Entries in matrix indicate the existence and nature of an impact.

No matrix impact representation can completely stand alone. Matrices cannot readily represent synergistic interactions of causal factors or the progression into higher order effects. The matrix developed for the Trojan study is not quantitative. Impact categories are couched as factors or conditions which may be increased or decreased. The symbols "+" and "-" are used respectively to indicate if the impact category is increased or decreased by the causal factor. The symbol "m" indicates that the study team considers the impact to be minor. An "s" indicates that the impact is not a primary but a higher order effect of the causal factor.

The matrix was reviewed and revised as the analysis progressed with causal factors and impacts added and deleted as time progressed. The final matrix is shown as Table 5. Its primary usefulness was as an aid to comprehensive analysis, providing a holistic "snapshot" of our understanding of the impacts at each point in time. It is hoped that it will also serve that function for the reader. The impacts in each impact category are discussed in the following pages.

LOCAL ECONOMIC IMPACTS

Taxation

As was hypothesized, one of the most significant effects of the Trojan nuclear power plant has been the local impact of Trojan-generated tax revenue. The primary effect of this revenue has been to lower the average tax levy rate in Columbia County, Oregon. Cowlitz County, Washington, of course, derives no tax revenue directly from Trojan since there is no plant property in that county. Indirect tax revenue does occur outside of Columbia County in the form of sales and property taxes resulting from Trojan employees. The precise magnitude of this effect is unknown; however, it would be expected to be of significance in that, as will be shown, a substantial portion of the Trojan construction work force lived outside of Columbia County. Such jurisdictional boundary situations are a potentially important issue in considering impacts and will be discussed again in following sections of this report.

To understand precisely how Trojan taxes affect local levy rates, it is necessary to first understand the Columbia County tax structure. The major portion of county taxes are levied not by the county as a whole, but separately by taxing subdivisions and jurisdictions (i.e., school, fire, and hospital districts, for example) within the county. The boundary lines of the various districts do not necessarily coincide. A line separating two fire districts may cut through the center of a school district and vice-versa. When the boundary lines separating the various taxing jurisdictions are overlaid on a map of the county, the result is a mosaic of small, relatively homogenous geographical areas called tax codes. Throughout any given tax code the levy rate is constant. For the 1978 - 1979 tax year (commencing 1 January 1978) 101 different tax codes were used in Columbia County. The average of these tax codes, which vary from

Major Increase: +
Major Decrease: -
Minor: M
Secondary: S

TROJAN CHARACTERISTIC	CONSTRUCTION					OPERATION								
IMPACT AREA	Site Prep. & Const.	Resident Workers	Worker Relocating	Commuting Workers	Construction Traffic	Tax and Other Payments	Physical Presence	Resident Workers	Worker Relocating	Commuting Workers	Tax and Other Payments	Effluents	Physical Presence	Visitors Center	Accident Risk	External Opposition
Tax Revenues						+					+					
Tax Rates						-					-					
Employment of Local Workers	+							+								
Local Business Activity		+	+	+										M+		M+
Income of Local Residents		+	S+	S+						S+						
Demographics (Population)			+						M+							
Water Utility - Demands on			M+													M+
" " - Quality of	M-											M-				
Sewage Utility - Demands on			M+													M+
" " - Quality of						M+					M+					
Solid Waste Utility - Demands on	+		M+													M+
" " " - Quality of														M+		
Transportation System - Demands on					+											
" " - Quality of					-	M+					M+					
Land Use - Quality of							M+						M+			
Housing - Availability of			-													M-
" - Cost of			+													M+
Recreational Facilities - Demands on		+	+	+					M+	M+						M+
" "																
- Availability of	-	-	-	-		M+		M-	M-	M-	M+					M-
Law Enforcement - Demands on			M+	M+	+				M+	M-				M+	+	+
" " - Quality of						M+					M+					
Fire Service - Demands on			M+													M+
" " - Quality of						+					+					
Emergency Preparedness - Demands												+			+	
" " - Quality						M+					M+					
Educational Services - Demand for			+						M+							M+
" " - Quality of						+					+					
Health Services - Demand			M+	M+	M+				M+	M+						M+
" " - Quality						M+					M+					

Table 5: Impact Matrix

year to year in number and value, would be the average tax levy rate.*

A large portion of Trojan tax revenue goes into those sub-divisions in which the plant is located, but not into other sub-divisions. Therefore, the tax levy rate in the Trojan sub-divisions becomes lower than the average tax levy rate in the remainder of the county. For the 1976 - 1977 tax year, levy rates ranged from a low of around $10.50 per thousand dollars of assessed valuation to a high of over $24.00 per thousand dollars of assessed valuation. Schools accounted for seventy-seven percent of the taxes in Columbia County that year. The effect of Trojan on school taxes in the Rainier school district (Columbia County School District No. 13) in which it is located is, therefore, striking. For the 1976-1977 tax year, the Rainier district had a levy rate of $4.76 per thousand dollars of assessed valuation to raise $1,812,177 in taxes while a levy rate of $11.21 per thousand dollars of assessed valuation was necessary to raise $1,069.177 in the Scappoose school district to the south of St. Helens. As is discussed on page 63 of this report, a Columbia County Intermediate Education District (CCIED) exists which is able to distribute the "Trojan bounty" more evenly throughout the county. In 1976, the CCIED collected $3,886,304 out of the total of $10,524,902 of tax revenues in the county.*

Information obtained from the Oregon Department of Revenue and the Columbia County tax assessor shows a difference in the assessed valuation of Trojan. This difference is probably the result of counting different elements of Portland General Electric (PGE) and Pacific Power and Light (PP&L) property in the sum of what constitutes the Trojan plant. To avoid unnecessary confusion, county figures will be used herein. The Trojan plant is currently appraised by Columbia County at a value of $481,984,000 (tax year 1978-1979).* Only the seventy percent of the value of Trojan which is privately owned is subject to taxation (this split sixty-seven and one-half percent and two and one-half percent respectively between PGE and PP&L, according to ownership). The remaining thirty percent of Trojan is owned by the Eugene Water and Electric Board (EWEB), a tax exempt public utility. It should be noted here, however, and it will be discussed on page 62 of this report, that EWEB has made certain voluntary payments in lieu of taxes.

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*Personal communication with Henry T. Hudson, Columbia County, Oregon, tax assessor, 1978.

Tax revenues collected from Trojan increased proportionally with the increase in assessed valuation during construction from 1970 through 1976. Concurrently, the average tax levy rate in Columbia County has decreased. Trojan now pays a sizable share of the total taxes in the county with the result that the average tax levy rate has been reduced substantially even though there has been a large increase in total revenue. Assessed valuation for Trojan, actual Trojan tax payments, and assessed valuation for all of Columbia County are listed in Table 6 and plotted in Figures 5 and 6. Also shown in Figure 5 are total Columbia County tax revenue and the average tax levy rates for Columbia and Cowlitz counties.

For tax year 1970 - 1971, total Columbia County assessed valuation was $263 million, with Trojan's taxable share valued at $3.5 million (about 1.4 percent). By tax year 1976 - 1977, with Trojan construction nearly complete, total Columbia County assessed valuation had jumped to $854 million. Trojan's taxable share of that was $314 million, about 37 percent. Total county and Trojan assessed valuation are plotted in Figure 6 for tax years 1970 - 1971 through 1978 - 1979. It can be seen in Figure 6 that total county assessed valuation started increasing early in the period at a rate exceeding inflation (as indicated by the plotted average consumer price index for all items), coincidental with the increase in assessed valuation of Trojan and at a similar rate. However, the rate of increase in total county assessed valuation soon greatly exceeded the direct effect of increased Trojan assessed valuation. In tax year 1977 - 1978, total county assessed valuation continued climbing to $973 million while Trojan's taxable share was leveling off at $327 million, less than 34 percent. The increase in total county assessed valuation greatly exceeded inflation; however, the increase in Trojan assessed valuation was less than inflation.*

The increase in actual tax revenues is shown in Table 6 and Figure 5. Here again, the increase in revenue exceeds inflation and the rate of increase for total county revenue is higher than for Trojan tax payments. Trojan tax payments leveled off between 1975 and 1977. The tax payment for the tax year 1976 - 1977 is about the same as it was in 1975 - 1976, when inflation is considered. For succeeding years, the actual dollar amount has decreased. The average tax levy rates for Columbia and Cowlitz counties are also shown.

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*Personal communication with Henry T. Hudson, Columbia County, Oregon, tax assessor, 1978.

Table 6: Trojan and Columbia County Tax Information[1,2,3,4]

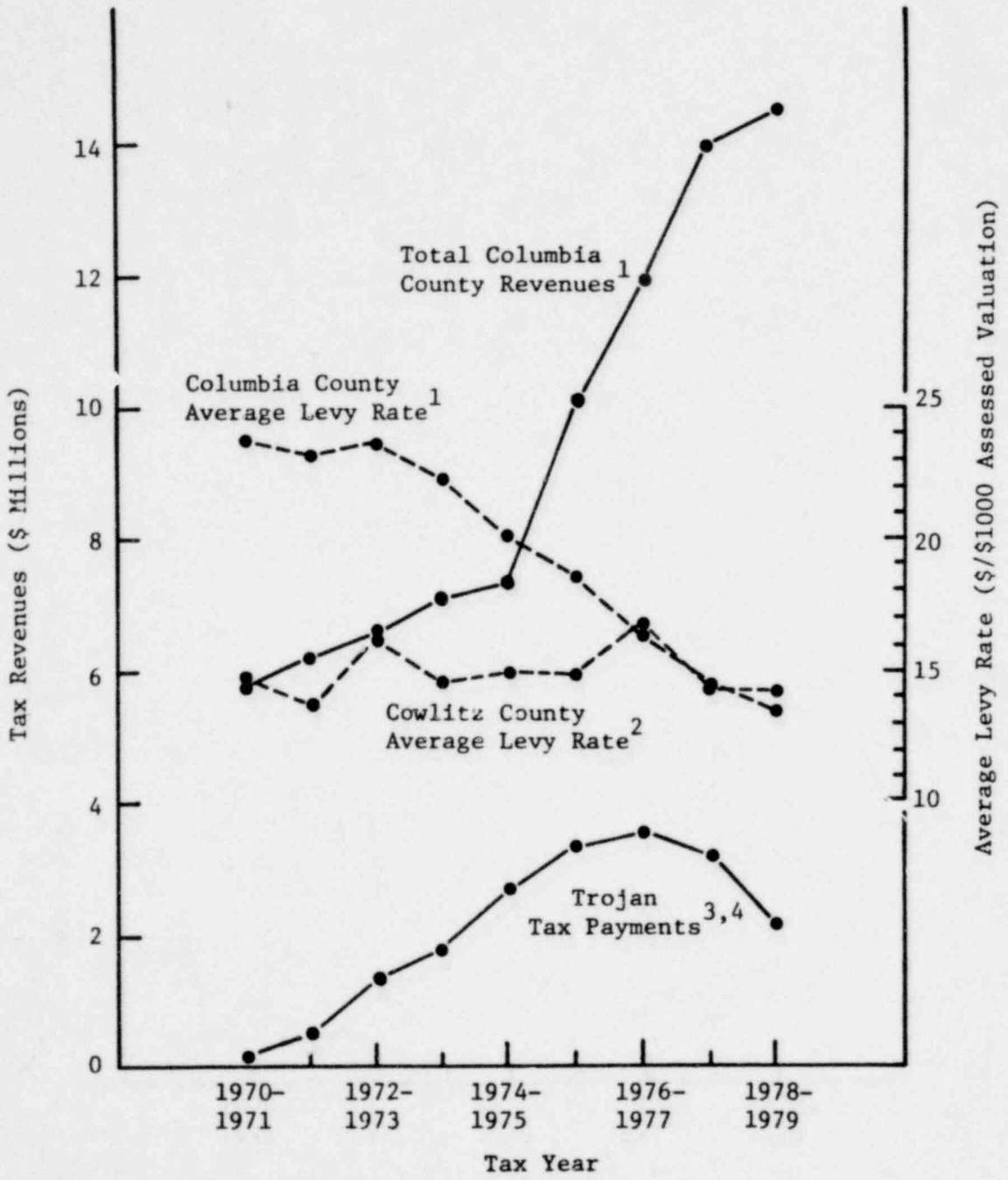
Tax Year	Trojan Tax Payment* PGE + PP&L	Trojan* Assessed Valuation	Columbia County Assessed Valuation
1970 - 1971	$ 190,645.78	$ 3,565,275	$ 262,511,130
1971 - 1972	461,624.20	8,795,000	277,581,354
1972 - 1973	1,453,708.82	27,195,000	321,695,323
1973 - 1974	1,784,923.18	103,471,000	427,416,525
1974 - 1975	2,768,923.25	167,411,000	571,966,080
1975 - 1976	3,353,345.84	228,326,300	712,005,095
1976 - 1977	3,529,574.93	314,374,500	854,132,797
1977 - 1978	3,259,889.47	327,113,800	972,716,064
1978 - 1979	2,214,514.97**	289,467,347**	1,001,962,647

*Note: The combined assessed valuation for PGE and PP&L amounts to 70 percent of the total value of the Trojan nuclear power plant. The remaining 30 percent is owned by EWEB, a tax exempt public utility.

**Note: The tax payment and assessed valuation shown in the table is that portion of the 1978 - 1979 tax year assessment which is uncontested. PGE and PP&L are contesting $47,920,553 in court. If the government prevails, the assessed valuation would be $337,388,900, 70 percent of total plant worth of $481,984,000.

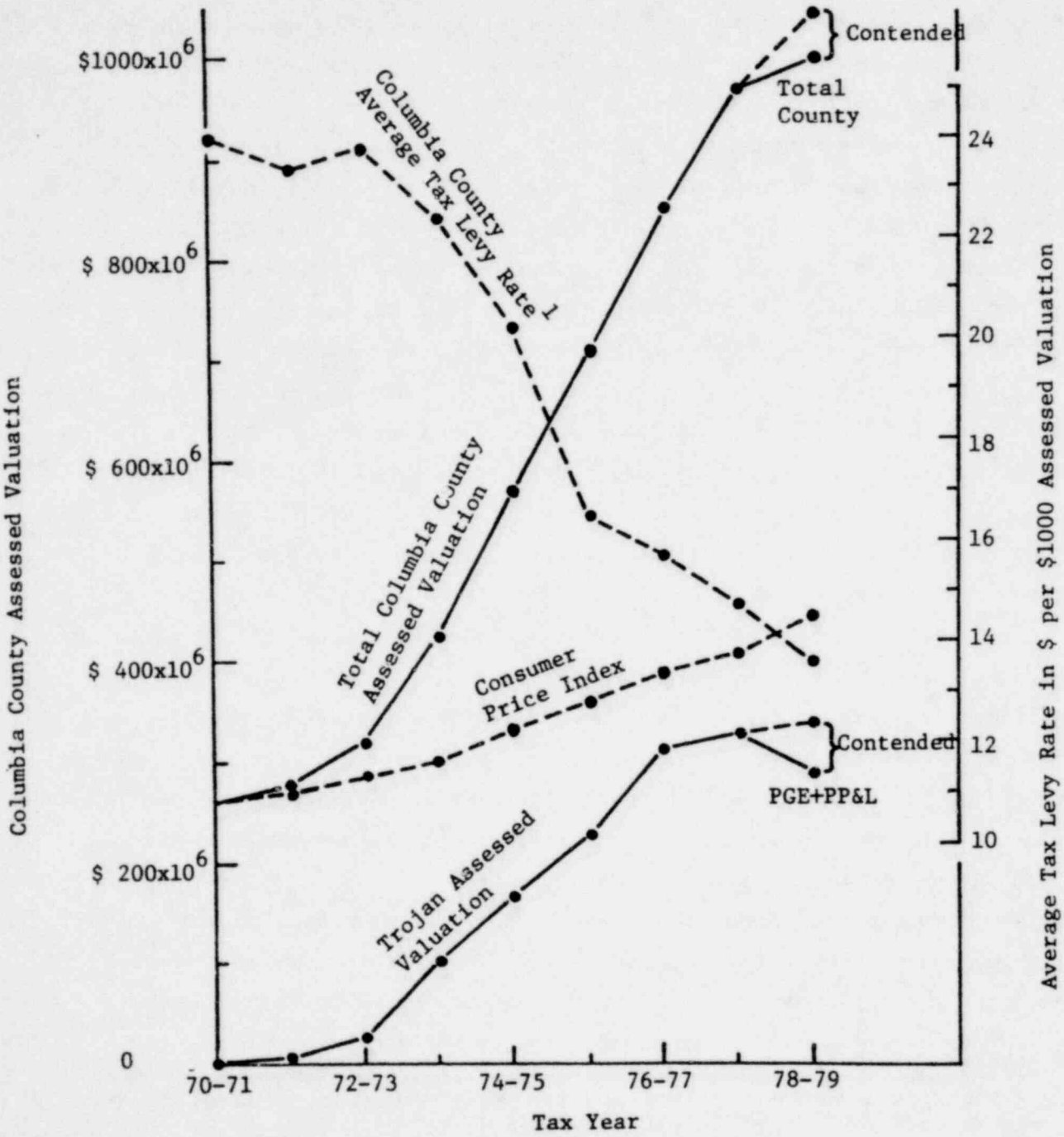
Reference Sources:
1. Oregon Department of Revenue
2. Columbia County Tax Assessor
3. PGE
4. PP&L

Figure 5: Tax Revenue Comparison.



Reference Sources:
1. Columbia County Tax Assessor, Henry T. Hudson.
2. Cowlitz County Tax Assessor Admin. Asst., Dean Takko.
3. PGE, Ed Miska.
4. PP&L, Bill Turnock.

Figure 6: Assessed Valuation Comparison.



Reference Sources: 1. Columbia County Tax Assessor, Henry T. Hudson.
2. U.S. Department of Health, Education & Welfare.

The drop in the rate for Columbia County is particularly striking when compared with the relatively steady rate of Cowlitz County.

The increase in tax revenue from Trojan has not been without controversy. PGE and PP&L have contested their assessed valuation in court. In the past, the contention has been resolved in favor of government; however, the mere fact of contention and the long delay attending court settlement of the issue effectively reduces revenue to the county. It would appear to be to the utilities' advantage to contest their assessed valuation. In the worst case, they have somewhat increased legal costs and must pay interest on that portion of contested taxes the court upholds as valid. On the other hand, taxes not paid may be invested at a profit that exceeds eventual interest charges and there is always the possibility that the court decision might reduce the assessed valuation. For the tax year 1978 - 1979 Trojan assessed valuation was $337,388,900 for the 70 percent PGE and PP&L taxable share. PGE and PP&L have contested $47,920,553 of this amount and, pending final court settlement, therefore are presently only paying taxes on $289,467,347 of assessed valuation. If government prevails, the additional tax would not be available for the current budget, but would be used as an "offset against future budgets".* As is indicated in Table 5, the taxes paid by Trojan have been falling since the 1976 - 1977 tax year and decreased 32 percent between tax years 1977 - 1978 and 1978 - 1979. Regardless of the outcome of assessed valuation litigation, the actual value of Trojan is declining at this time and so are tax payments. Even if the government prevails, the increase in assessed valuation for the 1978 - 1979 tax year over the 1977 - 1978 tax year is less than inflation and actual taxes are less to an even greater degree.

The effect of decreased tax rates may not have been perceived by Columbia County taxpayers and, paradoxically, may not have been an unmixed blessing. According to Columbia County Tax Assessor Henry T. Hudson:

> Tax rates are down, but assessed property values are higher due to inflation... A few property owners may be paying lower taxes, but most are paying the same or more. And the demands of local government have increased.

Columbia County may also be experiencing revenue problems due to, at least in part, secondary impacts of Trojan. The county levies taxes on property within its jurisdiction to support the provision of county services. Trojan has

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*Personal communication with Henry T. Hudson, Columbia County, Oregon, tax assessor, 1978.

obviously resulted in the need for increased county services, directly and indirectly.

Under Oregon law, jurisdictions can increase revenues by no more than 6 percent per annum without the approval of voters. However, 6 percent hasn't been sufficient to keep pace with inflation and the growing demand for county services and the voters have failed to authorize increasing revenues in excess of the 6 percent limit. In 1975 and 1976 the Columbia County commissioners asked the voters to approve budget levies in excess of the 6 percent per annum increase. In both cases the voters rejected the measure, leading to termination of some county employees and reduction in services.*

In essence, the real impact of the Trojan contribution to the county tax base has been to cushion the blow of inflation and the costs of expanded services as the county grows. This effect is now declining as Trojan assessed valuation and tax payments decrease. Whether or not the tax benefits of Trojan even compensated for the impacts of Trojan on life in Columbia County is uncertain. If Trojan assessed valuation (in terms of effective dollars) and tax payments decreases from now on to a very low level at decommissioning, the effect of Trojan from this point on would be to slowly decrease the county tax base.

Employment

It was hypothesized that Trojan construction would have a significant impact on local employment. Since the pre-construction Columbia County contract construction labor force averaged only 240 persons in 1970, it was clear that additional workers would be required for a Trojan workforce that peaked near 1,600 five years later.** These workers could be supplied in several ways:

1. Change of composition within the existing Columbia County labor force (which average 10,930 persons in 1970) from other occupations to construction;

2. In-migration of construction workers from outside of the local community (this possibility would fit the hypothesis of a transient workforce);

3. Commuting from the Cowlitz County portion of the local community (i.e., the Kelso-Longview, Washington, area with a labor force approximately double the size of that in Columbia County); or

4. Commuting from outside of the local community (i.e., primarily the major labor force available in the metropolitan Portland, Oregon-Vancouver, Washington, area).

*Personal communication with Henry T. Hudson, Columbia County, Oregon, tax assessor, 1978.

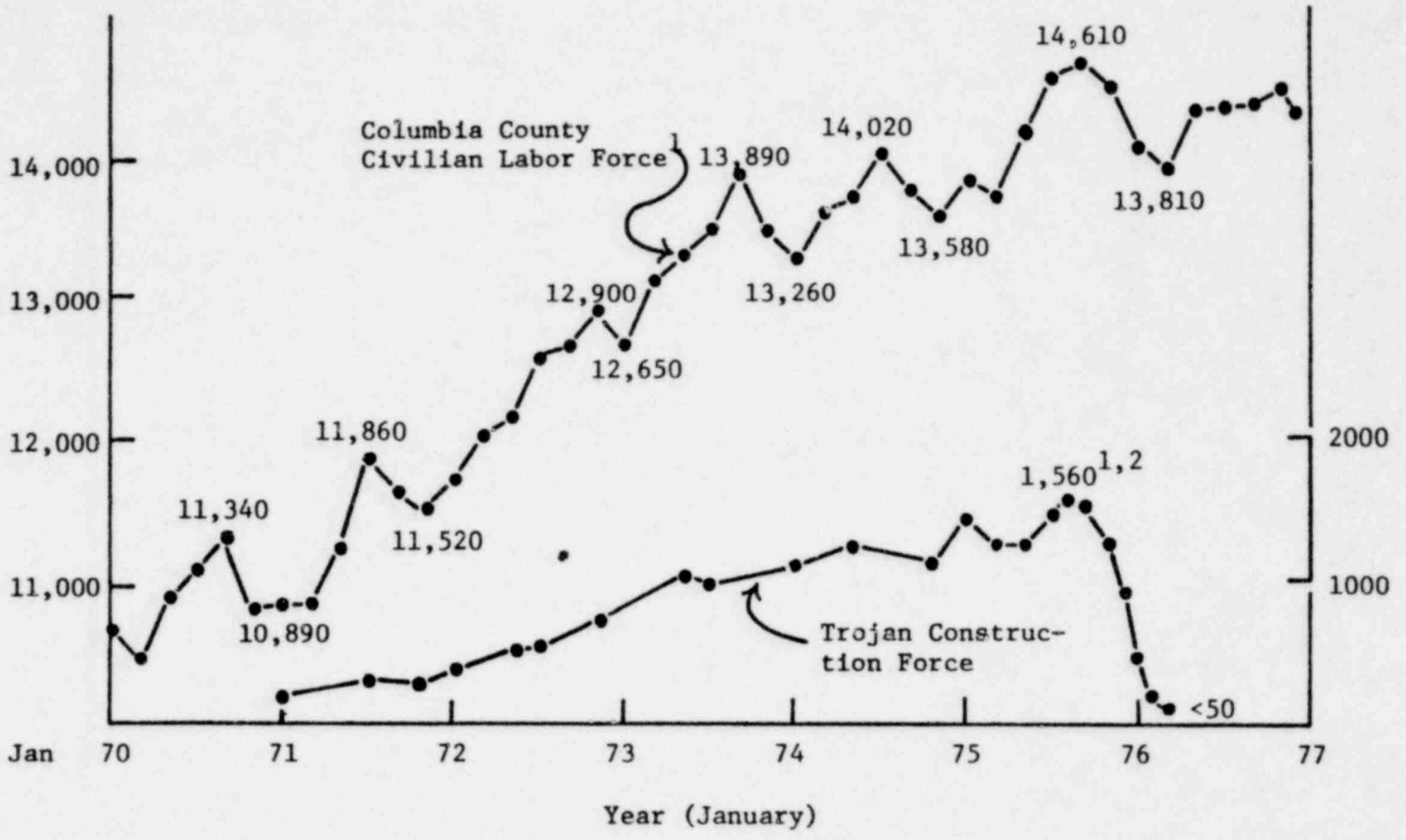
**Portland Research and Statistics Office, State of Oregon, Employment Division, Department of Human Resources

Whereas it is likely that all of the above possibilities did occur to some degree and there can be no question that Trojan did have a significant impact on Columbia County employment via possibilities one and two above, it appears that the majority of Trojan workers were supplied from outside of Columbia County via possibilities three or four above. Based on all of the available data (including that of transportation, housing, and school enrollments which is presented in later sections of this report), we conclude that the Cowlitz County labor force (augmented by in-migration of workers from other areas) contribution was probably more significant a contribution to the Trojan workforce, or at least of the same order, than more distant living commuters as per possibility four above.

The effects of Trojan on employment in the local community (emphasis here has been placed on the Columbia County labor force) are graphically presented in Figures 7 and 8. Employment data for the two counties was obtained from the respective state agencies and for Trojan from the Oregon Department of Human Resources and PGE. Civilian labor force in Figure 7 and county percent employed in Figure 8 includes all occupations, whereas Trojan construction force and total construction workers employed represents only contract construction occupations. In Figure 8 percent employment was obtained by subtracting unemployment from 100 percent. This indicator was used, rather than the more common negative parameter of unemployment, to facilitate comparison between all plots in Figure 8. A positive correlation would be characterized by all plots moving in the same direction (i.e., percent employment, if dominated by Trojan, should decrease with a decrease in Trojan workforce).

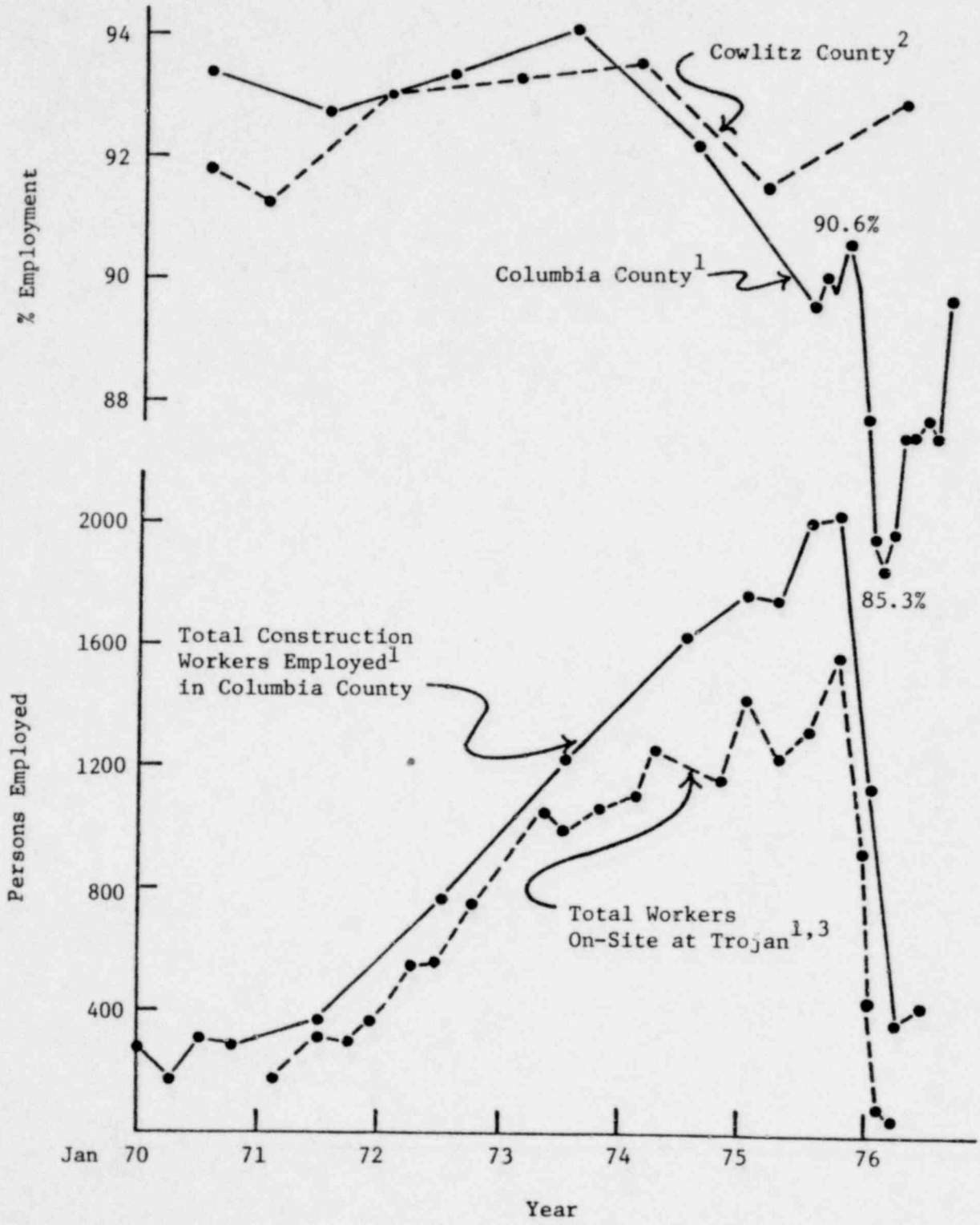
Data for the 1960's (not shown) indicated a seasonal nature for the Columbia County labor force and an increasing trend in size. Labor force size increased in the late spring and summer months and decreased to lower plateaus in the winter months. Such a situation would be expected in an area where outdoor employment (lumber industry, construction, etc.) was significant. The average annual labor force rose from 6,440 to 10,930 (an increase of 4,490 persons or approximately 70 percent) in the ten year period from 1961 to 1970. As can be seen in Figure 7, this rise continued with and probably was accelerated by Trojan. Between 1971 and the peak Trojan work force in the fall of 1975, the Columbia County labor force increased in a manner generally proportional to the

Figure 7: Total County Employment Changes.



Reference Sources: 1. Oregon Department of Human Resources.
2. PGE.

Figure 8: County and Trojan Employment.



Reference Sources:
1. Oregon Department of Human Resources.
2. Washington Employment Security Department.
3. PGE.

increase in Trojan construction force, but greater by a factor of three. Trojan also seems to have altered the seasonal pattern of employment. The winter plateau is abbreviated and damped to the point of nearly being absent for the winter of 1972-1973, a time frame during which Trojan construction force was increasing. During the first half of the construction period, both Columbia and Cowlitz counties' percent employed increased slightly with the major increase in Trojan construction force which occurred. However, during the second half of the construction period there was a sharp decline in percent employed in both counties (see Figure 8). That decline was accompanied by a greater degree of fluctuations in Columbia County's labor force (see Figure 7) than had occurred during the first half of the construction period. This fact may be explained by the changing picture of Trojan construction force seen in Figure 8. During the second half of construction, both the rate of increase dropped and greater work-force fluctuations were seen prior to the fall 1975 peak.

As can be seen in Figure 8 , the total of construction workers in Columbia County closely parallels Trojan on-site construction force throughout the construction period. Prior to Trojan, total Columbia County construction workers numbered less than 400. This number rose to a peak of just over 2,000 as Trojan construction force peaked at approximately 1,600 and then rapidly fell back to about 400 with the decline in Trojan construction force to less than 50. After the Trojan construction force peak in the fall of 1975, all indicators dropped rapidly for Columbia County. Percent employed dropped over 5 percent and the total labor force dropped 800 persons. The nature of the drop makes it undoubtedly correleated with Trojan; however, it is unlikely that the full 800 drop was direct employment at Trojan. Taking into account likely seasonal fluctuation and indirect employment decreases, direct Trojan employment at the peak for Columbia County might have been in the range of 300 to 600 (roughly one-fourth to one-third of the Trojan construction force). Nevertheless, Columbia County employment recovered after Trojan construction (although not to Trojan construction highs), indicating significant indirect or non-Trojan employment opportunities were able to take up some of the slack (the Columbia County labor force summer plateau for 1976 was about 300 persons below the previous year's peak during Trojan).

Although the data would indicate that the majority of the Trojan construction

force did not come from Columbia County (either from indigenous or transient workers), it would appear that the bulk of the Trojan construction work force did come from the local community (including the Kelso-Longview, Washington, area) and that, when indirect employment is considered, the increase in the Columbia County labor force and resultant impacts on public service requirements were significantly related to Trojan. It should be noted here that during the 5 year Trojan construction period, the Columbia County labor force increased by 3,720 (annual average)* or about 34 percent.

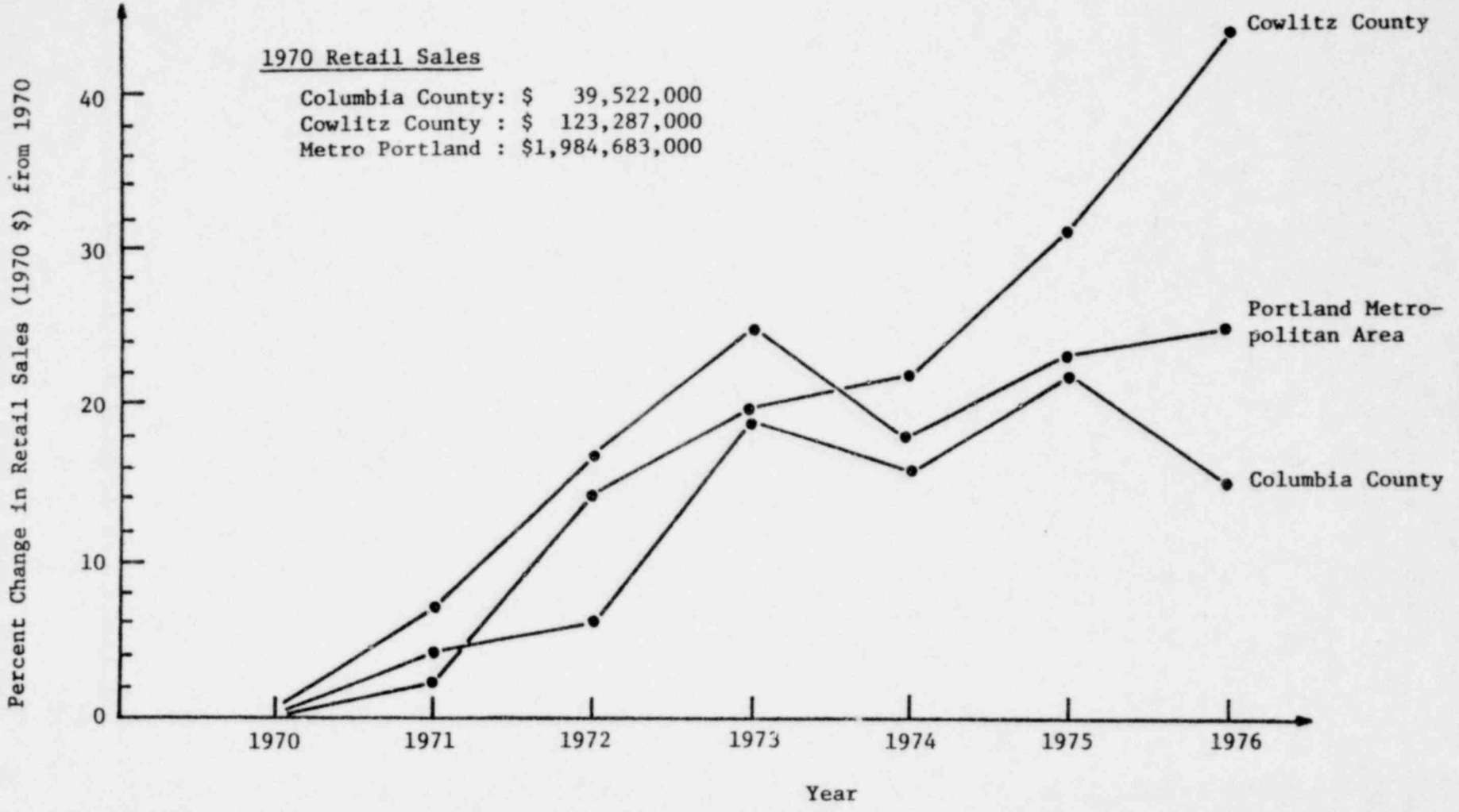
In general, it could be said that Trojan's effect on employment in the immediate area (i.e., the nearby portions of Columbia County) was less pronounced than with other large construction projects elsewhere such as the trans-Alaska oil pipeline. Trojan did not turn Rainier or St. Helens into company towns. This was due primarily to the fact that Trojan employed labor that commuted from nearby population centers, including the major industrial center in nearby Cowlitz County and, to some extent, the metropolitan Portland-Vancouver area, areas large enough such that Trojan would not be expected to be a major factor for them. Post-construction local unemployment effects were cushioned by increasing indirect or non-Trojan employment opportunities and welfare and unemployment compensation programs administered by the state and partially funded by the federal government, thus relieving local governments of the burden of financial support. Post-construction Trojan employment is relatively small (approximately 100). However, it is noteworthy that many of these workers are highly skilled technicians and professionals. These people for the most part were not native to the immediate Trojan community but have relocated to the community.

Business and Commercial Impacts

It would be expected that the presence of Trojan workers together with whatever direct or induced population growth may have occurred would be reflected in increased retail sales in the Trojan community. Figure 9 presents the change in retail sales from a 1970 base for Columbia and Cowlitz Counties and the Portland metropolitan area (Multnomah, Clackamas, Washington Counties, Oregon; Clark County, Washington). These data have been corrected for inflation.

*Portland Research and Statistics Office, State of Oregon, Employment Division, Department of Human Resources.

Figure 9: Percent Change in Real Dollar Retail Sales from 1970.



Reference Source: 1. Sales and Marketing Magazine, Survey of Buying Power Data Service, 1976.

These data indicate that the Trojan community did, in fact, experience significant growth in retail sales during the 1970-76 period. In Columbia County, retail sales rose sharply with increasing Trojan employment and dropped almost as sharply after Trojan construction was completed. Cowlitz County sales also rose sharply coincident with Trojan construction but have continued to rise independent of Trojan construction.

Figure 10 shows per capita retail sales in 1970 dollars for Columbia and Cowlitz Counties and the Portland metropolitan area. These data show that, in general, per capita retail sales in the Trojan community maintained their position relative to the Portland area, with Cowlitz County actually gaining fairly substantially. It would appear to be safe to conclude that Trojan construction provided a transient stimulus to Columbia County retail activities. As of yet, however, there is no evidence of any significant long-term increase. In Cowlitz County, the increase in retail activity has outlived Trojan construction and would seem to be unrelated to Trojan since Cowlitz County enjoys no growth-inducing tax benefits as a result of Trojan.

A specific Trojan-related impact stems from the tourist traffic generated by Trojan. Approximately 145,000 people visit the Trojan Visitors Center each year.* It is, of course, not clear how many of these people were passing through the community anyway. However, since Trojan is not on the main north-south highway (I-5) it can be assumed that for many of these people, Trojan is a special side trip. One would expect the Trojan tourist traffic to stimulate business in restaurants and service stations in the community. However, we were unable to obtain any data to substantiate this.

Retail sales forecasts for Columbia County indicates an expected growth of 61.8% between 1975 and 1980 (comparative expected Portland growth is 80.8%).[20] This would indicate the anticipation of the growth of more varied retail trade and industrial activity within the county. The tax levy reduction of about 15 mills per dollar is a benefit to existing industry and may lead to new industry locating in this region (the average tax levy of Columbia County now being comparable to the average tax levy of the more heavily industrialized Cowlitz County, this block to development no longer exists). The city of Rainier has experienced growth in retail facilities since Trojan came on line. Large retail produce and merchandise corporations have opened sizeable stores in Rainier,

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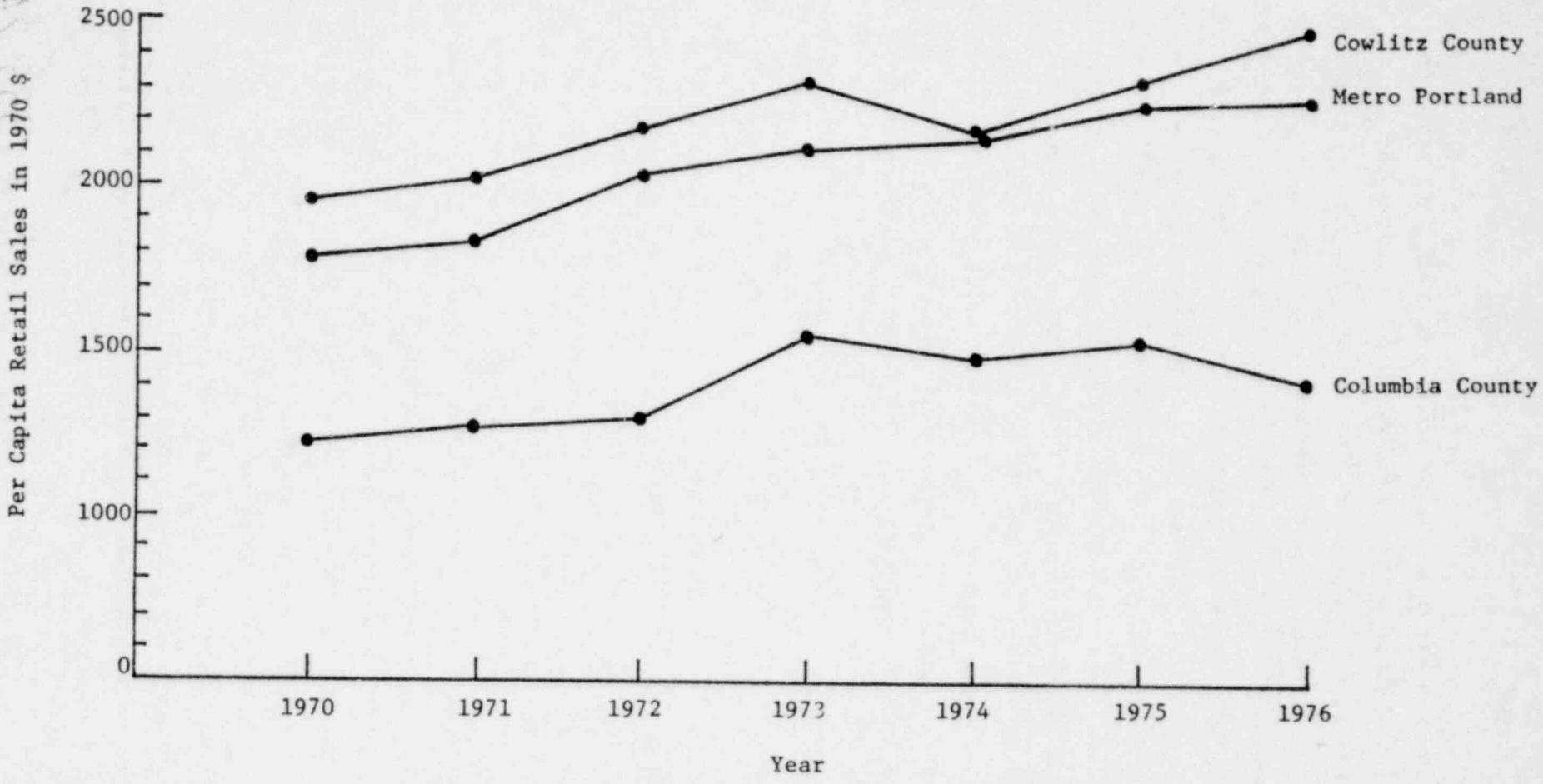
*Personal conversation with Bob Dent, Assistant Director, Trojan Visitors Center.

Figure 10: Per Capita Real Dollar Retail Sales in the Trojan Community.



Reference Source: 1. Sales and Marketing Magazine, Survey of Buying Power Data Service, 1976.

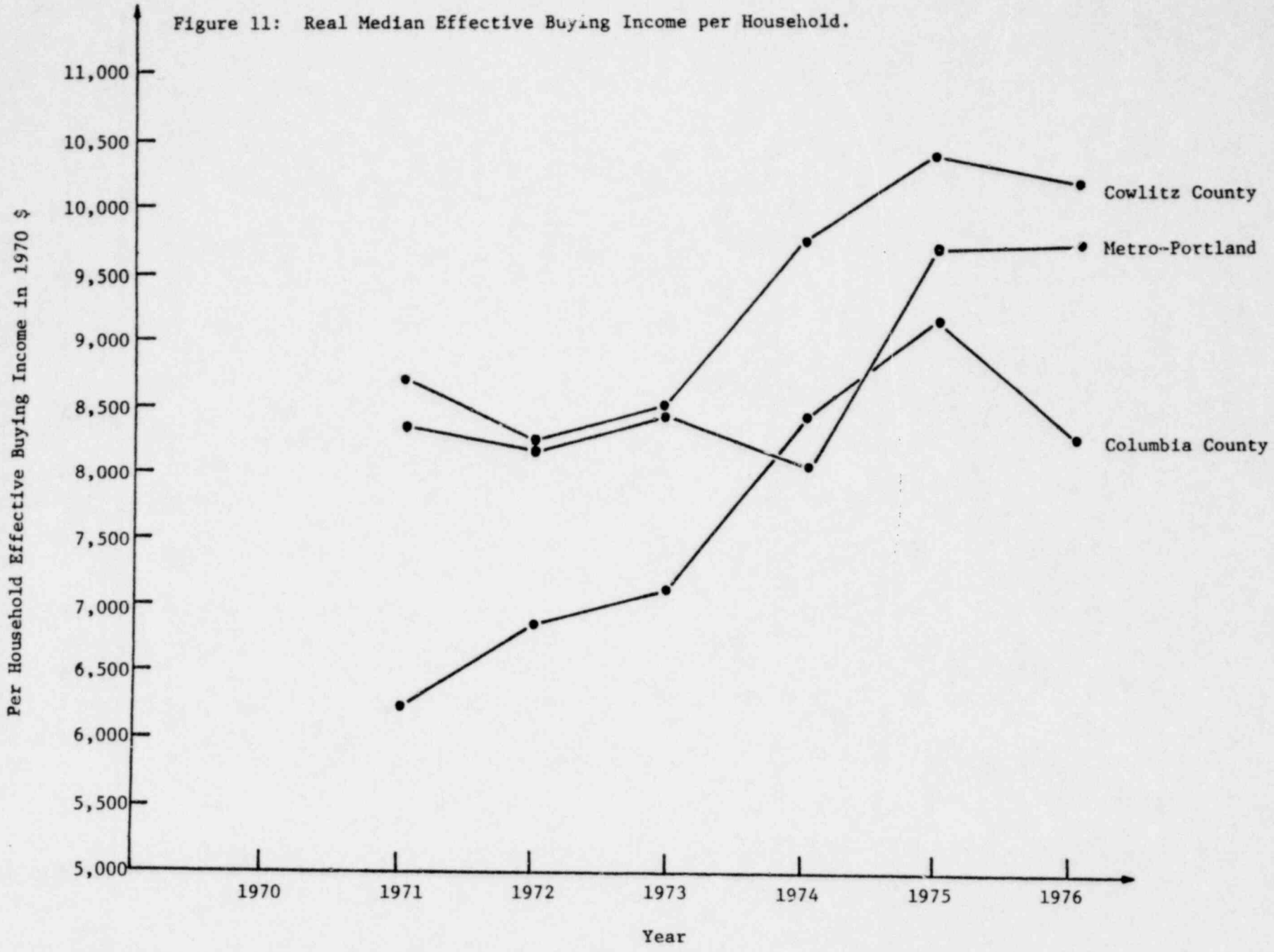
and Rainier is also the possible site for a new oil refinery. However, it is impossible to say that Trojan was or was not the initiating factor in this growth. Some growth was occurring prior to Trojan and, whereas Trojan may have been a growth promoter, growth has continued beyond completion of Trojan construction. Whether or not it would have occurred without Trojan is problematical.

Economic diversification would greatly enhance the economic and social well-being of the community. Approximately 30% of the resident work force works in the forest products industry. During the general recession of 1974, housing starts decreased; hence the demand for timber decreased significantly. This economic trend was manifest in the 5% increase in unemployment in Columbia County during this time. If the community is to keep all its eggs in the timber trade basket, then it is going to be solely dependent on the economic health of that industry. Trojan has perhaps given the community an opportunity to diversify its economic interests, for the reasons previously discussed in an earlier narrative.

Income

Perhaps the "bottom line" of the economic impacts of Trojan would be the effect on income of the local residents. To evaluate this, median household effective buying income data for the years 1971 to 1976 were examined. These data (which incorporate the effect of inflation), for Columbia and Cowlitz Counties and the metropolitan Portland area are shown on Figure 11. As these data show, substantial gains in median household income were made in the Trojan community during the construction period. There was, however, erosion in the gains after the peak construction period was over. In the case of Cowlitz County, this erosion was slight and most likely due to inflation pressures. In Columbia County, however, the decline in median household income between 1975 and 1976 was substantial. Although we have concluded that the Trojan construction employment of Columbia County residents was less than the majority of the work force, the loss of that employment and indirect effects such as the decrease in retail sales apparently caused income to decline. Nonetheless, Columbia County median income did gain relative to metropolitan Portland, going from 73 percent to 87 percent between 1971 and 1976. Some of this gain is directly attributable

Figure 11: Real Median Effective Buying Income per Household.



Reference Source: 1. Sales and Marketing Magazine, Survey of Buying Power Data Service, 1976.

to Trojan. Most, however is more likely due to growth of the county as an exurb of Portland, only part of which was induced by Trojan.

Also of concern is the effect of Trojan on the distribution of income. Were the improvements in median income the result of a general improvement or the result of adding a few relatively high income households to the community? To examine this, the household income distributions for Columbia County and, for comparison, metropolitan Portland for 1971 and 1976 were plotted as shown on Figure 12. The 1971 data are "net cash income" while the 1976 data are "effective buying income." These two values are defined somewhat differently; therefore, the shift between the 1971 and 1976 data is somewhat misleading. What is noteworthy, however, is tne change in the Columbia County data relative to the Portland data. This would indicate that the lower income groups had made fairly substantial progress over the 1971 to 1976 period. Since direct Trojan employment is relatively small and relatively high paid, this change is not a direct Trojan effect. It may, however, be at least partially a secondary effect related to the greater retail activity associated with Trojan.

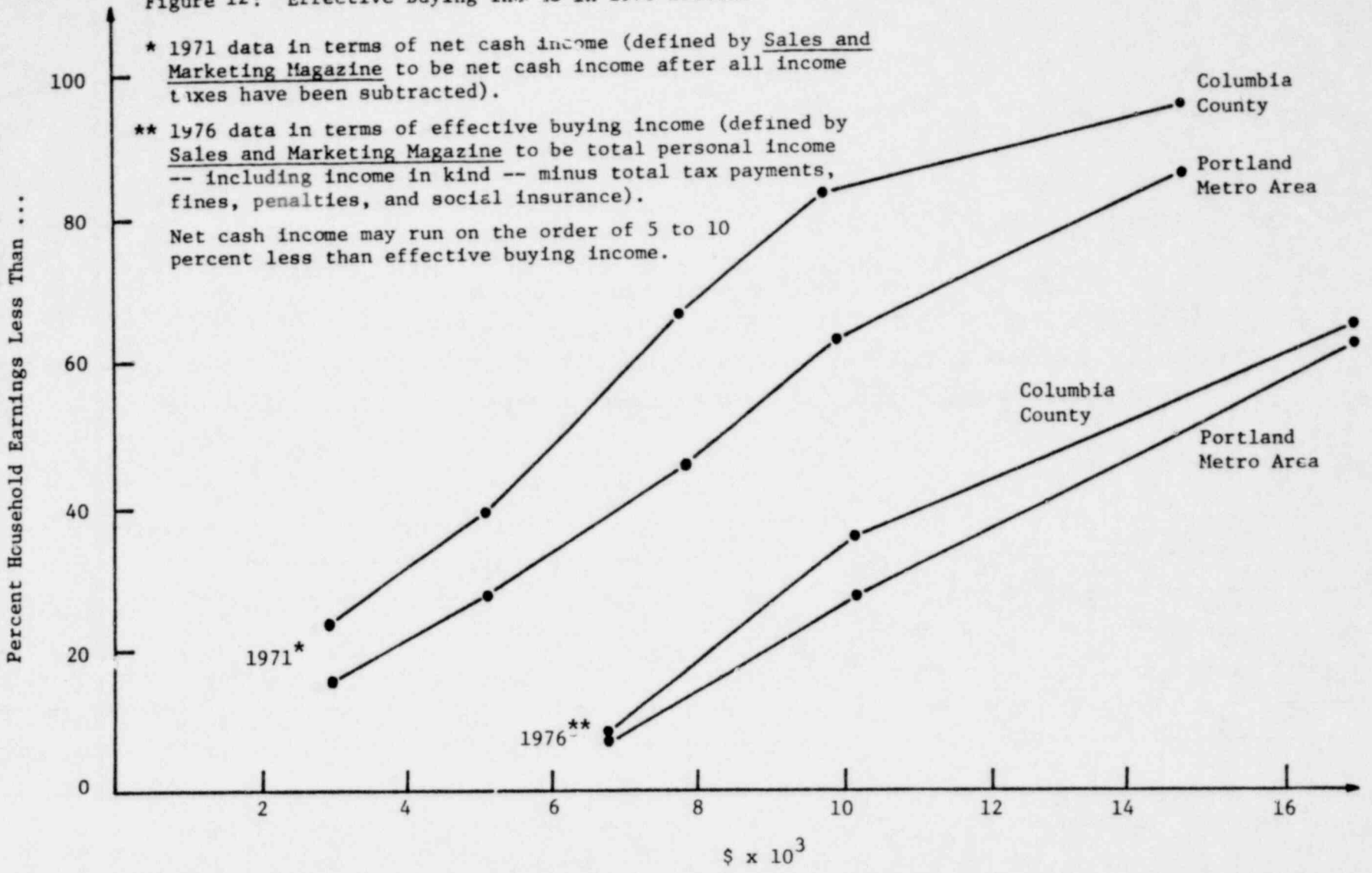
DEMOGRAPHIC IMPACTS

On the basis of a review of the experience in other "nuclear communities," we had hypothesized both a transient growth in the community due to the influx of the construction work force and a longer-term "induced" growth attracted to the area by low taxes and improved community services. These hypotheses are, however, only partially supported by the data available for the Trojan Community. The population of the local community of Trojan, i.e., Longview /Kelso, St. Helens, Rainier, Prescott, Columbia City are shown in Table 7.

As these data show, the Trojan community generally experienced steady if relatively unspectacular growth throughout the period of Trojan construction and operation.

As was concluded in the examination of Trojan employment, it appears probable that the majority of Trojan construction workers did not come from or relocate to the immediate vicinity of Trojan. Population data also support this conclusion. This is shown in Figure 13, which shows percent of change in the Trojan community's population since January 1971. Also shown are the same data for the Portland metropolitan area (Multnomah, Clakamas, and Washington Counties,

Figure 12: Effective Buying Income in 1970 Dollars.



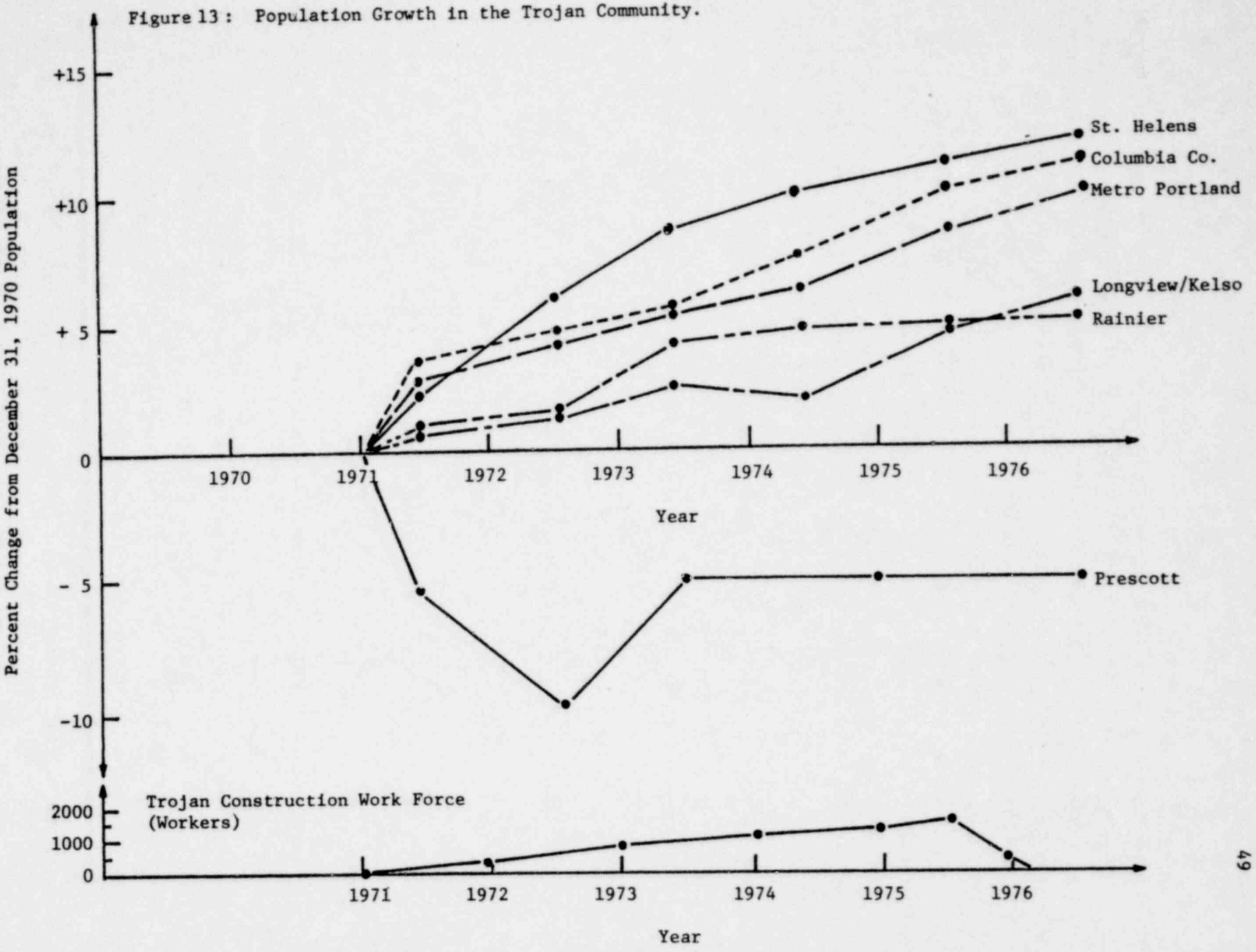
Reference Source: 1. Sales and Marketing Magazine, Survey of Buying Power Data Service, 1976.

Table 7: Population in the Trojan Community

	Columbia County	Annual % Change	St. Helens	Annual % Change	Rainier	Annual % Change	Prescott	Annual % Change	Longview/ Kelso	Annual % Change
December 31, 1970	28,790		6,212		1,731		105		38,677	
July 1, 1971	29,870	3.8	6,330	1.9	1,745	.8	100	-4.8	38,700	.1
July 1, 1972	30,070	0.7	6,600	4.3	1,750	.3	95	-5.0	39,178	1.2
July 1, 1973	30,200	.2	6,710	1.7	1,815	3.7	100	5.3	39,610	1.1
July 1, 1974	31,160	.5	6,855	2.2	1,825	.6	100	0	39,300	- .8
July 1, 1975	31,800	5.4	6,910	0.8	1,840	.8	100	0	39,871	1.5
July 1, 1976	32,400	1.9	7,020	1.6	1,840	0	100	0	40,050	0.4

Sources: Center for Population Research and Census, Portland State University; State of Washington Population Trends, 1974, Office of Program Planning and Fiscal Management, Olympia, WA; State of Washington Pocket Data Book 1976, Office of Program Planning and Fiscal Management, Olympia, WA.

Figure 13: Population Growth in the Trojan Community.



Oregon; and Clark County, Washington). As these data indicate, although growth in the Trojan community coincided with growth in Trojan employment, this growth continued unaffected by the rapid dropoff in Trojan employment. Since the unemployment rolls did not swell appreciably (p.36) and there were no comparable construction projects in the community, it can be assumed that most of the construction workers did not live in the immediate vicinity of Trojan.

It is interesting to note that Prescott, which is immediately adjacent to the Trojan plant, did experience a 10% decline in population coincident with Trojan construction. However, since Prescott is so small (population of approximately 100), this could be attributable to the loss of two or three families. Whether or not this loss was due to Trojan is unknown.

The question of long-term growth in the Trojan community induced by the Trojan-related tax and service benefits is more difficult, if not impossible, to answer. Recent growth in the Trojan community may just be part of a more general trend of growth in rural areas. Contrary to the experience of the 1950's and 1960's, the national trend has been that the fastest growing areas are no longer the metropolitan areas, but the non-metropolitan areas.

> ...The remarkable recent reversal of long-term population trends is demonstrated by growth in non-metro counties of 4.2% between April 1970 and July 1973, compared with 2.9% in metro counties. This is the first period in this century in which non-metro areas have grown at a faster rate than metro areas...As late as the 1960's, metro growth rate was double the rate in non-metro areas....During the 1960's, non-metro counties of today were averaging a 300,000 loss per year from outmigration. Thus far in this decade, they have averaged a 353,000 in-movement per year, while metro areas have dropped from 600,000 net immigrants annually to 150,000....Non metro counties were classified by whether or not they are adjacent to a metro area. As might be expected, adjacent counties have had the higher population growth since 1970 (4-7%) and have acquired about 5/8 of the total net inmovement into all non-metro counties.[21]

Columbia County, providing a pleasant rural environment within commuting distance (albeit long) of metropolitan Portland would seem to be a candidate for growth regardless of Trojan. And, in fact, the rate of growth in Columbia County was greater than that in metropolitan Portland.

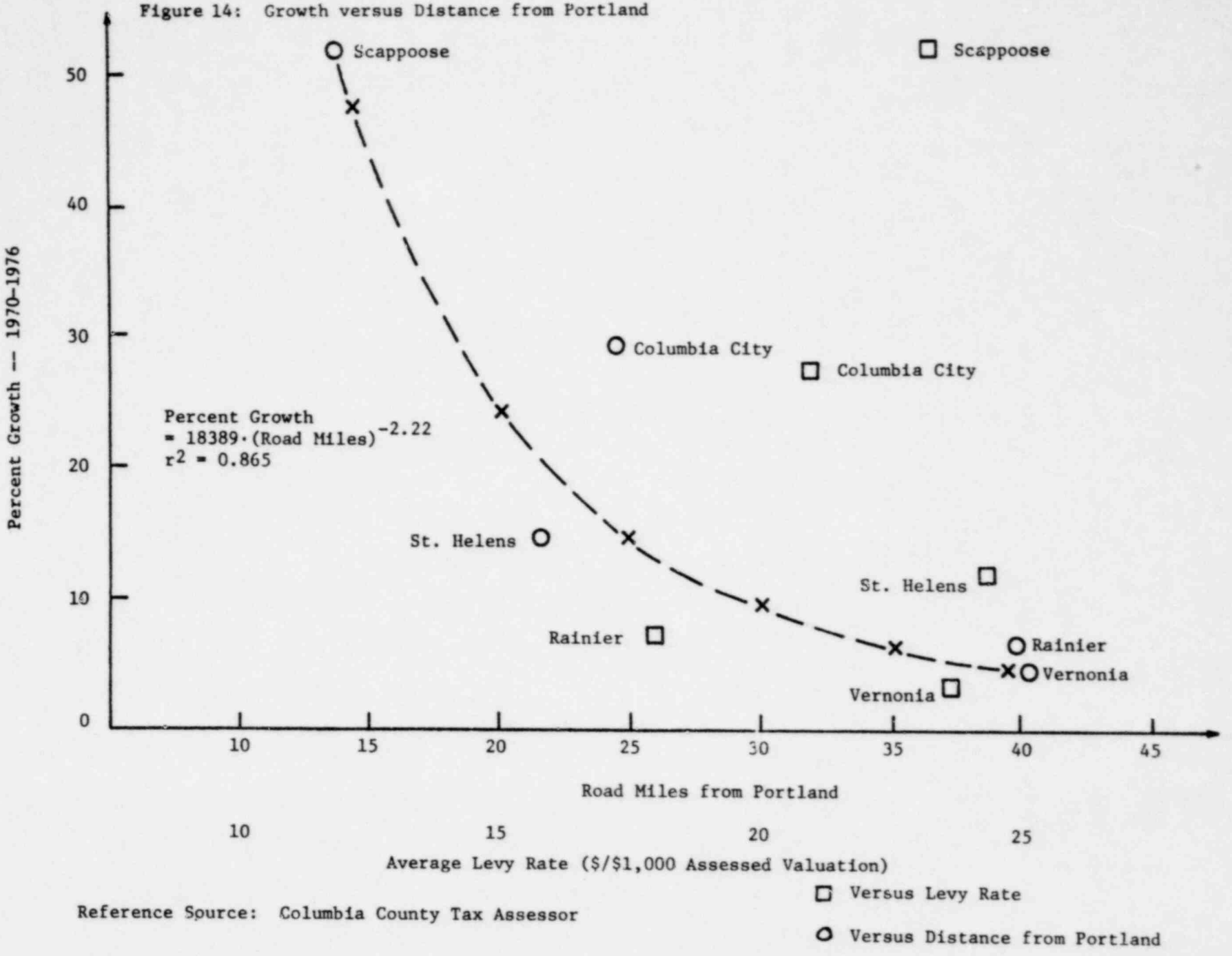
In an attempt to understand the factors influencing growth in Columbia County, the percent growth between 1970 and 1976 in the incorporated areas

(which accounted for 68% of the total county growth) were plotted as a function of road miles from Portland and as a function of the average levy rate in these areas. These data are shown on Figure 14. As these plots show, growth correlated well with distance from Portland (a powercurve fit to the data had an r^2 of .865) while there was no correlation with levy rate. This would indicate that the population growth in Columbia County was tied to the general growth of the Portland area. Once the decision to locate in Columbia County was made, the levy rate within the county was not a significant factor.

We also examined growth in Columbia County relative to another rural county adjacent to metropolitan Portland. The county chosen was Yamhill County, located to the southwest of Portland. The distance between the county seat and largest town, McMinnville, and Portland is slightly longer than the distance from Rainier to Portland but part of the distance is in limited access highway. The population of Yamhill county is approximately a third greater than Columbia but median income and per capita retail sales are approximately the same. The population growth for the two counties is shown on Figure 15. As these data show, the two populations have been increasing at about the same rate for the past few years. The levy rate in Yamhill County has been somewhat higher than that in Columbia County. For example, the 1976 levy in St. Helens was $24.48 per thousand compared to $27.42 and $26.86 in McMinnville and Newburg, The difference in the levy rate was apparently not a decisive factor in the growth of the two counties.

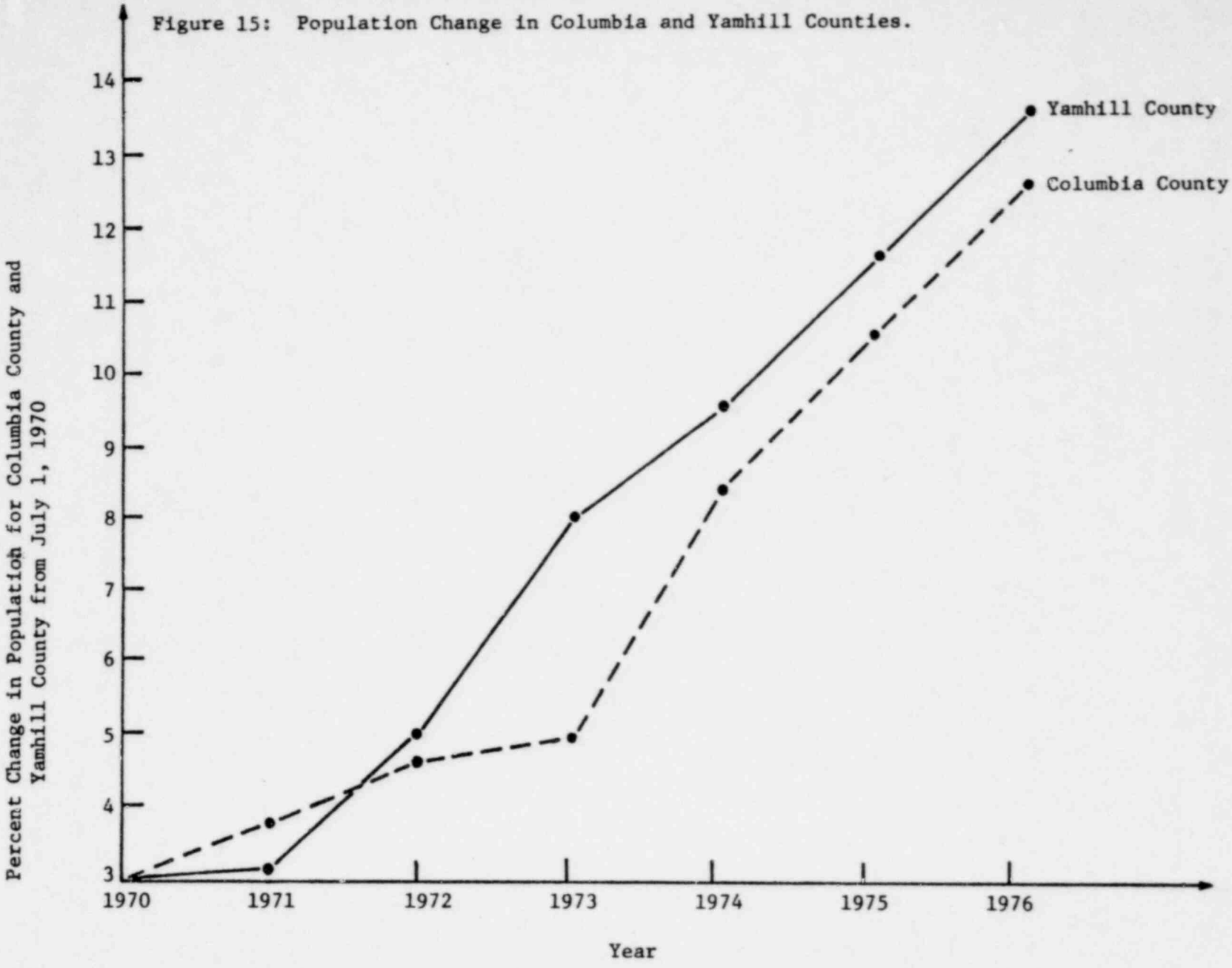
We conclude that Columbia County has experienced and will most likely continue to experience growth by virtue of its location relative to Portland. That growth is occurring in the Rainier area (a portion of Columbia County relatively distant from Portland) may be due in some degree to direct or indirect effects of Trojan. As previously indicated on page 44, the question of induced growth remains unresolved. It should be noted, however, that Columbia County is presently poorly prepared to manage the growth which has taken place and is continuing, regardless of the cause. Judging from our interviews and such indicators as levy rate increase proposals which have failed, there does not appear to be a consensus of opinion among the community or its leaders regarding future alternatives. Hopefully, state required comprehensive planning will help in the resolution of growth issues and give the local community a better capability to be able to anticipate and control development to match the

Figure 14: Growth versus Distance from Portland



Reference Source: Columbia County Tax Assessor

Figure 15: Population Change in Columbia and Yamhill Counties.



Reference Source: 1. Center for Population Research and Census, Portland State University.

aggregate of community values while providing adequate public services and a balanced budget. Trojan tax revenues could be of help in providing support for such planning activities; however, this option has not been attractive to county residents to date.

With regard to the characteristics of the population, apparently little has changed within the communities around the Trojan plant. Most of the residents are white, protestant, lower and middle class, educated as far as a high school diploma. In St. Helens, for example, out of a population of 7,020, only two families are black and 70% of the population are democrats. According to townspeople interviewed, most of the young people go to work in the mills after high school, with only a small percentage continuing their education at a college or university. Very few who attend college ever return to live in the area due to the lack of white collar positions available.

The recent influx of predominantly younger Portland exurbanites as well as the white collar, more highly educated people employed by industries like Trojan and Richhold Chemicals is altering the demographic, social and economic profile of the community.

PUBLIC UTILITY AND TRANSPORTATION IMPACTS

A major energy facility like Trojan may impact community public utilities and transportation networks as a result of the direct demands of the facility and the demands of the population attracted by the facility. Moreover, the environmental disruption caused by the facility may cause problems for local public utilities. These possibilities for the Trojan community are investigated in the following paragraphs.

Water Utility Impacts

Trojan to date has had no significant impact on the water utilities in the surrounding area. The general growth of the area, part of which is attributable to Trojan, has imposed new demands for water service; these have been met with no great problem.

To date, the major Trojan impact on water quality appears to have been associated with Trojan construction. Prescott receives its water from two streams, Jack Falls and Little Jack Falls, located to the west of Trojan. In discussion with local residents it was mentioned that the clearing of timber from

the land to make room for transmission lines, roads, and facilities has apparently led to erosion of topsoil and consequent pollution of the water supply streams during periods of heavy rainfall. Prescott residents complained of "muddy" colored water during these periods, which might indicate considerable introduction of sediments. They also expressed concern over chemical and radiological pollution of the water from fallout during rainstorms.

The public water utility of Rainier, six miles downstream from Prescott, draws water directly from the Columbia River. Therefore, the discovery of low levels of radiation from cobalt-58 (Co^{58}) released from Trojan in algae taken from the Columbia River and in sediments near Prescott and Rainier has led to concern over possible health effects.* The health effects of low level doses of radiation are not well understood and are extremely controversial. Nevertheless, information indicates that the radiation dose commitment of "normal" releases of radioactive substances to the air and water from operating nuclear power plants, of the type which has led to Co^{58} introduction into Rainier's water supply, is detrimental to public health in the long run because it commits the public to exposure to radioactive substances beyond that which would occur naturally. Theoretical overmortality estimates have been calculated which crudely quantify the risk.[22]

Sewage and Solid Waste Utility Impacts

Trojan has had no appreciable direct impact on the sewage and solid waste utilities of the community. General growth in the area, part of which is attributable to Trojan, is motivating expansion of these utilities. In 1970, a new wastewater treatment plant with capacity to handle a design population of 32,000 persons, was constructed by the city of St. Helens under a grant from the U.S. Environmental Protection Agency (EPA). By the end of Trojan construction in 1976 St. Helens population was estimated to be 7,020. Whether or not the existence of this large excess capacity will "accommodate" future growth or spur it becomes a "chicken-or-the-egg" paradox which depends largely on case specific variables. It is unlikely to retard growth.

Transportation Impacts

The major transportation links in the Trojan area are rail and highway.

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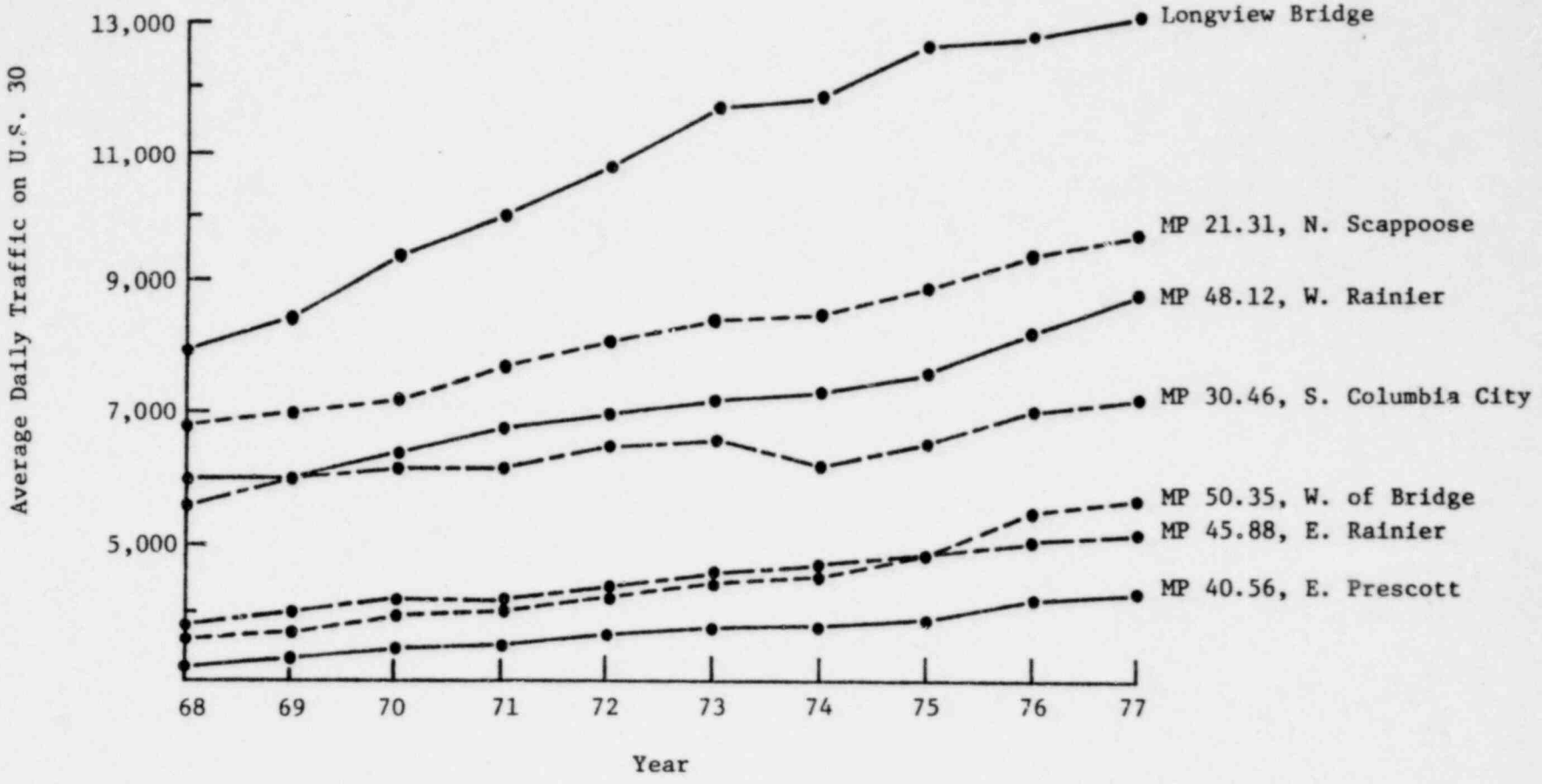
*Personal communication with Gary Booth, Oregon State Health Division, Portland, 1978.

Water transportation is available along the Columbia River at freight rates considerably less than rail or truck (there are dock facilities at Rainier) and air transportation is possible via general aviation airports at Longview, Washington, and Scappoose and Veronia, Oregon, or the commercial airport at Portland, Oregon; however, neither water nor air transportation play a major role in normal transportation patterns in the area. Rail transportation is supplied by the Burlington-Northern Railroad and is available six days a week for freight only. Therefore, the transportation system of concern here is that of busses, trucks, and private vehicles on the highway. Information on bus transportation was requested from Greyhound Lines, Inc., but was not made available by that company.

The Trojan construction force increased through the early 1970's and reached a peak of 1,600 workers in the fall of 1975. Workers living in Longview or Kelso, Washington, would have to cross the Columbia River via the Longview Bridge and join those workers living in Clatskanie or Rainier, Oregon heading southeast on U.S. 30 to reach the Trojan construction site. Workers living in the St. Helens, Oregon, area would reach the construction site by traveling northwest on U.S.30. Average daily traffic (ADT) counts for the period 1968 through 1977 were obtained from the Oregon Department of Transportation for various mileposts along U.S.30 and the Longview Bridge. This data is graphically presented in Figure 16. With the exception of the year 1974, there is a general increase in ADT at all sites. The drop in the rate of ADT increase (and actual reversal of direction in one case) is attributed to the shortage of fuel accompanying the 1973-1974 "oil crisis". The data is similar for two areas remote from the Trojan vicinity, highways near the Eugene and Medford, Oregon urban areas, shown in Figure 17. Whereas the data are not striking, it is consistent with the expectation of an increase in ADT proportional with an increase in the Trojan workforce (except for the year 1974). There is also an indication of a moderation in the rate of ADT increase for 1976 and 1977, after the Trojan workforce peaked and started declining, with the major exception being ADT west of Rainier. In that case, the continued increase in ADT seems to reflect the situation that Rainier is becoming a bedroom community for the Longview-Kelso area.

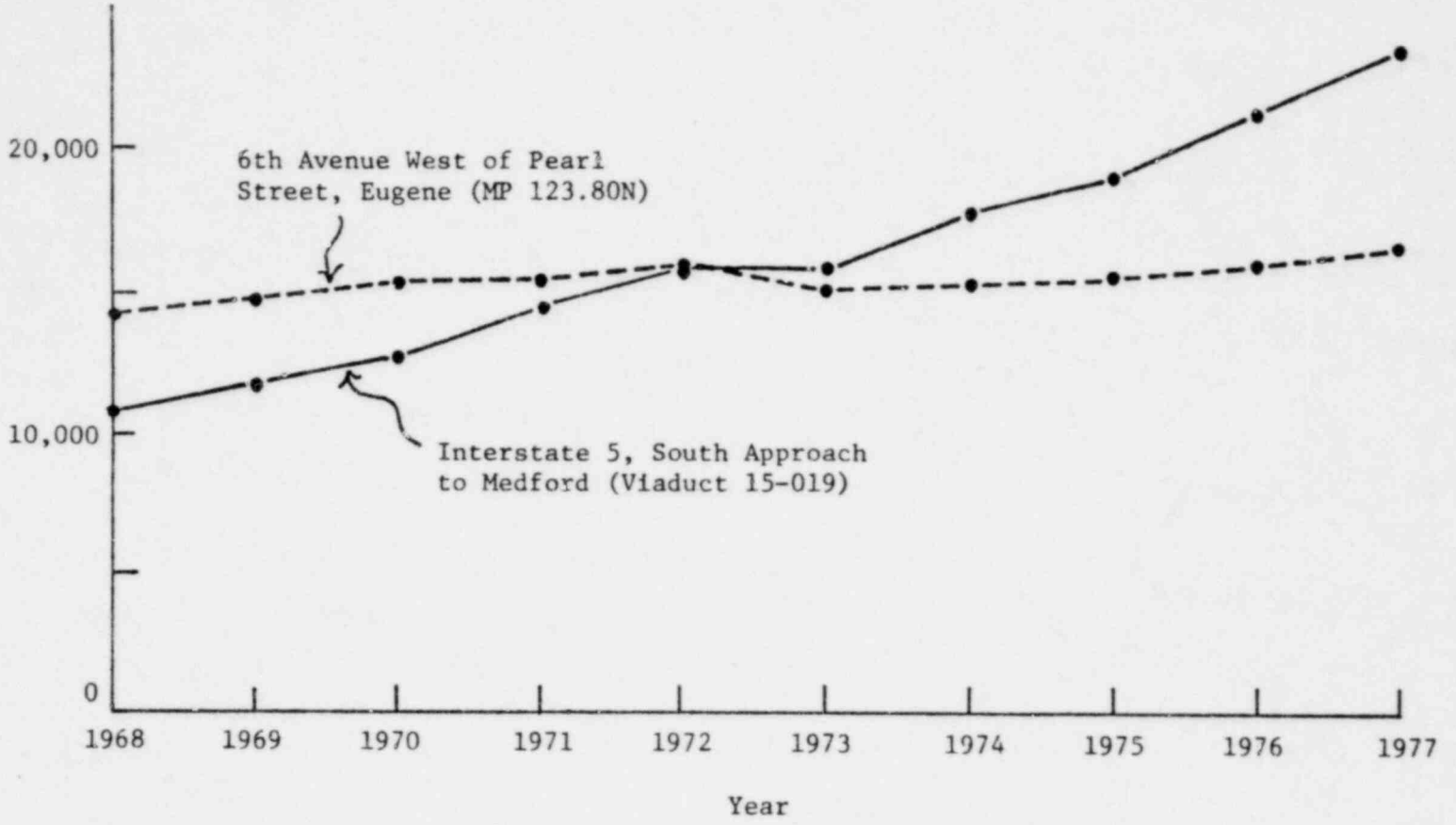
With the exception of a four lane section near the Longview Bridge, U.S. 30 is a two-lane road. It was originally constructed in the 1920's and 1930's;

Figure 16: Trojan Vicinity Traffic.



Reference Source: 1. Oregon Department of Transportation.

Figure 17: Non-Trojan Impact Traffic.



Reference Source: 1. Oregon Department of Transportation.

however, sections have been upgraded since that time as warranted. The design capacity of the two-lane sections near Trojan varies from 4,000 to 6,000 vehicles per day. The design capacity of the four-lane section near the Longview Bridge is 14,200 vehicles per day. There are ultimate plans to widen U.S. 30 to four lanes between Astoria and Portland after 1984. The Longview Bridge has two lanes with a design capacity in each direction of 524 vehicles per hour (5 percent trucks) or 25,152 vehicles per day maximum.

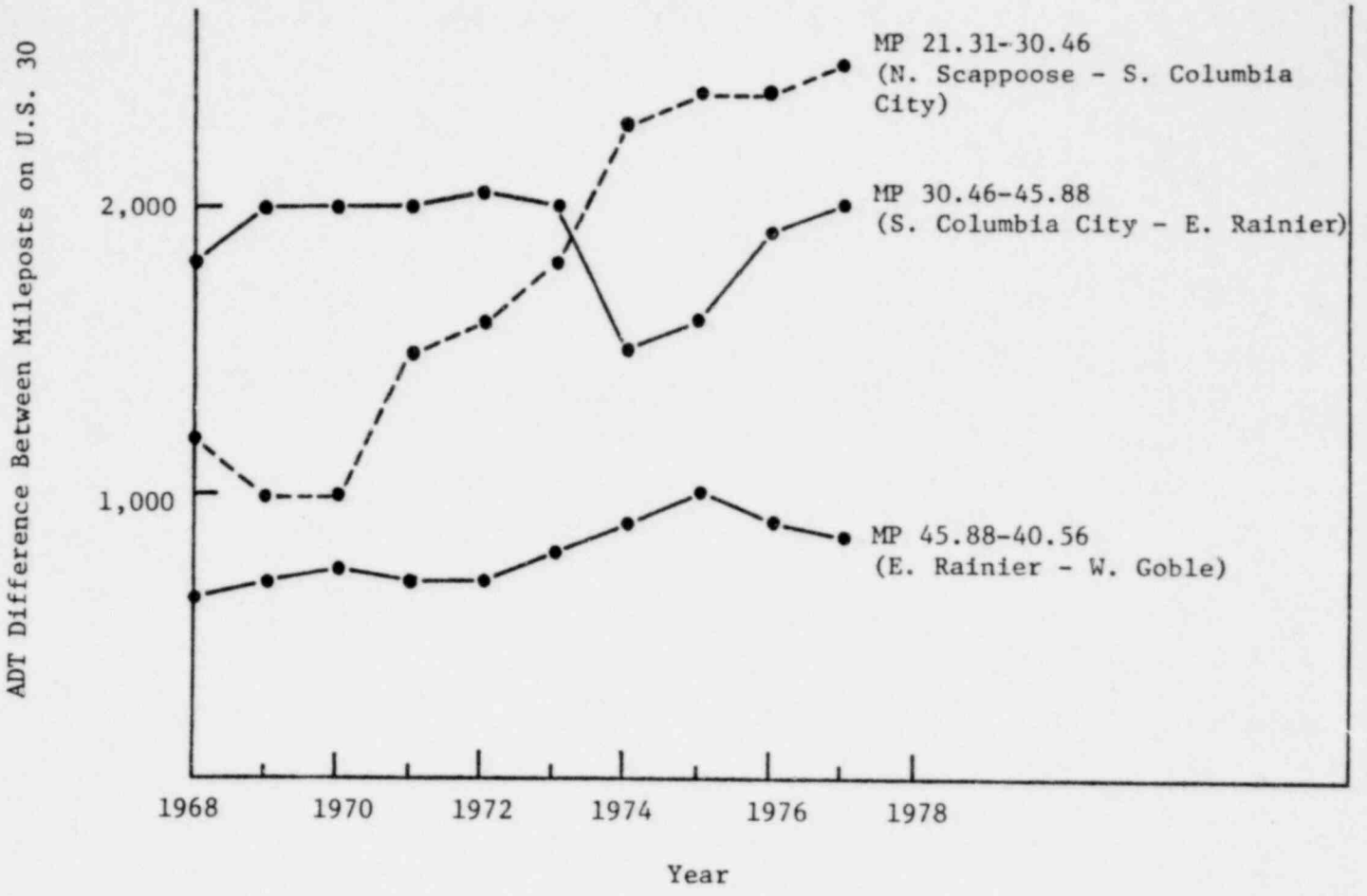
In 1969, prior to construction, the ADT at milepost 40.56 (between Goble and Trojan on U.S. 30) was 3,300. During 1975, the peak year of construction, the ADT at this location was 3,900; an increase of 600 vehicles per day. Similarly, the 1969 ADT for milepost 45.88 (at the eastern Rainier city limits) was 4,000 while the 1975 ADT was 4,900; an increase of 900 vehicles per day. The difference in ADT between these two mileposts (with Trojan in between) might give some indication of the change in traffic with destinations between them, as is listed in Table 8 and plotted in Figure 18. As can be seen in Figure 18, the difference varied somewhat prior to the early 1970's, increased during the early 1970's, peaked in 1975, and decreased thereafter. Also shown in Figure 18 are two other ADT differential plots for mileposts on U.S. 30. The sharp dip and recovery in the differential plot for mileposts 30.46 (at the southern boundary of Columbia City) and 45.88 is striking indication of a correlation of traffic flow with Trojan construction. The dip (vice the rise seen for the differential plot between mileposts 45.88 and 40.56) is due to the fact that the absolute level of traffic at milepost 30.46 was higher than at milepost 45.88 and during the peak construction force years of 1974 and 1975 the difference decreased as traffic to the northwest of Trojan increased relative to traffic to the southeast. The nature of these curves would also indicate that persons living in the Columbia City area were a significant contribution to the Trojan construction work force in 1974 and 1975. This would be consistent with the housing information (see Figure 20) which shows a peak in new housing starts in Columbia City in 1972. The third plot on Figure 18 shows the difference in ADT between mileposts 21.31 (on the northern edge of Scappoose) and 30.46. As is evident, the difference increased with time, most rapidly prior to the "oil crisis" and at a slower rate thereafter, and there is no obvious correlation with Trojan. None would be expected. The increasing differential in this case is likely due to the proximity of Scappoose to Portland,

Table 8: Average Daily Traffic Difference Between Mileposts on U.S. 30

Year	Mileposts 21.31-30.46	Mileposts 45.88-30.46	Mileposts 45.88-40.56
1968	1,200	1,800	650
1969	1,000	2,000	700
1970	1,000	2,000	750
1971	1,500	2,000	700
1972	1,600	2,100	700
1973	1,800	2,000	800
1974	2,300	1,500	900
1975	2,400	1,600	1,000
1976	2,400	1,900	900
1977	2,500	2,000	850

Reference source: Oregon Department of Transportation

Figure 18: Milepost Differential Traffic on U.S. 30.



Reference Source: 1. Oregon Department of Transportation.

as discussed on page 51 of this report. This data is in disagreement with the results of an on-site survey reported in a newspaper article to have been taken near the period of peak construction in 1975.[23] According to that article, about 60 percent of the traffic leaving the plant turned to the southeast (towards Columbia City, St. Helens, and western Portland) and the remaining 40 percent turned towards the northwest (towards Rainier and the Kelso-Longview area). We are more confident that the ADT data is indicative of the situation than the reported survey. This confidence is increased by the logic that traffic originating in the metropolitan Portland area (particularly those sections of Portland near or east of Interstate 5 and the Vancouver, Washington area which comprises the major portion of the metropolitan Portland area) would be likely to commute to the Trojan site via Interstate 5 and the Longview bridge as opposed to taking the more rural and presumably slower U.S. 30 route. This logic is further supported by the notable congestion which occurred on U.S. 30 in Rainier during construction.

U.S. 30 runs through the center of Rainier, bisecting the business district. The result is congestion and adverse impact on the surrounding area, particularly at morning and evening rush hours when traffic flow peaks. Residents interviewed by the research group complained of the noise and inconvenience of the traffic jams in downtown Rainier. One businessman complained that it took up to 20 minutes to cross U.S. 30 in a car. During construction, the problem was mitigated somewhat by the addition of extra traffic control police to direct the flow of traffic at major intersections during peak periods. If anything, the situation has become worse since completion of Trojan construction since traffic has continued to increase, particularly between Rainier and the Longview-Kelso area. A traffic count taken during 1977 determined an average rate of 587.3 vehicles per hour travelling in both directions on U.S. 30 through downtown Rainier (presumably during the working day) for an average rate of 14,095 vehicles per day. The 1977 ADT value at the same location was 7,100 (it has been increasing sharply since 1974).

An additional impact would be that of persons visiting the Trojan visitors' center. At the present time, almost 145,000 visitors per year have been coming to Trojan along U.S. 30. How many of these have come solely for that purpose and would otherwise have utilized the road is unknown. However, it can be

assumed that a minor additional impact results from this cause.

The overall impact of Trojan on transportation systems is difficult to quantify. To accommodate increased traffic flows during construction, the Oregon Department of Transportation installed a separate left-turn lane in front of the Trojan site and widened the road. Existing roads around the plant were also upgraded. The costs for these improvements were paid by PGE. However, the increased costs of road maintenance, traffic controls, and supervision by police agencies that occurred primarily during the construction phase (in terms of direct impacts) were not paid for by Trojan, except in terms of the general tax picture. The direct impact of Trojan during the peak of construction might have been on the order of several hundred vehicles per day above the normal increasing trend of traffic (as indicated by Figures 16 and 18). Additionally, there would be the social costs such as worsened traffic jams in downtown Rainier.

Even more difficult to quantify would be the indirect or secondary impacts. Road systems in the vicinity of Trojan appear to be approaching design capacity and it is likely that design capacity is significantly exceeded already during peak traffic hours. Trojan, as a part of the growth trend, must share a part of the responsibility for this increase in the long term. The increase will, besides the impacts of congestion, lead to increased maintenance costs and pressure for expansion that otherwise might not have occurred or might have occurred at some later time (increasing U.S. 30 and the Longview Bridge to four lanes).

LAND USE IMPACTS

The major direct land use impact of Trojan has been the actual conversion of the 634 acre plant site to industrial use. Most would agree that this impact is relatively minor.

More important, but much more difficult to define, is the impact on land use caused by the general growth of the community, part of which is Trojan-related or induced. Many of the residents of Columbia County enjoy and want to preserve, at least for themselves, the rural flavor of the county.

At the present time, there is concern in the community that the rural open

spaces (timberland) will be lost to residential, high-density developments. To combat this, several community leaders have suggested to the Planning Commission that rural residential developments be limited to a minimum of 5 acres per lot.*

At the present time, development is perhaps slowed by the lack of good roads (most of the roads through the hillside are narrow and gravel topped) and the hilly terrain. A thin layer of topsoil covers the basaltic formation with large rock outcrops dominant over much of the landscape. Thus, high-density development is restricted to only a relatively small number of locations. Much of the landscape is capable of supporting the growth of trees, but not the development of large subdivisions.

As was noted on page 51 , Columbia County has been relatively ill-prepared to manage and direct growth. At present there are only two areas of the county which are zoned; an area around Clatskanies in the northwest corner of the county and an area around Scappoose, St. Helens and Columbia City in the southeast part of the county. These areas were zoned in 1973 as a result of a 1969 planning effort carried out in response to state legislation.

The county is currently in the midst of a comprehensive planning process which may result in the adoption of land use goals, guidelines and zoning for the entire U.S. 30 corridor. This would constitute a major advance in the communities' ability to cope with growth.

HOUSING IMPACTS

Quantitative information concerning housing in Columbia County is very limited. There is somewhat more information available for Cowlitz County. This lack of information makes a discussion on housing impacts largely subjective and based on qualitative information or extrapolation from other indicators. Although we have concluded on the basis of other indicators (employment, transportation, population trends, etc.) that the majority of the Trojan construction workforce did not relocate to the immediate vicinity of Trojan, it is apparent from the limited available information that the majority did come from the Trojan community as a whole (including the Kelso-Longview area) and that housing stocks in both the Columbia and Cowlitz county portions of the Trojan community were stressed as a result.

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*Personal Conversation with Wes Kimball, Realtor, Rainier, Oregon.

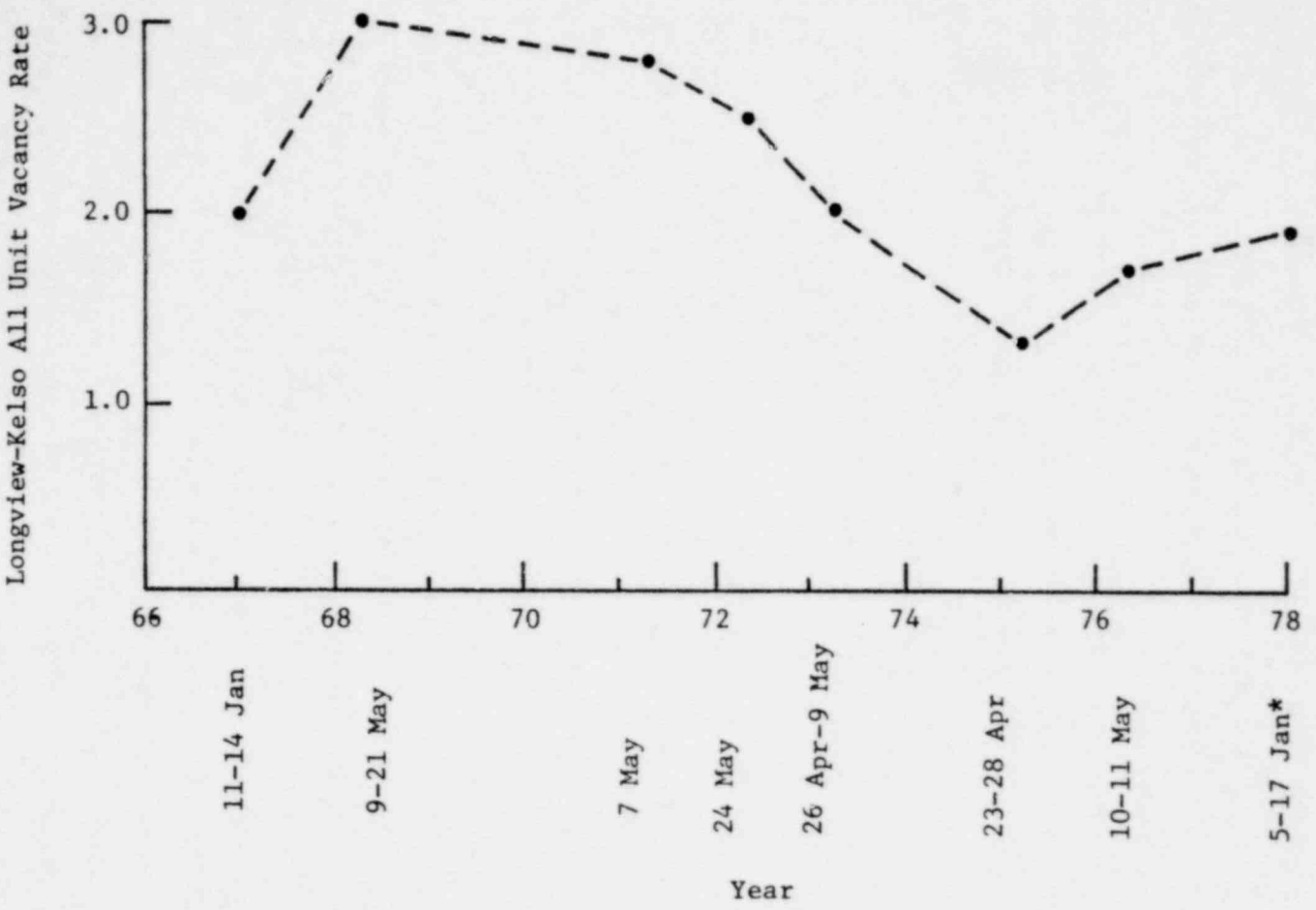
Probably the best available quantitative information is that of vacancy rates for the Kelso-Longview, Washington area. These are graphically presented in Figure 19. As is evident, from this postal vacancy rate information, the vacancy rate declined from around 2.8 percent near the commencement of Trojan construction to a bottom of 1.3 percent during peak construction work force time in 1975. It started back up after that time and reached 1.9 percent in 1978. As it turned out, it was a fluke that this information was available. As of January 1978, the Federal Home Loan Bank of Seattle has discontinued taking vacancy rate surveys for the Kelso-Longview area. Such surveys have never been conducted in Columbia County.

With regard to housing in Columbia County, the quantitative information is fragmentary. The only sequentially complete information is that of housing starts. These are graphically presented in Figure 20 for the Columbia County communities nearest Trojan and for the county as a whole. The only apparent correlation between this information and Trojan is the possibility that housing starts in Columbia City reflected planning for Trojan workforce support as the transportation information on page 59 would seem to indicate essentially was the case.

During Trojan construction, housing was recognized to be limited in the St. Helens area. A vacancy rate of 1.5 percent was reported in a newspaper article in 1976, but the validity of that figure is unknown.[24] The same article indicated that inflated rental prices were experienced. While such a situation would be expected, it was never documented. The lack of low-income housing did, however, lead to the formation of the Columbia County Housing Authority to identify and deal with housing problems in the St. Helens area. As a result, low-income subsidized housing was built within St. Helens. These houses were scattered throughout the city of St. Helens. Virtually all previously vacant lots in the city are now filled. Most of the housing constructed under this plan was restricted to within the boundaries of the city because of the lack of services and utilities beyond the city limits.

To further alleviate the housing shortage, the District Court of Appeals in Columbia County handed down a ruling allowing for oversized mobile homes on lots as legitimate family dwellings. While this course of action was perhaps an appropriate response at the time, it has subsequently led to some problems.

Figure 19: Kelso-Longview Vacancy Rates.

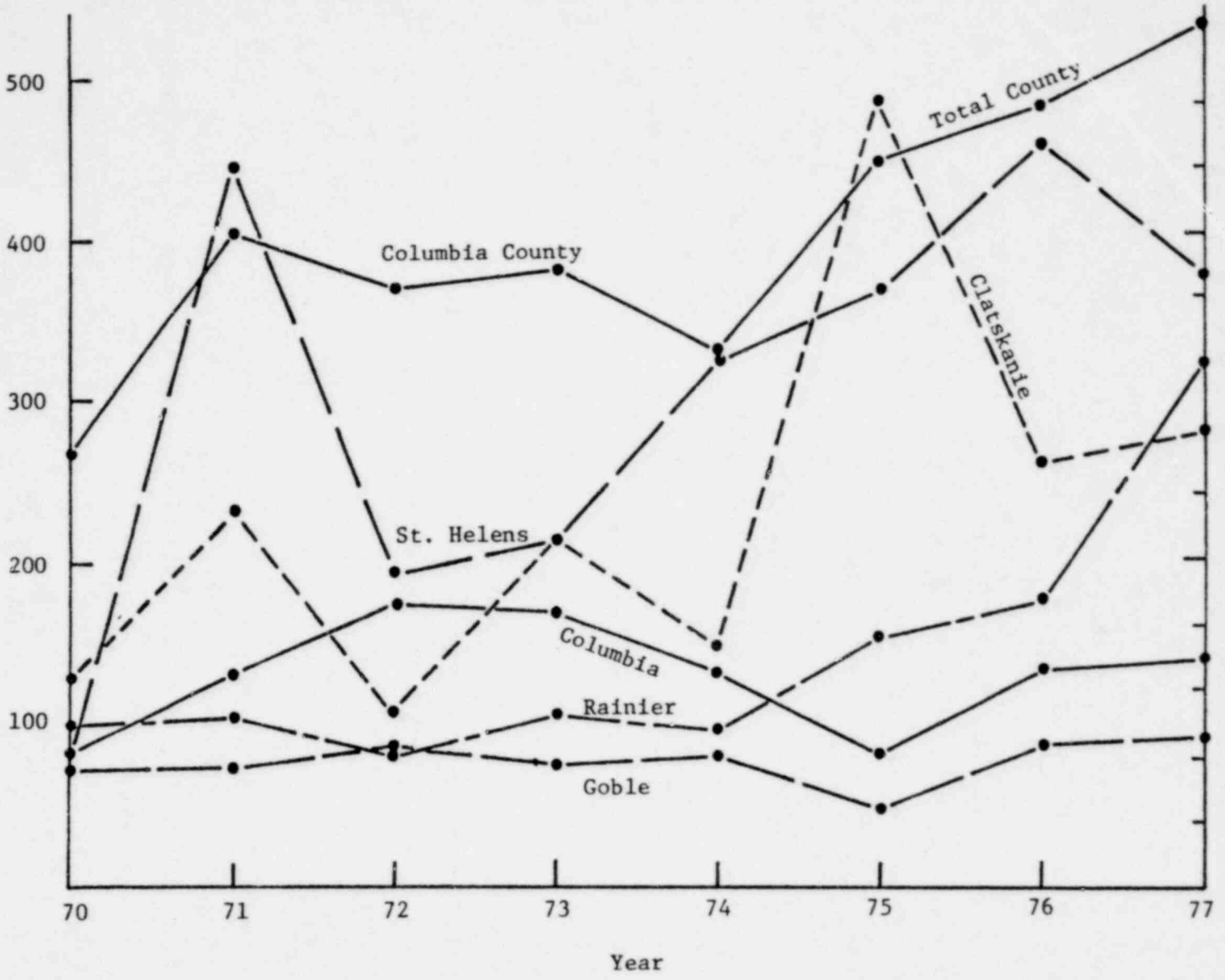


* Includes Woodland, also other definitional changes in survey methodology.

Reference Sources: 1. Pre-1978, U.S. Department of Housing and Urban Development Postal Vacancy Surveys.

2. 1978, Federal Home Loan Bank of Seattle Housing Vacancy Survey.

Figure 20: Housing Starts in Columbia County.



Reference Source: 1. Columbia County.

Primarily, it opened the door to rapid mobile home development all around Trojan. In the Rainier/St. Helens region, five mobile home dealerships have opened up since 1970 and led to the development of four major mobile home parks.[25] The usual argument against this high-density mode of living is that they are public service intensive per acre, while contributing less to the taxed evaluation of that acre than a comparable permanent residence. In essence, they get more than they pay for compared to the other residents of the county.

Construction workers, unable to find permanent residences or rental units, opted for mobile home residency. While this alleviated the housing shortage problem to a certain degree, it left the county with another problem, the rampant growth of mobile homes in a rural region. While the mobile home may run contrary to the more permanent rural ethic, it does, however, provide a residence for those who cannot afford to purchase a house at today's market prices. Their popularity is, of course, by no means limited to Columbia County.

Recent actions have been taken by the Columbia County Housing Authority to curb the influx of mobile homes. A change in building code requirements has been enacted permitting new septic tank development only in those areas that have a topsoil cover of at least 30". The previous requirement was 24". This will dramatically decrease the number of available parcels of land that could be used for residency by mobile home owners.

To encourage development of permanent, single-family residences, the Oregon Farm/Home Program provides low-income housing to qualified applicants whose family incomes do not exceed $15,000 annually and who wish to reside in townships under 10,000 people. Many Columbia County residents qualify for such assistance.

Jurisdiction and control over housing development patterns lies largely with the local planning department in Columbia County. This agency is responsible for the issuance of building permits. Criteria for these permits include consistency between lot size and zoning for the parcel where zoning exists. There is, however, no requirement for lot size in unzoned areas. That is determined by the water and septic tank evaluation.

The character of the housing stock in the Trojan community has been somewhat altered by Trojan and other new industries in the area. Several of the management

level employees of Trojan live in the hillside on the northwest side of Rainier. Residences here are listed in the $50,000 to $90,000 range.* This development is relatively new and dates back to the influx of the white collar employees of industries like Boise Cascade, Reichhold, and Trojan. The white collar demand for high-priced residences has added to the gradual increase in land values in the area.

The town of Prescott, one-half mile from the Trojan reactor building, has not been impacted in the same way as the rest of the region. The major effect would be the stagnation of the town and the animosity of the residents toward Trojan. Some residents have alleged that Trojan decreased land values;* however, the validity of that statement is uncertain and, until a sale actually occurs, cannot be tested.

Due to the proximity of Prescott to Trojan, PGE originally offered to purchase the land on which Prescott is situated from the residents. Only one family accepted the offer and relocated to another piece of property that they already owned. The remainder of the residents chose to stay for a variety of reasons. Some are retired and on fixed incomes; thus, the cost of relocation and purchase of a new or used home at today's market price is simply prohibitive. One resident had his house and lot which include river view and beach assessed at $14,000. A comparable lot and home elsewhere in the county is assessed at $23,000.** Hence, for most of the blue collar residents, relocation is financially impossible.

Portland General Electric has, however, purchased the available land in the town which included some buildings. These structures were demolished, and the land remains vacant. Several residents informed us that it was their impression that PGE desired to construct another reactor at the present site of Prescott in the future.

RECREATION AND RECREATIONAL FACILITIES

The impact of Trojan on recreational facilities occurred during the construction phase. There already existed a large demand for playfields for sports such as softball and soccer in the St. Helens' area. The local community supports several leagues in which many residents participate. The demand for field space, particulalry during spring and summer, far exceeds the number of fields available. The impact of Trojan, though marginal, was to exacerbate

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*Personal conversation with Wayne Weigandt, Realtor, St. Helens, Oregon.
**Personal conversation with Alex Hill, Past Mayor, Resident, Prescott, Oregon.

an existing problem.

In response to these demands, the city of St. Helens and the County Fair Board each built some new ball fields, but the problem persists. There simply are not enough fields to accommodate all the sports activities.*

There are only three small county parks in Columbia County. The County Planning Office indicated an unmet need for parks, such as a lineal park for hiking, in the county. At the present time, the county has no state or regional parks.

There was no perceptible impact on hunting and fishing recreation, possibly because there is such a large capacity for these sports.

In general, P G E has attempted to alleviate the park and ballfield shortage and even provide access to sports fishing through the construction of the wilderness parks, ballfields and fish-stocked lakes and ponds that surround the nuclear facility. These facilities have also benefited P G E 's public image in the community.

CULTURE AND LIFESTYLE

Trojan has, in general, had little direct impact on the culture and life style of the community.

Many early settlers came to the region to cut the trees and harvest the logs. The great river provided them with a means of marketing their products. The level land paralleling the river was ideal for constructing their towns, mills and residences. While the mills may have gotten larger, the towns expanded into cities and the population increased substantially. The individualistic spirit of the first settlers still remains almost unchanged in their descendents.

The life style of those living in the immediate vicinity of the Trojan nuclear power plant apparently hasn't been affected either by the facility, or the attention focused on them by opponents of the plant. One of the residents expressed a view that is shared by many of those who live around Trojan:

> "I think the people who live in Seattle and Portland are more worried about the power plant and our lives than we are here. That's where most of the protestors come from... the park is going to be a real asset... but we don't hold any plans for big hotels and restaurants. We want to stay like we are."**

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*Personal conversation with Monroe Singleton, Realtor, Rainier, Oregon.
**Personal conversation with Gibb Crouse, Editor, Chronicle Sentinel Mist, St. Helens, Oregon.

The addition of visitors each summer has resulted in some increase in additional local store sales yet has not impinged on the rural life style that has survived through the construction of Trojan.

It seems likely, however, that the rural lifestyle is destined for some change under the pressures of growth. The social and economic characteristics of the community have begun to change under the influence of exurban growth and the addition of employees of technologically sophisticated industries such as Trojan. The ultimate result of these changes is unknown.

One potential adverse impact on lifestyle has been identified. As will be described in more detail in the following section, the security requirements of the Trojan plant may impose limitations on the personal freedoms of members of the Trojan community. This possibility was brought home forcibly to two members of the research team. They were detained and questioned by Oregon State Police while interviewing two anti-Trojan activists from Portland at a restaurant near the plant. While this is entirely understandable in light of the subsequent bombing and demonstrations, it does raise questions about the impacts of Trojan on the personal freedom of both residents and visitors to the Trojan community. It seems clear that the security of the plant will necessitate some sacrifices of personal freedom. Perhaps most would say these sacrifices are more than compensated for by the benefits of the plant. Others would disagree.

PUBLIC SAFETY IMPACTS

One of the major impacts of the Trojan nuclear power plant is the requirement for and/or the development of upgraded public safety services, particularly the fire and police services.

Police Service

Trojan construction activity and the parallel permanent community growth caused an increased need for police services. This need was primarily for traffic control. Federal LEAA and CETA funds were available for a short time to increase personnel. When federal funding ended, the staff size was reduced. However, the increased tax revenue from Trojan has made it possible to maintain an improved level of local police services.

Perhaps the most significant impact on police services due to Trojan has been the improvement in inter- and intra-police agency communication. The best example of this is the new emergency/fire/police/ambulance/ control communications center in Longview/Kelso. This complex boasts the most up-to-date radio communciations system in the entire region. A factor in the development of this system was the construction and operation of Trojan and the attendant need for emergency response capability. It should be noted, however, that this complex has received no funding in the form of direct grants or tax revenue from the operation of Trojan.

While lacking in size and degree of sophistication, Columbia County also boasts of a new emergency communications complex. This complex was established and operates on federal and local funding, although Portland General Electric did contribute $3,000 to support the establishment of the office.

The primary impact of these new sophisticated communications systemsis the improved capability of the local police agencies to operate both individually and jointly, providing security and service to the local communities. Were it not for Trojan, local police agencies would be financially denied these capabilities.

Trojan has imposed other demands in the police services of the community. Anti-Trojan demonstrations at the plant site in late summer and early fall of 1977 resulted in the arrest and eventual prosecution of approximately 130 persons for trespassing and obstructing access to the plant. Both local and state police were involved. Moreover, the Columbia County courts and county prosecutor were tied up in trying (unsuccessfully) the demonstrators. It is probable that more demonstrations can be anticipated in the future.

Because Trojan is the target of demonstrators and possibly even sabotage, (a small bomb was recently exploded at the Visitors' Center early one morning); state and local police became involved in providing off-site security for Trojan.

Fire Service

The Trojan nuclear power plant has literally created a fire protection service for the people of Rainier and the surrounding rural communities. This socio-economic impact is one of the primary impacts of Trojan on the local community.

Prior to 1974, the City of Rainier owned two fire engines which served the City of Rainier exclusively (17 square miles service area) with an all volunteer fire fighting force. The fire department occasionally responded to calls in the outlying areas, but it was under no commitment to do so and didn't really have the facilities for an adequate response. The entire volunteer force numbered but twenty men total.

With the development of the nuclear facility, the citizens, prompted by P G E , decided they could afford to form a rural fire protection district. Consequently, they annexed the Goble area, Prescott, and the surrounding localities into the Rainier Rural Fire District. They approved a bond issue for 475,000 to purchase three new fire engines, three tankers, and to build three new rural stations. They then hired three full-time personnel: a fire chief; assistant chief; and one staff person. The volunteer force also grew to 80 persons.*

When Trojan prompted the citizenry of Rainier to incorporate into a rural fire district, the Trojan faciltiy itself was not included within that fire district. Instead, they obtained a separate contract with the Rainier Rural Fire District for fire protection and services. An agreement signed in February 1974 provides that the Trojan partners pay the lesser of $100,000 per year or 90% of the fire district's total annual budget in exchange for fire protection services.* The contract costs are distributed among the partners proportionate to their share of ownership. If Trojan were to be included in the fire district and assessed at fire district rates, they would pay almost seven times the amount they are currently charged, or $700,000 annually.

The new district now covers 74 square miles including Rainier, Goble, Prescott, Fern Hill and other small outlying areas. Property owners in these locations pay $1.92 for each 1,000 assessed valuation for the service, 20 cents of which goes for fire protection and $1.72 of which goes to paying off the bonds.* Without Trojan, these same residents would be paying about $4.12 for each 1,000 of assessed valuation for the equivalent service.* Next fiscal year, 1977-1978, there will be an increase of 75 cents to $2.67 per $1,000 assessed valuation to cover a deficit of $60,000 that the new district incurred in growth and development.* Apparently, the bond issue ($475,000) was short $60,000 in the estimation of the costs that would be incurred in formulation of the district.

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*Personal conversation with Gene Fisher, Assistant Fire Chief, Rainier Rural Fire District, Rainier, Oregon.

PGE has donated outright $30,000 to the new district to help offset the cost over-run.

To provide adequate fire protection service to Trojan, the fire personnel are required to receive special training and qualifications. P G E has agreed to provide the necessary specialized training for fighting fires at Trojan and to familiarize fire personnel with the on-site fire protection facilities. Fire personnel may be required to enter restricted areas for which they must be security cleared as required by law. However, to date, no personnel have received any security clearance; no specialized protective clothing for combating a fire in a radioactive location has been provided, and no personnel have been given or instructed in the use of potassium iodide pills for thyroid blocking.* Each volunteer has been equipped with a dosimeter to record exposure levels to radioactive materials.

Despite the fact that the staff of the Rainier Rural Fire District have described their relationship and cooperation with Trojan as being very good, there have been breakdowns in procedure and communication. Recently, the fire district responded to a small fire inside the restricted zone but were denied access to the fire and detained at the main gate.**

The residents of the Rainier Rural Fire District have received other economic benefits from Trojan besides the reduced levy rate. The Insurance Services of Oregon graded the district in December of 1975. In May of 1976 the new grading system went into effect. The area of the city proper is now rated at 6, down from 7; the rural area is rated at 8, down from 10. This means a substantial savings on insurance premiums for the tax payers. (A rate change from 10 to 8 is a decrease of almost 50% on the premium).**

EMERGENCY PREPAREDNESS

An area of community impact which heretofore has received relatively little attention is the need for emergency preparedness imposed by the presence of a nuclear facility. This was chosen as an area for special study by the research team. This analysis is presented in Appendix B so that it can stand alone,

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*Thyroid blocking is a technique whereby potassium iodide pills are taken orally to saturate the thyroid gland with iodine, hence preventing any further absorption of radioactive iodine.

**Personal conversation with Gene Fisher, Assistant Fire Chief, Rainier Rural Fire District, Rainier, Oregon.

independent of the rest of this report. The major findings of this analysis are as described in the following paragraphs.

Preparation of emergency response plans and the exercise of those plans constitute an economic impact on the communities involved. Because Trojan is located on a state boundary, two of the jurisdictions involved in emergency preparedness receive no tax revenues to support their Trojan related activities. Even where tax revenues are present, it is obvious that Trojan related emergency preparedness is a unique requirement for which the jurisdictions involved should receive direct compensation from the operator. Certain aspects of emergency preparedness, particularly the warning capability, could be improved with better funding (this comment is relevant to the mid-1977 time frame and does not reflect any changes which may have occurred since then).

Preparation of off-site emergency plans is not explicitly required as a condition of licensing. Although this has not hampered the development of such plans in a timely fashion, an explicit requirement would put affected jurisdictions in a better position when negotiating for compensation from the operator.

Existing emergency plans are deficient with regard to the area of coverage (i.e. area which would be evacuated in the event of a major radiation release at the Trojan Plant).

Public involvement in and awareness of Trojan emergency preparedness plans and activities has been minimal. This could inhibit effective response to an actual emergency.

Doses of potassium iodide should be made available to persons living in the vicinity of Trojan. The use of potassium iodide blocks the absorption of radioactive iodine by the thyroid and thereby provides an inexpensive means of reducing the risk of thyroid cancer in the event of an abnormal release of radioactivity from the plant.

On the positive side, Trojan related emergency planning and facilities have improved the capability of the community to respond to non-Trojan emergencies such as floods, chemical releases, and so on.

EDUCATION

There are six school districts in the general area surrounding the Trojan

nuclear power plant. Trojan itself is located within the Rainier district (Columbia County School District 13). That district is encircled by the St. Helens, Veronia, and Clatskanie districts in Oregon (Columbia County School Districts 502, 47J, and 5J respectively) and the Longview and Kelso districts in Washington. Enrollment, teaching staff, and operating budget data were obtained for each district for the school years 1968 - 1969 through 1977 - 1978 as available. From this information, student:teacher ratios and per capita student expenditures were calculated. Additionally, qualitative impressions were solicited from district personnel.

The data obtained from each school district is graphically presented in Figures 21 through 24. It shows that the general trends for the area are as follows:

1. Declining student:teacher ratios;
2. Increasing per capita student expenditures;
3. Declining student enrollments;
4. Increasing teaching staffs; and
5. Increasing operating budgets.

The districts most likely to evidence impact would be Rainier (due to location) and St. Helens (due to location and size). The Longview and Kelso districts are much larger in size, Clatskanie is further away, and Veronia is geographically remote and more closely linked to Portland than the Trojan area. The degree of enrollment pressure (hence impact) would appear to have been muted by two factors. First of all, as previously noted, actual in-migration of construction workers to the immediate Trojan area was relatively small. Secondly, increases in enrollment due to an influx of Trojan construction workers would be bucking the general regional trend of declining primary and secondary school enrollments, as indicated to be the case for both Washington and Oregon in Figure 25. Washington enrollment peaked in the late 1960's and declined thereafter, whereas Oregon enrollment peaked in the early 1970's and declined until after Trojan construction was completed. The trend in Oregon has been holding even since 1975. Oregon Education Department officials believe that this situation is the result of in-migration to the Medford and Willamette Valley areas, primarily by Californians. Despite these considerations (i.e., relatively small in-migration to the immediate Trojan vicinity and a general regional trend of declining enrollments) and the general perception by school district supervisory personnel that Trojan had little, if any, impact, the data clearly shows that Trojan did have an effect.

Figure 21: Student to Teacher Ratio.

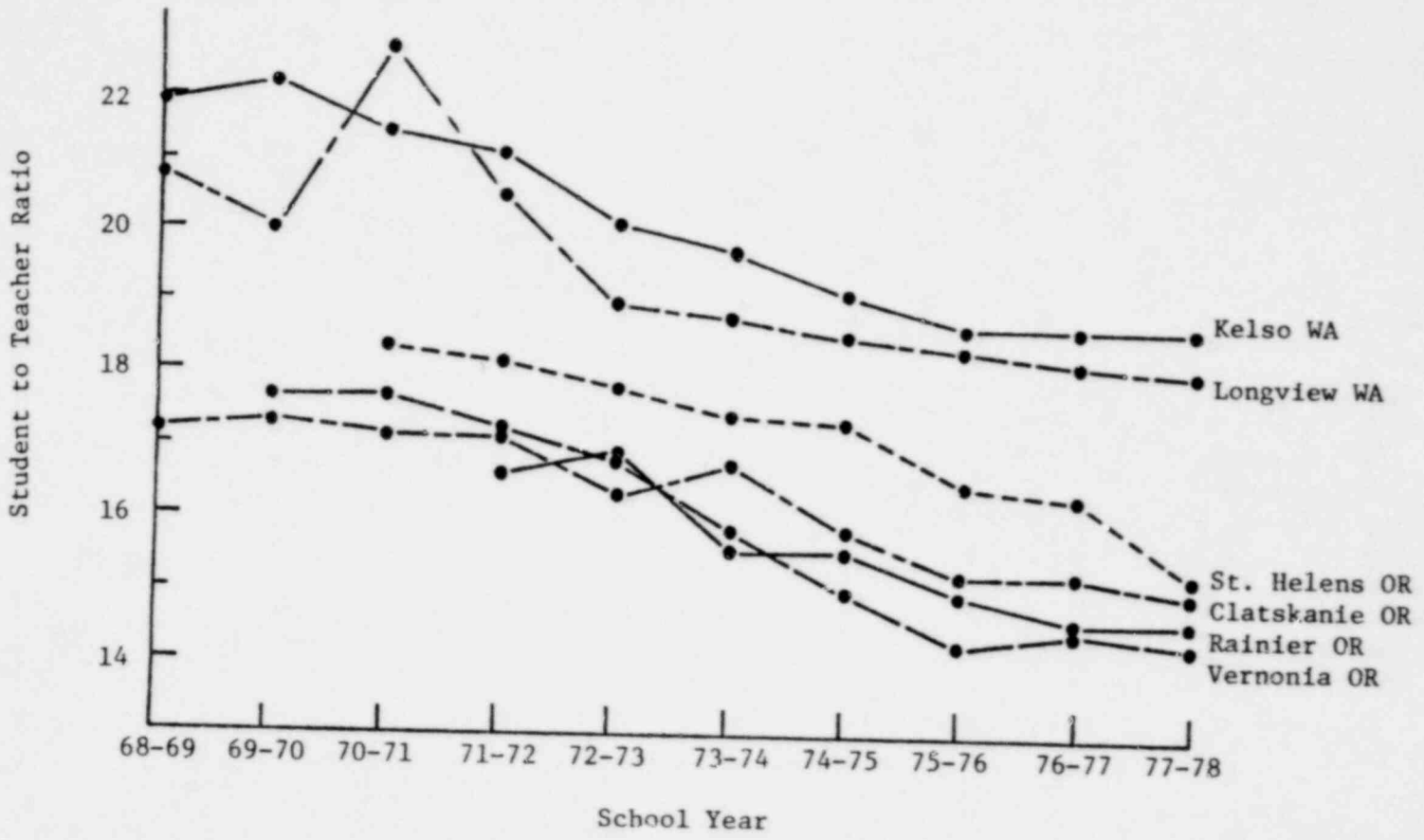


Figure 22: Expenditure per Student.

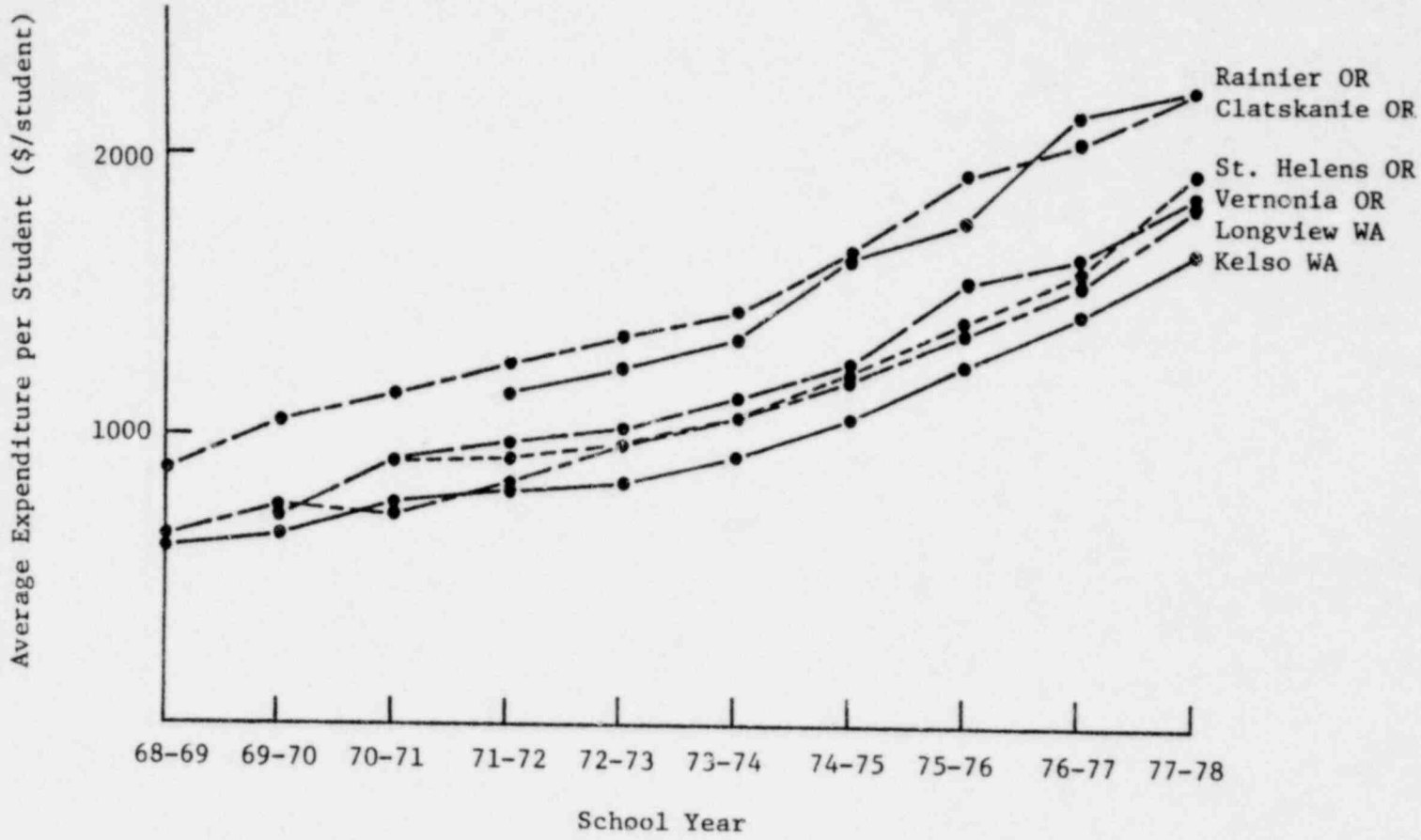


Figure 23: Average Student Enrollment

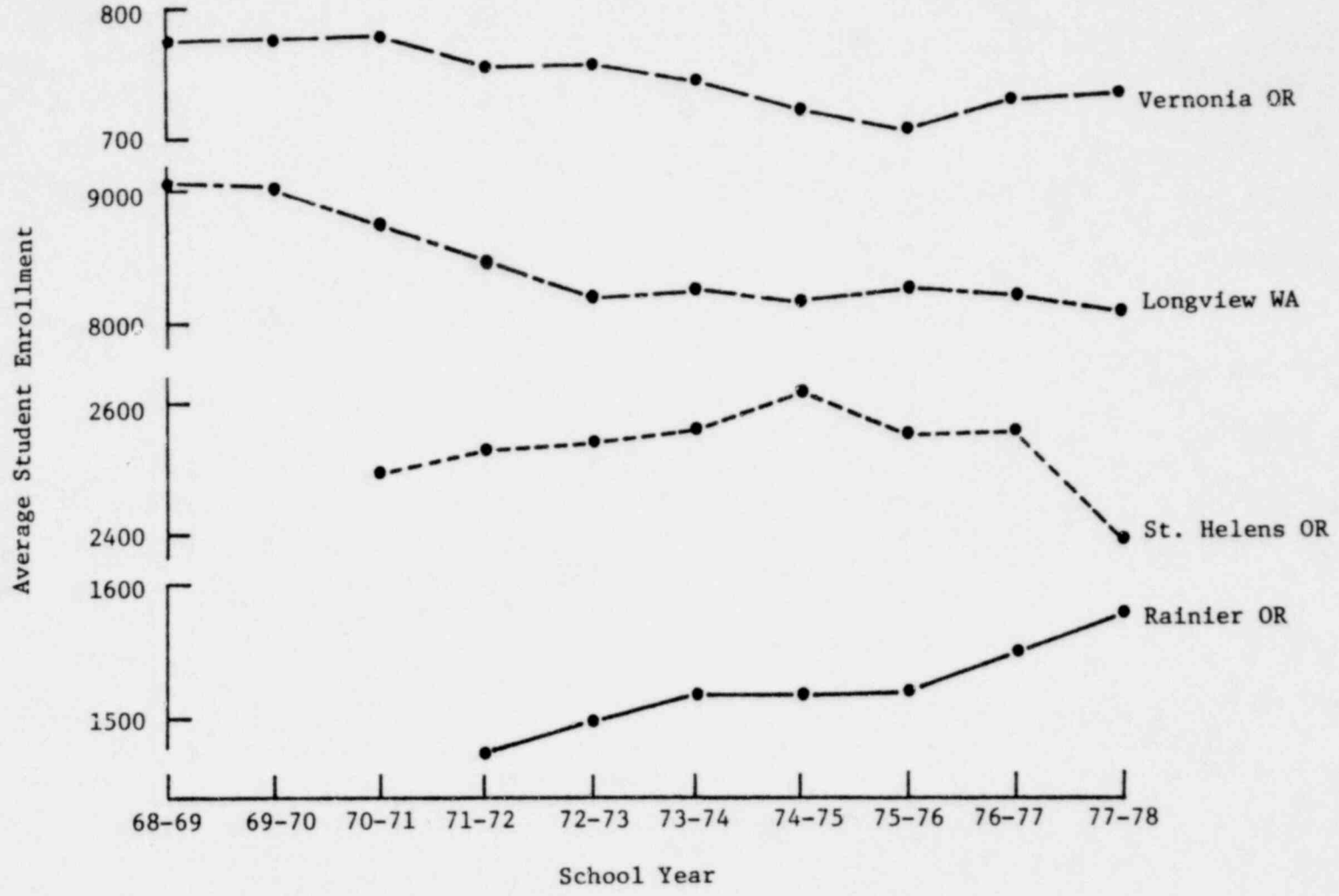


Figure 23 : (Cont'd.)

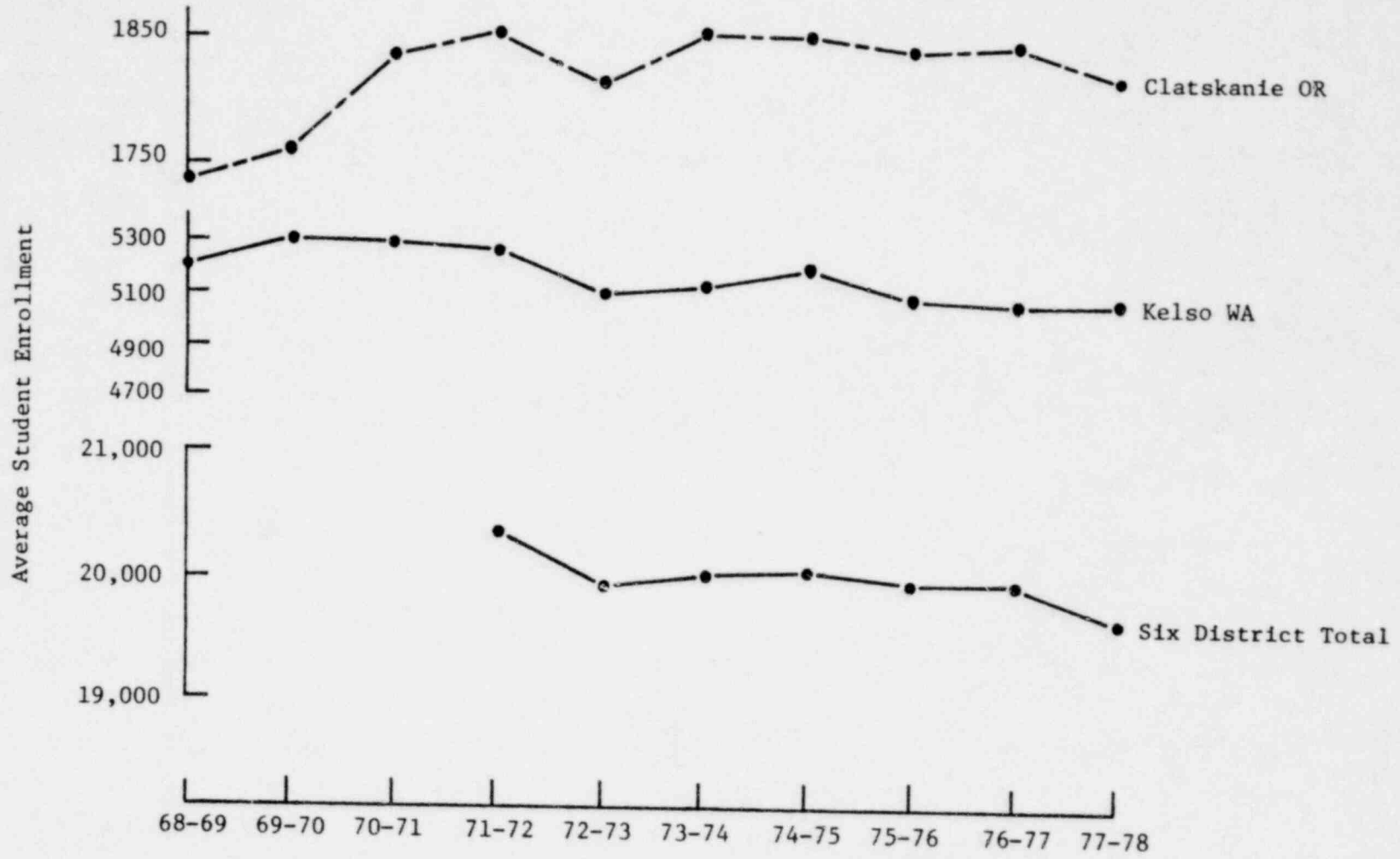


Figure 24 : School Budgets.

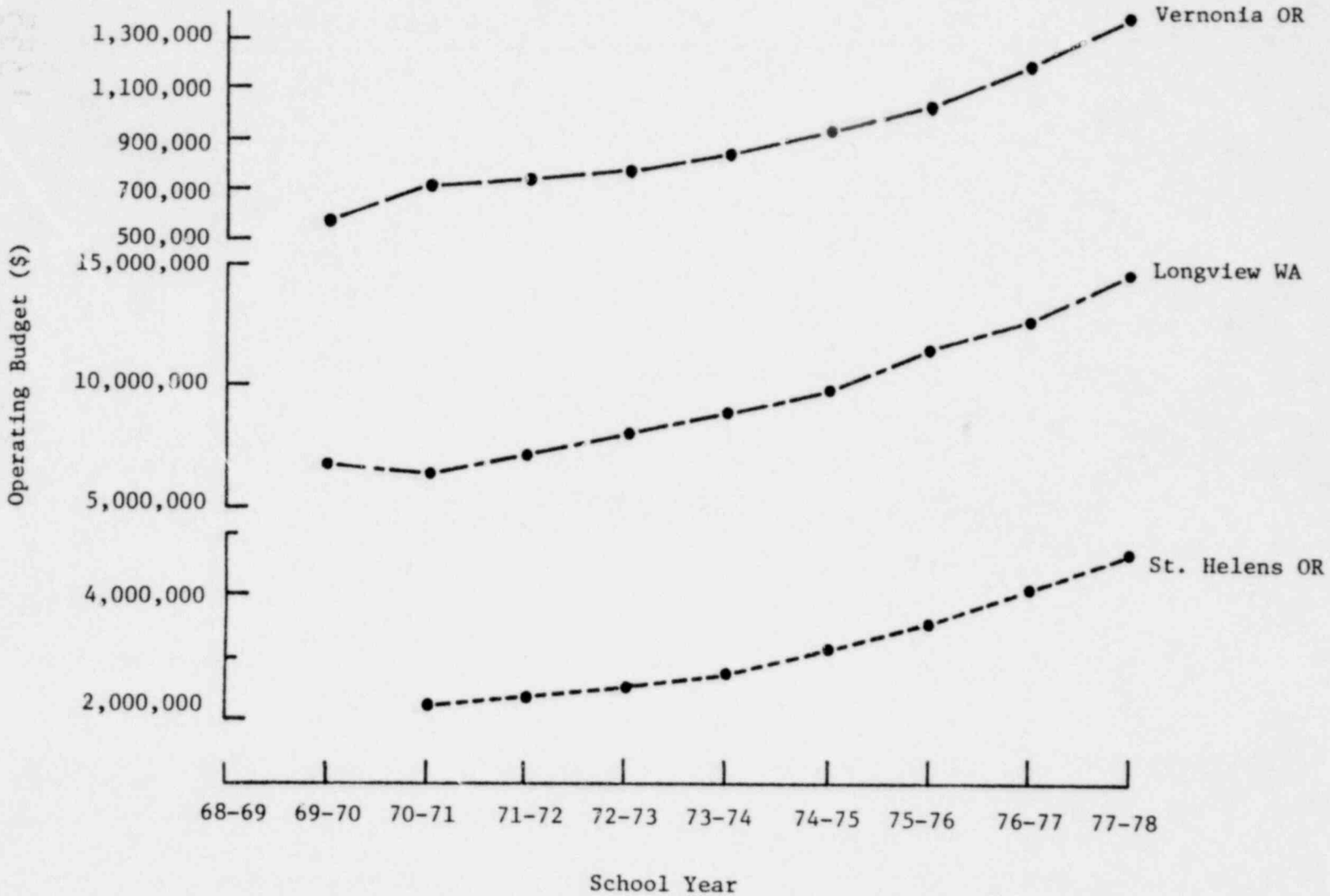


Figure 24: (Cont'd.)

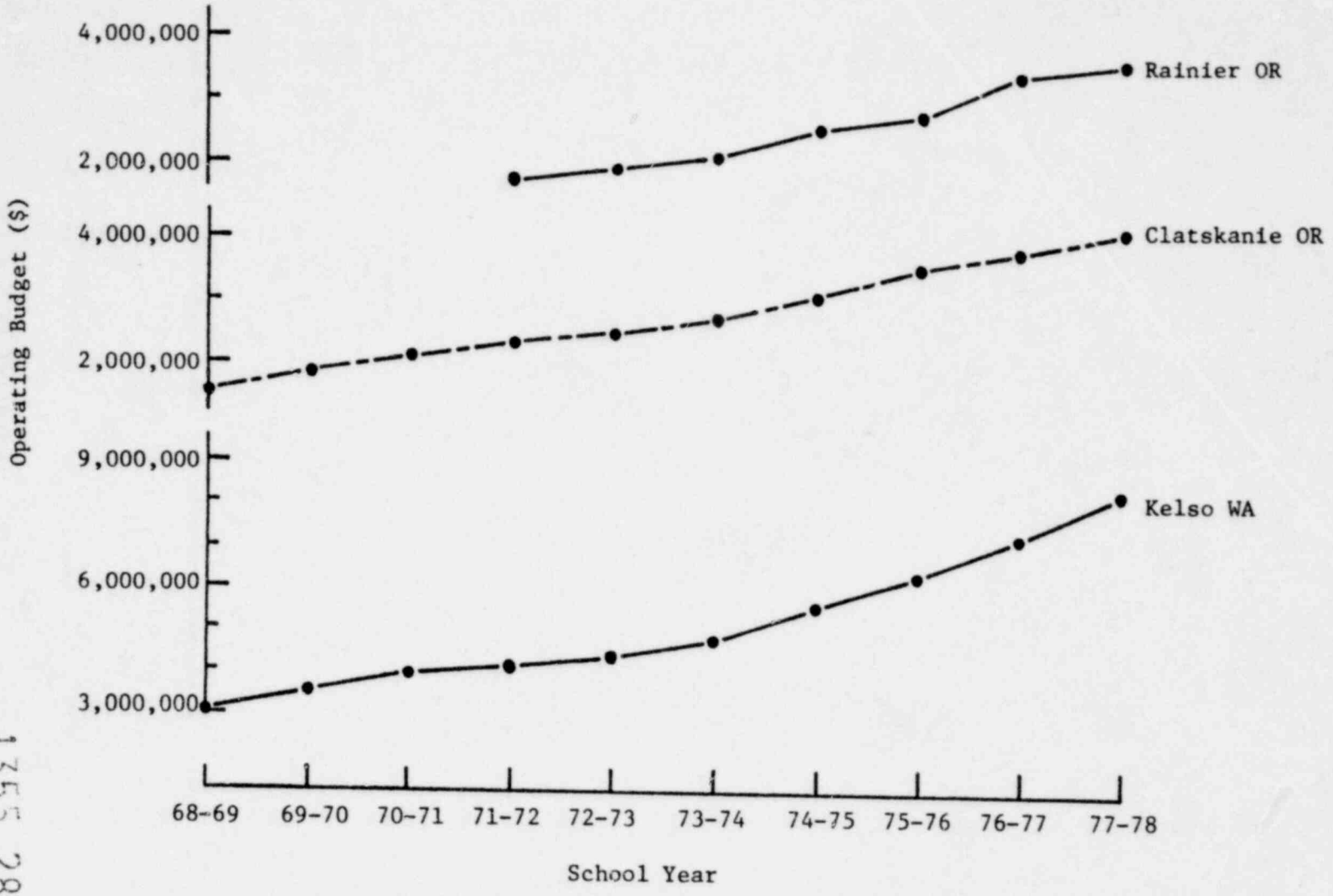


Figure 24: (Cont'd.)

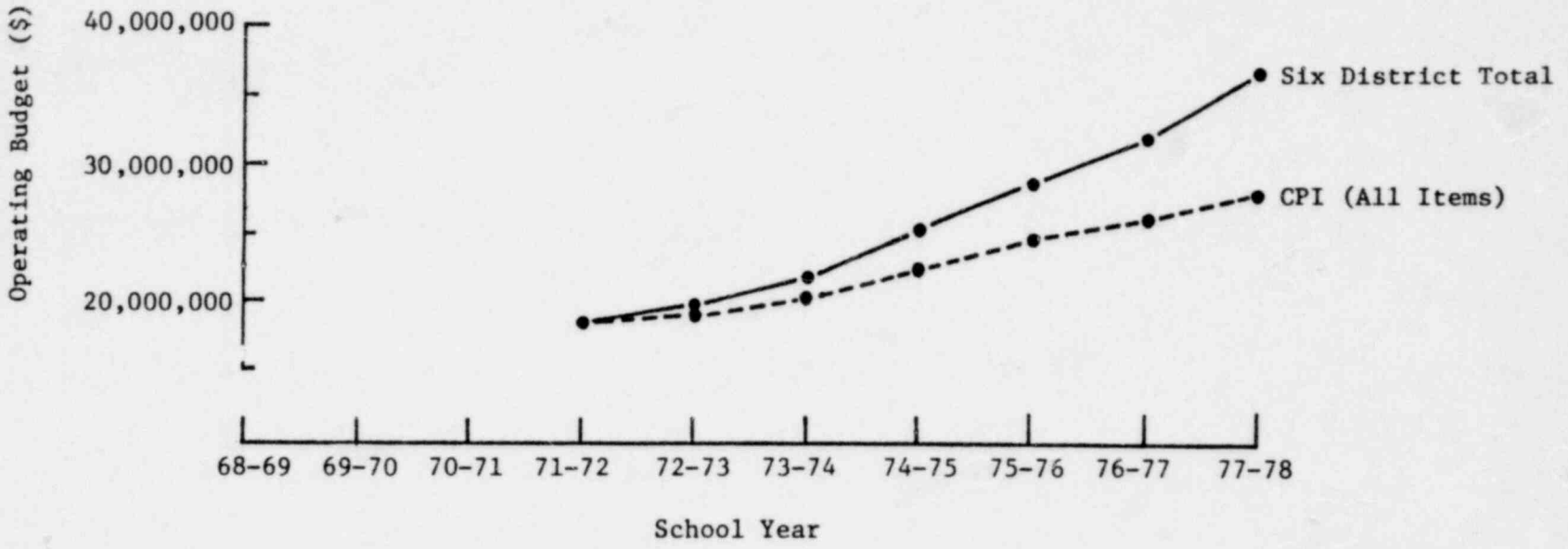
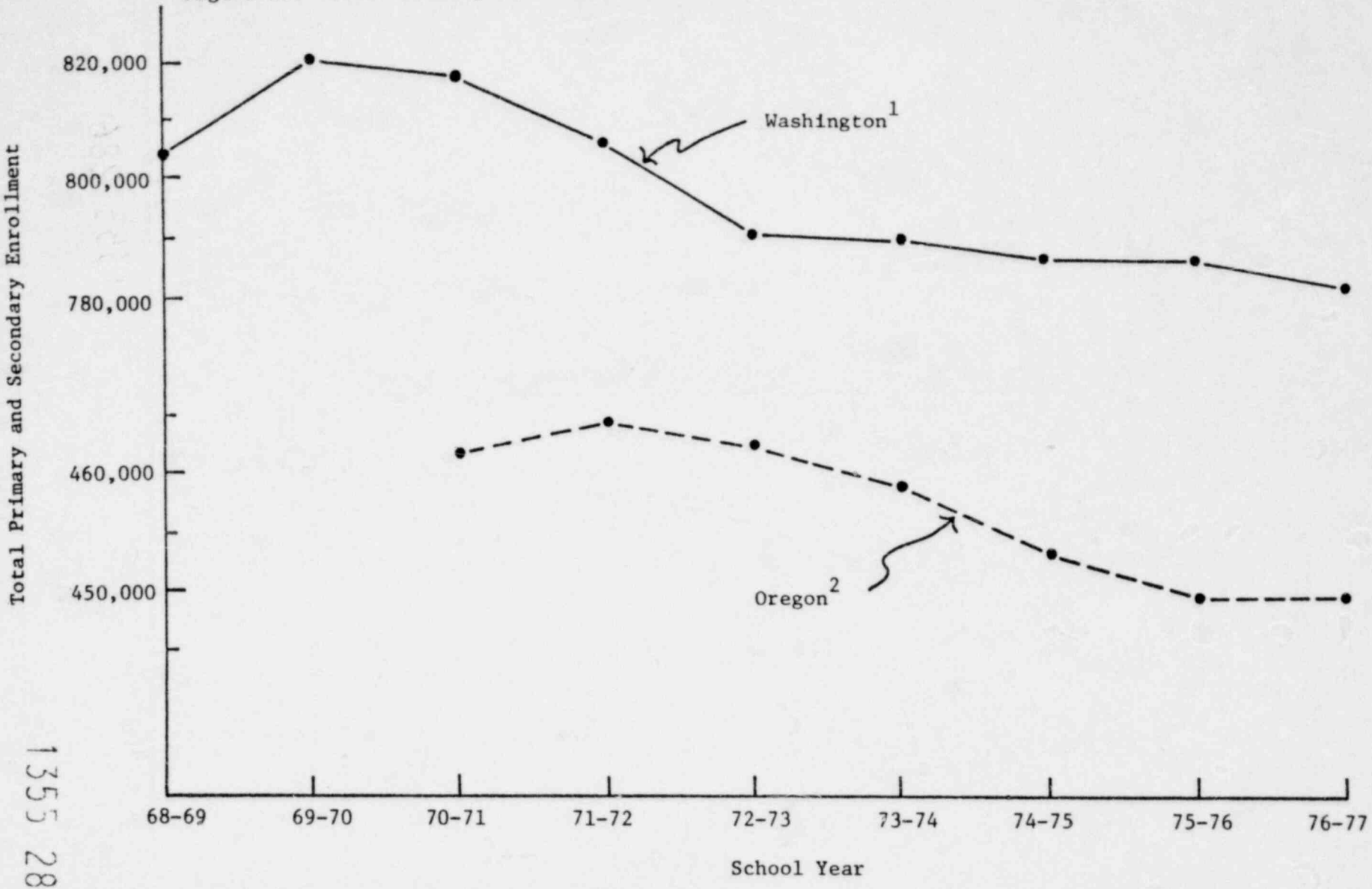


Figure 25: Total Primary and Secondary Enrollment.



Reference Sources:

1. Washington Department of Public Instruction, Data Reported as Enrollment for the Month of October.
2. Oregon Education Department (Data Prior to 1970-71 School Year Unavailable at This Time). Data Reported as Average Daily Membership.

The general effect of Trojan on enrollment in surrounding school districts would appear to have been to cause slight increases in enrollment for the closer and smaller districts or to temporarily reverse or level-off the declining trend in enrollments for the larger and further away districts. Distinct increases in enrollment were seen for the Rainier and St. Helens districts as construction progressed. However, after the peak construction employment season of 1975, enrollments declined markedly in St. Helens (an effect in keeping with the hypothesis that the change was due to Trojan) but continued to increase at a greater rate for Rainier (an indication that growth in Rainier involves more than the direct effect of Trojan). The data would indicate that established trends of declining enrollment for both Longview and Kelso were temporarily leveled-off by Trojan (in the case of the smaller Kelso district there was a moderate reversal with a peak coincidental with peak Trojan construction) and then re-established after Trojan construction was completed. The Clatskanie district case seems similar, although the direction of enrollment change prior to Trojan construction is not clearly established. The effect of Trojan on the Veronia district would appear to be negligible. The declining trend there is coincidental with Trojan construction, but may have been reversed more recently as people working in Beavertown and Portland look for homes in the rural environment.

It is significant to note that increased operating budgets greatly exceed inflation, as indicated by the consumer price index for all items. At least a partial explanation for this situation has been the decrease in the student:teacher ratio. Another factor appears to be the addition of major new facilities, particularly for the Rainier district. It seems probable that Trojan was a significant factor in the decision that such facilities could no longer be delayed.

The impact of Trojan has been most discernible on the Rainier district in which it is located. To take advantage of anticipated Trojan tax revenues, the elementary and junior high and high school districts consolidated to form one unified school district at the end of the 1970 - 1971 school year. Although the district had been overcrowded for some time, students had not had to go on double sessions. Thirteen portable classroom units had been obtained in 1966 to avoid that. These units were unpleasant and expensive to operate. On the strength of future Trojan revenues, the school district issued seventeen year bonds in 1974 to finance the building of an $8 million community complex. Included in this complex are an elementary school, a high school with continuing

education facilities, an auditorium, a swimming pool, banquet facilities, and playfields. The complex is meant to serve both school and community functions. The district started moving into the new complex in 1976 as sections became usable. The move was completed in 1978; however, the newly completed facility is already overcrowded as increasing enrollments have continued beyond Trojan construction.*

Prior to Trojan, the districts comprising what is now the Rainier district were relatively poor and had one of the state's highest tax rates. School accreditation may have been in jeopardy due to poor facilities. It was difficult to pass annual operating levies, let alone construction bond issues. When the district passed its seventeen year bond issue in 1974, it was stipulated that the payment of interest only would occur during the first two years. Thereafter, fifteen equal-sized annuities of interest and principal were to be paid.[26] This approach lowered the payments the district had to make until Trojan was complete and making maximum tax payments. Taxes paid by Trojan became significant in about 1971 and increased throughout construction, especially during the last two years. District voters were able to assess themselves lower and lower levies and still have large increases in school funds due to Trojan taxes. The district levy rate after construction had decreased to 4.76 mills as compared to about 7 mills prior to construction.[27]

When construction of Trojan was completed, the Rainier district became one of the wealthiest in the state. Trojan represents a massive source of tax revenue in the district. Furthermore, EWEB, exempt from paying taxes since it is a publicly owned utility, has been making donations to the district. The first donation of $180,000 came in 1975. This was increased to a value of twenty percent of the operating budget in 1976 (nearly $900,000 at that time). It is now in excess of one million dollars.[28]

In 1976, school taxes in Rainier district were about $5.17 per $1,000 assessed valuation...$2.51 for the building bond and $2.66 for the general fund.[29] Without Trojan, they would be about $40 per $1,000 assessed valuation to meet the operating budget of $2,699,000 this year.[30]

There are several other major building projects that are symbolic of the district's new-found wealth: a $340,000 addition to the Goble Elementary School; a $140,000 addition to the Rainier Elementary School; and a remodeling of Rainier Elementary and High Schools, amounting to $210,000.[31] Trojan is also

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*Personal conversation with John Cermak, Superintendent, Rainier School District, Rainier, Oregon.

paying for 84% of the $8 million cost of the new high school and community center.[32]

With the increased revenue now on hand, the school district has been able to add major new program areas to its course offering. Special education programs and a variety of other student services are being handled by the addition of ten new staff members.[33] A community school awarding accredited two-year college degrees has been established under the district's management and financed by local area residents, thus placing it outside the community college system operated by the State Education Office.

The economic benefits of Trojan to the Rainier district have not been without their drawbacks. A major problem has been timing. Even though the district used innovative financing techniques (deferring payment on the principal until after large Trojan tax payments became available), it was not possible to bring the new facilities on line fast enough to keep pace with enrollment increases. The same can be said of current growth that has continued beyond Trojan. As already mentioned, the new facilities completed in the fall of 1978 are now overcrowded.

It should be noted that other school districts within the county are benefiting from the presence of the Trojan plant through the equalization function of the Columbia County Intermediate Education District. (CCIED) This occurs through the levy of a tax, pro-rated for each district according to its assessed valuation per student ratio in order to pay a certain percentage (approximately 50%) of the member districts' operating expenses. The remaining one-half of all operating costs plus all capital construction funds must be provided by each individual school district. In 1976, the CCIED collected approximately thirty-seven percent of the school taxes in the county. When the Rainier district was one of the poorer districts in the state, it received more equalization funds than the residents paid out in taxes. Now that the district is rich, it receives back only fifty cents on every dollar paid into the equalization levy.[34] This allows more equalization funds for other school districts.

HEALTH CARE IMPACTS

The impacts of Trojan on health care services have been almost negligible.

The only apparent effect Trojan had on the various health care programs in the county was that the personnel at Trojan added to the existing demand for a more comprehensive and complete health care program within the county. This was particularly apparent with respect to the number and size of hospitals, retirement homes for the infirm and elderly, day care and out-patient clinics, alcohol and drug abuse clinics, and family counseling programs.

To construct new facilities and hire additional staff, the hospital districts sought federal support in the form of regional improvement and capitol construction grants. When this approach proved unsuccessful, they let local bond issues and constructed a new hospital near St. Helens, just off U.S. 30. Trojan does not contribute tax revenues to that hospital. During the construction period for Trojan, the county absorbed some additional case load from Trojan workers, mostly in the form of innoculation programs, home nursing visits and alcohol abuse programs.[35] At the present time, the State of Oregon has assumed these functions but reduced them to only two functions: alcohol abuse and counseling, and family inoculations.[36]

With the construction of the new hospital outside St. Helens, the various health care programs have all been coordinated under one office, the chief administrator of the hospital. Almost all of the local physicians have located their offices at the hospital.*

While the demand for public health care services has increased (i.e, day care centers, family planning and counseling, free family clinics, drug abuse programs), the Columbia County Adult and Family Services budget has been decreased because the state considers the area to be rural, thus receiving a low priority rating compared to metropolitan centers such as Portland. However, the Department of Adult and Family Services, under a new administrator, has been successful in acquiring enough CETA funding to maintain current program levels and provide basic services. Table 9 provides an illustration of the staff size to welfare patient load for 1971 through 1983.

The 1977 and 1983 caseload figures represent a sharp increase over previous years because, in the past, many family problems (i.e. drug abuse, rape, incest, wife abuse, child abuse) have gone unreported and untreated. However, with the educational level of the community gradually increasing, more residents are aware of the necessity to treat these problems and seek medical, psychiatric and

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*Personal conversation with Bob DeRoos, Manager, Columbia County Department of Family Services, St. Helens, Oregon.

Table 9: Adult and Family Services Caseload

Year	Staff	Caseload (annual approximate)	Staff/Case Ratio
1971	13	500	1/39
1974	16 (23%)[2]	800 (60%)	1/50
1977	24 (50%)	2,000 (150%)	1/84
1983	*[1]	3,000[3] (50%)	--

Note:

(1) * This figure will be based on available funding.
(2) The figures shown in brackets represent the percent increase during the three-year period.
(3) This figure is based on an estimated service population of 40,000. At the present time (1977), the service population is 32,400.

Source: Personal conversation with Bob DeRoos, Manager, Columbia County Department of Family Services, St. Helens, Oregon.

psychological services. This trend is projected to increase providing the Adult and Family Services Department with an annual caseload of 3000 by 1983.*

Within the boundaries of the Rainier Rural Fire District, Trojan supplied revenue has benefited community health care significantly. Within the last two years, the Fire District has developed an emergency medical services program modeled after the "MEDIC ONE" program pioneered in Seattle, Washington.* The ambulance service was first put into service in August of 1976 and responded to 28 calls during the remainder of that year.* The crews that man the ambulance are all volunteers and extensively trained. The ambulance is located in Rainier about two-thirds of each week and at Goble the remaining third. "Quick Response" teams are organized at each location to provide quick and immediate care while the ambulance is responding from the other location.

In 1977, the program will be further upgraded and expanded into the area of intravenous therapy and intubation of patients in cardiac arrest and major trauma. First Aid and courses in Cardio-Pulmonary Resuscitation will be offered free to the public. Without continuing financial support from Trojan, this program could not continue nor, for that matter, would even exist.

Community hospitals have not been impacted by the need to prepare for radiologic emergencies related to Trojan. P G E. has a contractural agreement with the Good Samaritan Hospital in Portland for emergency radiation injury care. There is a secondary agreement with St. Vincent's Hospital in Portland to handle any overflow from Good Samaritan. P G E has agreed to bear all costs of maintaining radiologic emergency preparedness. Radiation injury convalescent care is to be provided by the Hanford Environmental Health Foundation Hospital in Richland, Washington. Ambulance service for the 45-minute trip to Portland is contracted through a private ambulance service in Longview, Washington, and to the Columbia District Hospital in St. Helens. Columbia District Hospital has also expressed a willingness and capability to help with radiological emergency service.

POLITICAL AND INSTITUTIONAL IMPACTS

The research group was able to undertake no major political or institutional analysis of the Trojan community. It seems safe to assume that since Trojan weighs so heavily on the tax revenue scale, it has also altered the

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*Personal conversation with Bob DeRoos, Manager, Columbia County Department of Family Services, St. Helens, Oregon.

balance of political power in the community. The nature and extent of the change is not known.

Institutionally, general structures remain unchanged with a few exceptions. New revenues and new duties have, for the most part, been accommodated within existing institutional structures. Major exceptions are the consolidations of the Rainier School District, creation of the Rainier Rural Fire District, and creation of the post of full-time Emergency Services Coordinator in Columbia County. Perhaps the most far reaching change is yet to be determined. That is the proposed comprehensive plan for Columbia County which will be considered for adoption early in 1978. The role of Trojan in this is indirect but perhaps significant.

P G E has gone out of its way to develop good community relations. Traditionally, P G E has enjoyed excellent communications and relations with the federal government and the national financial community. The company has also been a good neighbor in the community, at least in the traditional ways. The company is active in its support of local charity fund drives and business clubs. Employees are encouraged to be active in United Way, civic organizations, and social, church, and neighborhood functions.

However, P G E 's response to groups which express an opinion critical of nuclear power leaves much to be desired. These groups include interest groups (e.g., environment, consumer) and state regulating agencies. It appears that P G E management is not appreciative of the levels of sophistication, credibility, and power these groups have attained in recent years. Their position has been to deny these groups access to information that might illuminate a controversial issue. An analysis, conducted by Arthur F. Little indicated that management has:

> ...a general conviction that if a planned action makes technical and economic sense, the public and the regulators will eventually see the wisdom of P G E's decisions.[37]

Perhaps the key word for describing P G E 's community relations is "condescension". A 1976 company annual financial report states:

> ...good citizenship is a corporate responsibility and for years P G E has held the utility leadership position for contributing most to the community. We shall continue to do so.[38]

Without a doubt, P G E contributes to the community; however, there is little indication of company willingness to hear and respect the opinions of some segments of the community.

The company does have extensive public information programs. The financial annual report indicates that the Trojan Visitors Information Center has expanding programs and services to meet the "objectives of providing energy information to the public." P G E has a new program entitled "People Serving People." An element of this program is concentrated on speaker training for employees. Another element of this program is the establishment of workshops to give employees a better "understanding of the political process" and to improve the "implementation of grassroots communciations." Approximately 200 employees participated in these two activities in 1976.[39]

A major community activity of P G E in 1976 was working toward the defeat of Oregon's Nuclear Safeguard Initiative. A great deal of the company's time and effort was spent on this activity, which culminated in the 58% to 42% defeat of the initiative. This activity was supported by an extensive volunteer effort from employees and retirees. Though this effort may have been beneficial to the community, it is implicit that 42% of Oregonians would not have considered it so.

Many of the residents interviewed by the research group expressed concern and dismay over the political influence exerted by P G E in the procedure of establishing a fair and reasonable rate base. One resident expressed the view that P G E gets every rate raise they ask for and the public has absolutely no input into the proceedings. Since the construction began on Trojan, P G E has been awarded two rate increases totaling 25% increase and is currently seeking an 18% additional increase.[40]

P G E's posture with respect to community relations has caused few problems in the immediate Trojan vicinity. The most intense citizen's opposition has come from outside sources, such as Portland, Seattle, and Eugene. Regulatory problems have occurred in connection with state agencies (e.g., Oregon Department of Energy, Department of Environmental Quality, and the Public Utility Commission). Communications with these groups have broken down over Trojan on some occasions. The Oregon Energy Facility Siting Council has brought suit against P G E for violation of Trojan effluent monitoring requirements.

The Oregon Department of Energy and several individuals have petitioned to intervene in the NRC license amendment proceedings which P G E is seeking for modification of the Trojan spent fuel pool storage rack. This is to permit delayed shipping of spent fuel until a suitable disposal site can be found. P G E has sued the Oregon Department of Revenue over the appraisal of Trojan. The Chinook Indian Nation in the vicinity of the plant has pursued litigation over a claim they have made to the site.

Prior to the issuance of the operating license, P G E signed an agreement with major environmental organizations, wherein the environmental groups agreed not to obstruct plant construction and operation in exchange for P G E 's promise to meet certain environmental conditions. These include P G E 's agreement to meet all environmental requirements of 10 CFR 50, Appendix I.[41] P G E would otherwise have been the first utility to ask for exemptions from Appendix I. These environmental groups have been silent since the agreement.

CONCLUSIONS

Based on the foregoing analysis of the Trojan community, we have drawn several conclusions about the social and economic impacts of the Trojan nuclear power plant on that community. These are summarized in the following paragraphs.

Taxation

We hypothesized that Trojan might result in or contribute to a higher tax base, a lower tax rate, and increased tax revenues in Columbia County. The major economic impact of Trojan has in fact been its effect on Columbia County tax revenues and the levy rate. Trojan now accounts for approximately 30 percent of the county's assessed valuation; however, revenue collected from Trojan amounted to only about 15 percent of total county revenues for the 1978-1979 tax year. Trojan has resulted in a major decrease in the average levy rate and it has dropped approximately 40 percent since 1972. This has meant very tangible benefits for Columbia County tax payers. However, the benefits have been primarily in the form of maintaining the economic status quo. Increased assessed valuation due to inflation has resulted in tax assessments which have changed little(or have increased in some cases) despite the decrease in the levy rate. Additionally, there have been problems with both the temporal and spatial distribution of these tax revenues. Tax revenues were received

too late to finance the development of facilities and services necessitated to some degree by the construction and operation of Trojan. In other instances, jurisdictions which incurred direct or indirect costs attributable to Trojan were and are unable to levy direct taxes on Trojan (i.e., Cowlitz County). Schools and emergency preparedness are examples of these problems. Additionally, Trojan may have contributed to the reluctance of taxpayers to approve tax increases sufficient to keep up with inflation. Although Trojan may have had the result of cushioning the effect of inflation, in the short run, the declining contribution of Trojan to Columbia County tax revenues may effectively increase the rate of tax increase necessary to maintain existing services in the long term.

Employment

We hypothesized that Trojan might result in or contribute to relocation of a transient construction workforce to the Trojan community, decreased unemployment during construction, and increased unemployment after operation commenced. Although some in-migration did occur to the immediate vicinity of Trojan in Columbia County, the majority of the construction workforce apparently commuted from the Kelso-Longview, Washington area and, in some degree, from the metropolitan Portland, Oregon area including Vancouver, Washington. There was an initial effect of decreased unemployment. This effect was apparently damped in the later stages of construction as Trojan leveled off and fluctuated in workforce requirements. The increase in unemployment following completion of Trojan construction was rapid but shortlived. Continued growth in the local community has provided additional employment which has taken up the slack resulting from completion of construction.

Permanent employment at Trojan is relatively small but contains a high proportion of relatively highly paid managerial, technical, and skilled labor occupations. These employees have, for the most part, relocated to the Trojan community.

Housing and Property

The quantitative information base concerning housing impacts is very limited. Nevertheless, it appears that Trojan did stress the local community's housing capacity. Housing in the immediate Trojan vicinity was limited and vacancy rates in the Kelso-Longview, Washington area dipped during Trojan construction.

It became necessary, at least partly due to Trojan, to undertake a low-cost housing project and to relax the regulations concerning mobile homes. The latter is viewed by some of the residents of the community as a problem. The in-migration of permanent Trojan employees who are relatively highly paid has resulted in the addition of medium and high priced houses to the housing stock. Whereas property values have generally increased for the local community, some residents of Prescott feel that the proximity of Trojan to their homes has depressed the value of their property. However, in the general case, the hypothesis of housing shortages during construction and increased property values following construction appear to have been validated.

Growth and Public Services

We hypothesized that Trojan would spur local community growth. The decreased tax rate would be expected to attract additional industrial development. The Trojan community did, in fact, experience considerable growth during construction and this growth has continued into the operational phase. Whether or not the growth was actually induced by Trojan or would have occurred anyway is uncertain. Growth has continued to be particularly vigorous in the Rainier area. Growth in other portions of Columbia County seems to be more a function of proximity to Portland than anything else. In our opinion, Trojan was an important factor in the growth of the local community; however, notwithstanding Trojan, it appears likely that a lower degree of growth would have occurred anyway. The major influence on growth in Columbia County would, therefore, appear to be the capability of areas in Columbia County to serve as "bedroom communities" for the larger nearby urban areas.

On a per capita basis, retail activity in the Trojan community more or less held its own in comparison to the metropolitan Portland area. There was a noticeable decline in retail activity in Columbia County after the completion of Trojan construction. This indicates that the Trojan construction force spent at least part of their paychecks in the Trojan community.

We also hypothesized that Trojan would increase the demand for public services. This in fact seems to have been the case, although precisely how much of the increase in demand is a function of Trojan is difficult to say. Trojan tax revenues have made possible substantial improvements in educational facilities and programs in the local community. However, the timing of revenue

did not allow for improvements to be made prior to impacts. Fortunately, in the case of educational facilities, enrollment increases which might be related to Trojan were counter to the general regional trend of enrollment decline and were, therefore, probably not as detrimental as they could otherwise have been. Continued growth in the Rainier area has resulted in overcrowding of the new facilities which Trojan helped finance.

During construction Trojan imposed increased demands on community police services, primarily for traffic control purposes. However, the community has benefited indirectly from Trojan as a result of emergency communications facilities which are partially Trojan related. Police services are now impacted by the need to provide off-site security for the plant and on-site response to occurrences like the recent anti-Trojan demonstrations.

Trojan has brought about vastly improved fire services for the local community by virtue of contractual arrangements with the Rainier Rural Fire District. The improved fire service has reduced fire insurance rates in the community. There may, however, be some question as to how well prepared the fire department is to respond to fires at the Trojan plant and to the quality of coordination between plant personnel and the fire department.

Although Trojan has resulted in some additional demands on local community utilities, recreational facilities, and health care systems, these effects have not been major. There is the potential for increased health impacts due to long-term radiation dose commitments above background levels or incidents.

The impact of Trojan on transportation in the local community was, however, very significant during construction. Trojan aggravated traffic problems in downtown Rainier and led to congestion. Trojan related growth has placed the highway system that much closer to capacity and increased wear so that upgrading in the future will likely be necessary sooner than previously planned.

Rural Lifestyle

We hypothesized that Trojan might result in or contribute to industrialization in the local community and a gradual change in the rural lifestyle of the area. The culture and lifestyle of the Trojan community is slowly changing as its growth as an exurb of Kelso-Longview and Portland continues. The effects of Trojan itself appear to have generally been minimal. The major possible exception to this has been a potential curb on the personal freedoms of community residents

brought about by the security requirements of the plant. To date, this has primarily affected anti-nuclear protestors, most of whom are not residents of the local community. Some industrial development is likely but, to date, there is no indication that Trojan has been a major influence in industrialization of the local community other than as reinforcement of the general growth trend.

Health, Safety, and Environment

We hypothesized that there would be concerns about health and safety risks associated with the plant and the environmental impacts of it. These concerns have been very obviously manifested in demonstrations, court proceedings, and citizens becoming active as intervenors in administrative proceedings before the NRC. Justification for these concerns rests primarily with the fact that nuclear power plants result in a radiation dose commitment above natural background levels which can be forecast to have an adverse effect in the long run, the unresolved problems of radioactive waste disposal, and the possibility of a major release of radioactivity resulting from a nuclear incident. Additional environmental concerns which have materialized related primarily to erosion from construction activities.

Emergency preparedness requirements have resulted in some unique costs and benefits for the community. The costs of emergency planning and exercise are not adequately compensated for by tax revenue from the plant. This is particularly the case for Cowlitz County, Washington, which derives no revenues from Trojan but still incurs emergency response responsibilities. Emergency plans were judged to be deficient in these areas of coverage and the means used to warn the population in the event of a real emergency. Public awareness of emergency plans and procedures is minimal and may adversely affect the Trojan emergency response capability. A side benefit of Trojan related emergency planning and facilities is an improved capability to deal with non-Trojan emergencies.

Trojan relations with the local community are generally good. Relations with the broad community including some regulatory agencies and groups critical of nuclear power have not been smooth. Regulatory agencies have found it necessary to conduct hearings to address various Trojan related problems including safety deficiencies and public demonstrations have occurred which have

resulted in arrests and trials.

Planning and Controlling Growth

We hypothesized that Trojan would contribute to recognition of the inadequate capacity for planning and controlling growth. To some extent, this has probably been true. Congestion in downtown Rainier, for example, tends to bring the problems of inadequate planning home and Trojan undoubtedly was a factor in that congestion during construction. Comprehensive land use planning is now underway in Columbia County in response to state requirements and it is likely that Trojan will have the result of stimulating community acceptance of such planning.

LESSONS FROM TROJAN FOR THE FUTURE

The information from Trojan would tend to reconfirm information from other major construction projects in rural areas. Impacts can be expected which will stress the local community's ability to provide the full spectrum of necessary services such as housing, educational facilities, transportation networks, etc. The magnitude of the impacts is logically proportional to the relationship between the project and the local community in terms of scale, work force requirements, and advance planning. A large scale project requiring a sizeable work force would have a tremendous impact on a small community such as Rainier if there was no other available community in the area to help absorb the effects. In the case of Trojan, it is clear that much of the impact was transferred outside of the immediate area to locations more remote from the site of construction.

The timing of impacts and planning of mitigating measures is critical. In the case of Trojan, mitigating measures generally appeared to follow impacts rather than anticipate them. Work force levels grew initially and then evidenced greater fluctuation before finally ending in a large peak. The end of construction peak is a phenomena which has been noted with other construction projects. The fluctuations and the final peak in the last half of the construction period may have had a greater adverse effect than the construction work force buildup in the first half of the period, even though time for planning after initial impacts was available. Measures to address anticipated impacts are necessary prior to actual construction; however, the institutional mechanisms

for such planning and action are non-existent and are unlikely to be voluntarily adopted since it would be expected that industry would resist such measures as advance tax payments. Furthermore, commitment to such payments would not in any case be possible prior to the issuance of construction permits, at which time the opportunity for advance planning and action is gone. The adoption of mandatory lag time between permit issuance and construction is a logical solution which would also be unlikely to be politically palatable.

Emergency preparedness planning should be adequately funded by the licensee for all jurisdictions involved and the geographical area should be expanded to cover foreseeable accident situations. Coverage should fully include the higher population Longview/Kelso urban area, since the likelihood of an accident affecting areas out to fifteen miles from the plant is not much less than that for closer in cases where the population is less. Potassium iodide for thyroid blocking should be made available for use by persons in the expanded geographical area. Furthermore, it is essential that there be greater public involvement in emergency preparedness activities. This is necessary to ensure the effectiveness of such planning in the event of real emergencies as well as to promote understanding of the nature of the risks involved on the part of those who are exposed to them by living in the vicinity of the plant.

In the final analysis, the socioeconomic impacts we have been discussing herein are the result of centralized and complex technology. They may be avoided by choosing other less centralized and complex technology or, if society decides that such technology should be continued, they may be mitigated by institutional changes that promote advance planning and action prior to construction. If neither option is adopted, society will have made a decision that such impacts are the necessary price that will be paid.

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APPENDIX A

November 1976 — Trojan Site Visit

March 24 & 25, 1977 — Interviews

Henry T. Hudson
Columbia Country Tax Assessor

John Cermak
Rainier School District Supt.

Donald Olmsheid
St. Helens School District Official

Dave Philbrick
Oregon State Dept. of Energy and EFSC

Sharon McKeel
Intervenor in Trojan Spent Fuel Pool Enlargement

Larry Williams
Oregon Environmental Council

Victor N. Brederhoef
Oregon Dept. of Revenue, Salem

July 12 & 13, 1977 — Interviews

Lou Ann Pederson
Cowlitz Co. Emergency Services Director
Longview, Washington

Wayne Weigandt
Realtor, St. Helens, Oregon

Alex Hill
Former Mayor, Prescott, Oregon

Father Edward Alstock
Catholic Priest, Rainier, Oregon

Gib Crouse
Editor, Chronicle-Sentinel Mist
St. Helens, Oregon

John De France
Columbia Co. Emergency Services Director
St. Helens, Oregon

Gene Fisher
Assistant Fire Chief
Rainier Rural Fire District
Rainier, Oregon

July 12 & 13 Interviews (Continued)

Ray Goodsey
Assistant Superintendent
Intermediate Education District
St. Helens, Oregon

August 18 & 19, 1977 NAJORT IV Exercise

Trojan facility

Cowlitz Co. Office of Emergency Operations

Observor/Comptroller Critique, St. Helens

Prescott Inn - Meeting with members of the Trojan Decommissioning Alliance

August 22, 23, 24, 1977

Columbia County Agricultural Extension Service, St. Helens, Oregon

Bob De Roos, Administrator, Columbia County Family Planning & Welfare Services, St. Helens, Oregon

Max Jensen, President, Rainier Branch, Oregon Bank, Rainier, Oregon

Wes Kimble, Realton, Rainier, Oregon

Monroe Singleton, Realtor/Insurance Agent, Rainier, Oregon

NAJORT IV Critique, Cowlitz Co., Columbia Co., and Portland, Oregon

November 7, 197

Dick Donovan
Federal Preparedness Agency

Bill Brown
Defense Civil Preparedness Agency

December 5, 1977

Bill Brown
Defense Civil Preparedness Agency

Warren Hansen
Consultant for DCPA

APPENDIX B

SOCIAL AND ECONOMIC IMPACTS OF TROJAN EMERGENCY PREPAREDNESS

INTRODUCTION: EMERGENCY PREPAREDNESS AS A SOCIAL AND ECONOMIC IMPACT

The social and economic impacts of nuclear power plants and other large energy facilities are an important area of public concern. The objective of this and similar research sponsored by the NRC is, of course, to enrich the data base with experience derived from the construction and operation of existing facilities. This empirical base is essential to the task of anticipating the potential impacts of new facilities and designing mechanisms by which these impacts might be avoided or mitigated.

One potential impact category associated with the operation of nuclear power plants which has received little recognition as a social and economic impact to date is the activity associated with emergency preparedness.

This report will answer important questions about the social and economic impacts induced by Trojan's emergency response plans. These questions include:

- What are the costs of the plans?
- How are the costs allocated and has the cost allocation affected the quality of the plans?
- Is the public interest adequately protected by the emergency response plans?
- What direct social impacts have occurred or could reasonably occur from greater public involvement in the plans?
- What if any are the secondary social and economic benefits of Trojan emergency response plans?

Interjurisdictional Involvement

The development and exercise of emergency response plans requires a major effort in inter-jurisdictional coordination. Federal, state, county and municipal levels of government are involved and within each of these governmental jurisdictions, several agencies are involved. At the county level these include the sheriff's department, the emergency services department, the state health department, state highway department, the state energy facilities siting

authority, and the state agricultural department. At the federal level, federal emergency services, the Civil Defense Preparedness Agency, the Food and Drug Administration, Department of Energy, and the Coast Guard are involved.

The Trojan Plant presents additional complications because it lies on a state boundary which is formed by a navigable river. Activities on the river are regulated by the U.S. Army Corps of Engineers, and two states and two counties become involved in the emergency plans. If a real emergency should occur, all of these entities must communicate, coordinate, and cooperate effectively.

FACTORS MOTIVATING THE DEVELOPMENT OF EMERGENCY PLANS

There is no legal authority at any level which clearly requires that off-site plans be developed and exercised, much less any requirement that such plans receive NRC or other approval. The existence of Trojan off-site plans is due to a variety of factors. These factors are discussed in the following paragraphs.

Secondary Benefits to the Communities

Numerous secondary benefits accrue to communities as a result of Trojan incident readiness. These will be discussed in a subsequent section.

Willing Cooperation From PGE

Although NRC regulations do not require explicitly that off-site plans exist or meet any standards, it would have been very difficult if not impossible for Trojan to be licensed without some kind of off-site plans. This is because the requirement for such plans was made implicit by 10 CFR 50.34 and appendix E of 10 CFR 50. These required that the Final Safety Analysis Report (FSAR) contain agreements with local authorities and procedures for notifying and coordinating with local authorities for response to an off-site emergency. The expected composition of off-site plans has been made reasonably specific by NUREG 75-111, Guide and Checklist for the Development and Evaluation of State and Local Government Radiological Emergency Response Plan in Support of Fixed Nuclear Facilities.

PGE recognized the importance of having the plans in place and enthusiastically cooperated in their development.* Governmental jurisdiciton, particularly the counties, have commended PGE personnel for their cooperation in plan development and in staging exercises. This cooperation has been a source of encouragement to local governments, making their jobs easier and keeping their attitudes toward the task good.

Incentives and Guidance From the Federal Government

The federal agency with the overall monitoring role for federal coordination in development of state and local plans for fixed nuclear facility

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*Personal conversation with Lou Ann Pederson, Cowlitz County Emergency Services Director.

incidents is the Federal Preparedness Agency of the General Services Administration.* In the December 24, 1975 Federal Register, the FPA announced the assignment of responsibility for radiological emergency planning assistance to various federal agencies. Those assignments provide major roles for the Nuclear Regulatory Commission and the Defense Civil Preparedness Agency (DCPA) of the department of Defense.**

NRC was assigned the lead role in emergency response planning, training, and the other assistance activities, and given the opportunity to develop and promulgate guidance to state and local government for the preparation of radiological emergency response plans.

The DCPA was assigned responsibility for providing assistance to state and local authorities in planning for wartime emergency preparedness actions and must coordinate emergency operations in response to radiological incidents under NRC guidance. The DCPA was made responsible for issuance of guidelines on the use of civil defense resources including warning, communications, training, and radiological defense emergency response systems.

The responsibilities of both these agencies are mainly carried out in the form of large subsidies to state and local governments and in the form of free educational services and free consulting services for plan coordination and development. Substantial matching funds from DCPA are provided for plan development and exercise. The DCPA can fund emergency response activities for wartime civil defense purposes which may also be used for peacetime emergencies.

Positive Attitude on the Part of the Agencies Involved

The local agencies, particularly at the county level, want to be involved in emergency planning activities at least partially for the reason of bureaucratic self-preservation. The agencies have stressed the importance of their Trojan activities and sought funding to support those activities.

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*Personal conversation with Richard Donovan, Federal Preparedness Agency, Region 10, Seattle, Washington.

**Personal conversation with William Brown, Region 8 Civil Preparedness Agency, Bothell, Washington.

EXISTING EMERGENCY RESPONSE PLANS AND THEIR DEVELOPMENT

It is assumed that the reader is familiar with the group of plans which make up the overall Trojan plan. They include the PGE Trojan on-site plans, the Columbia County Oregon Plans, the Cowlitz County Washington Plans, the Oregon State Plans, the Washington State Plans, and federal agency plans. An attachment at the end of this appendix has been provided to summarize those plans. The responsibilities and interrelationships of all significantly involved agencies of all levels of government are summarized in that appendix. Brief descriptions of the important agencies' methods of functioning, including duties of key officials, are included. Persons not familiar with the off-site plans for response to a Trojan incident should read Appendix A before continuing further.

Trojan is the first and presently the only commercial nuclear plant in the states of Oregon or Washington. State and local plans were developed in 1975 because of Trojan. Final development and coordination of the plans has been to a great extent directed by the DCPA through its educational consultants W. W. Hanson and Associates. That firm was formed during the development of Trojan plans. The firm's principals, however, were involved in the plans' development from the very first as emergency personnel instructors for the states of Oregon and Washington.

Exercise of Off-Site Emergency Response Plans

Both state plans require that there be drills on exercise with participation by PGE and local governments. The Washington State Plan requires that this be done at least annually. So far there have been four exercises for Trojan. They have been designated by the code name "NAJORT" which is Trojan spelled backwards.

NAJORTs I and II took place late in 1975 before Trojan went critical. NAJORT I was a major exercise and revealed certain deficiencies in the plans. NAJORT II followed shortly after as a limited exercise to test plan revisions made as a result of NAJORT I. NAJORT III took place in August of 1976. It took place mainly in Columbia County and was not as big an exercise as NAJORTs I and IV. NAJORT IV was a major exercise affecting both states and was unique in that it included follow-up recovery phase (i.e. after the reactive phase during which evacuation takes place) table top exercises.*

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*Personal conversation with Archie Mustard, Oregon State Health Division.

These involved state and federal agencies more, because their roles became significant after the initial county level reactive phase. The NAJORT IV exercise was observed by the study team.

NAJORT IV

The hypothetical accident sequence for NAJORT IV was written by Portland General Electric personnel. Operating personnel knew that there would be an exercise, but they reportedly did not know what the hypothetical accident sequence would be. The accident sequence as written consisted of two separate accidents which were unconnected. The first accident was an on-site accident wherein a worker was injured and contaminated radioactively. No specific accident circumstances were described for the second accident. It involved a large release of radiation into the environment and affected off-site areas requiring evacuations to take place in Columbia County and Cowlitz County. The accident was merely defined in terms of readings on control room instruments. The instruments involved were the Process and Effluent Radiation Monitoring System (PERMS) instruments. There are basically two instrumentation schemes for the measurement and indication of escaping radiation. The PERMS have their sensors in all of the plant vents and release points so that the actual release rate of radioactive gases, vapors and aerosols can be observed. The ARMS, Area Radiation Monitoring System, does not indicate a release rate, it merely indicates the radioactivity level at various points in the plant.[1] The second NAJORT IV hypothetical accident was described merely in terms of readings on the PERMS. The developers of the accident scenario apparently felt that it was not germaine to purposes of the exercise to define any possible in-plant occurrences which would result in those readings of the PERMS.

Essentially all of the participants in all of the involved jurisdictions off the plant site knew that there was going to be an accident drill on August 18th, they knew that the accident would probably be of such magnitude that some localized evacuation of residents would have to be simulated, and they knew that there would probably be a hypothetical wind shift so that both Columbia County and Cowlitz County would be involved. They did not know which directions the hypothetical wind would be blowing in, at what time, so they did not know which areas would be affected.

Although the first accident was essentially an on-site accident, the community became involved because an ambulance had to respond and transport the victim to Good Samaritan Hospital in Portland. The sequence of events in the accident were simulated by notes in sealed envelopes. For example, the mock victim was given a note which said, "As the ram on the bailer you are operating is actuated and begins to compress the waste, the drum ruptures. You are struck by debris, cut on the left arm, and knocked unconscious to the floor." After the in-plant chemical and radiation-detection technicians responded to the victim and surveyed the extent of his radiological contamination with instruments, they were given an evelope which informed them of his hypothetical level of exposure.

For the second and more major accident, to initiate the drill, the shift supervisor was merely handed an envelope with a message saying that the PERMS had begun to signal alert alarms and were indicating certain hypothetical readings. These were abnormally high; thus the shift supervisor initiated his emergency-response activities. In fact, he did not even have to make his own decision whether or not to respond, the message said, "The incident is deemed serious enough to require immediate off-site notification of both Oregon and Washington agencies". After the shift supervisor obtained meteorological data he was given an envelope with a message to substitute hypothetical exercise data for the real meteorological data. The response that followed was based on the hypothetical data.[2]

The initial wind direction was such that Columbia County was affected but Cowlitz County was not. Two hours later a hypothetical wind shift occurred, and Cowlitz County became effected. Two hours after that, the shift supervisor was handed a message which said that the release had been terminated, and the accident drill was brought to a close. Information other than the PERMS readings and the meteorological data were used in determining off-site actions. Monitoring teams moved into the affected areas and were given hypothetical messages after they performed their field measurements. These messages gave the dose rates and airborne radioiodine concentrations that were assumed to exist at the particular monitoring locations. All of the participants in the exercise had to base their responses on the hypothetical readings of all plant and mobile off-site instrumentation.

During and after the exercise some participants were confused by the two

accidents of NAJORT IV. They thought they were supposed to be related somehow and searched for the connection. Also, there was some confusion associated with the fact that the second accident was described in no physical terms other that the reading of the PERMS. In both these cases the confusion was mainly academic and probably did not affect the response of the participants to the hypothetical accident.

EVALUATION OF EMERGENCY RESPONSE PLANS

The process and results of the exercise will not be discussed in great detail. A report has been prepared on this exercise by the Defense Civil Preparedness Agency, through its consultants, W. W. Hanson and Associates. The report is identified as Final Report NAJORT IV August 1977. It would not be of value to duplicate that effort. In the opinion of the researchers that report thoroughly and accurately presents and assesses the results of NAJORT IV. It should be reviewed in conjunction with this report. This report will elaborate upon and expand upon the conclusions of the DCPA report.

The DCPA report concluded quite accurately that communications were a major problem. Numerous individuals within about 13 government agencies, private corporations, and volunteer groups had to function together as a system. Each part of the system had to know what the other parts of the system were doing at any given time. All communications had to be verified as to their authenticity. Pranksters or terrorists, for example, could generate spurious messages. The distribution of technical information from the Trojan plant was a problem. Technical information was disseminated from the Company Control Center rather than the Trojan Emergency Operating Center. This put one more step in the communications process, and added to the delay.

Coordination was identified as a weak spot. It is very difficult to separate coordination from communication since the latter facilitates the former. In the way that is used here, however, coordination means the arrangement and working out of the systemic roles of the various involved parties, prior to the time of an actual emergency response. It was concluded that there needs to be more standardization of operating procedures for the Trojan Emergency Operating Center and for the evacuation of people moving into the reception centers. No members of the public were actually moved to reception centers, but in the discussion subsequent to the exercise, reservations were expressed by involved jurisdictions, particularly at the county level, regarding likely difficulty of accomplishing a large and timely movement of people to the reception centers without disorder. Training of the personnel operating the reception centers was determined to be deficient. The responsibility for leadership at the centers has not been made clear. Further training was also indicated as desirable for state and local officials involved in the recovery period activities.

Taken at face value, the results of the exercise would seem to be quite satisfactory. Certain things, however, troubled the researchers. Before the exercise took place, all of the participants knew that it was going to take place on that very day. They could each freshly review their individual roles in the complicated dovetailing plans of the many involved jurisdictions and agencies. Officials of the DCPA, however, reminded us that NAJORT IV was indeed an exercise, not a test. If it caused the participants to review their roles, then a large part of its intent was accomplished before the exercise was even initiated.*

The NAJORT IV exercise began mid-morning when all the participants were wide awake and at work. None of the key figures in the response were ill or away, such as the Sheriffs or Directors of Emergency Services.

The wind blew in convenient directions. The situation could have been quite different, for example, if the wind had been blowing toward the Trojan visitors center. The emergency operating center would have to have been set up elsewhere. If the wind had been blowing slowly from the south, a situation which wind-rose data from the final environmental impact statement would indicate to be likely, mock evacuation of the entire Longview-Kelso area would have to have been staged.** Use of reception centers would have been out of the question for that number of people. Officials in the Cowlitz County Department of Emergency Services have indicated that they do not know how long it would take to evacuate the Longview-Kelso area. Simulated evacuation of even a small portion of Kalama, as was the case with NAJORT IV caused the Cowlitz County Sheriff to observe that the public notification system was not satisfactory. Door-to-door visits were made to warn people. The sheriff reported that people were very confused and dissatisfied to hear that door-to-door visits would be the warning method in the event of a real emergency. The notifications were made quickly but additional equipment is needed such as a P.A. system for the sheriff's department airplane. Worst of all, although public officials have been trained for the proper response, the public has had little forewarning that any such Trojan emergency is a possibility. With proper advance education, an evacuation could take place more rapidly.***

In the opinion of the research team, the availability of training to state and local agencies involved in emergency response planning is adequate. A number of courses are developed by various federal agencies for presentation each year by federal or state instructors for presentation at the state and local area. These courses are offered to all sorts of personnel such as police,

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*Personal conversation with Lyle Pratt, Region 8, Bothell, Washington, Defense Civil Preparedness Agency.

**Derived from WASH 1400 Reactor Safety Study in conjunction with Trojan

***Person conversation with Basil D. Bena, Cowlitz County Sheriff's Departmer

fire and rescue personnel, hospital, medical and support, health physicists, and emergency response organization personnel including the upper as well as the lower echelons. These courses are funded by the federal government.

Perhaps the most serious limitation in the existing emergency response plans is the small area of coverage.

Our source of information for assessing appropriate area coverage is the Nuclear Regulatory Commission's WASH 1400 report, Appendix 6, "Calculation of Reactor Accident Consequences." Figure 6-10 of Appendix 6 is reproduced on the following page as Figure 1 . It plots the area of a hypothetical evacuation against the probability per reactor year that evacuation of that large an area will be required. The curve designated "no decontamination" represents the evacuation area.* To be sure, WASH 1400 indicated that the probability of any evacuation at all having to take place is very small. However, one can easily see from the curve that if an evacuation occurs, the likelihood of a large evacuation (up to 100 square miles) is not that much less than the likelihood of one square mile or less being involved.

In order to relate these evacuation areas to the Trojan situation, area was converted to radial distance, using the assumption that three adjacent sectors would be involved in an evacuation. This is consistent with the PGE evacuation plan, which stipulates that the downwind sector and two adjacent sectors would be evacuated. A map with radial sectors has been reproduced from the PGE Trojan plan and is included as Figure 2 . What we have observed from this is that with a south wind blowing, if an evacuation is required at all, the chance of it involving Longview and Kelso may not be drastically less than the chance of it involving only Prescott. To illustrate this more clearly, Figure 3 has been provided. Figure 3 shows the probability in percent that an evacuated area will extend beyond a given distance from a reactor.

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*These curves were developed to assess property damage, thus the designations are in terms of contamination. The text of WASH 1400 explains that the curve designated "no decontamination" represents the area that would be evacuated.

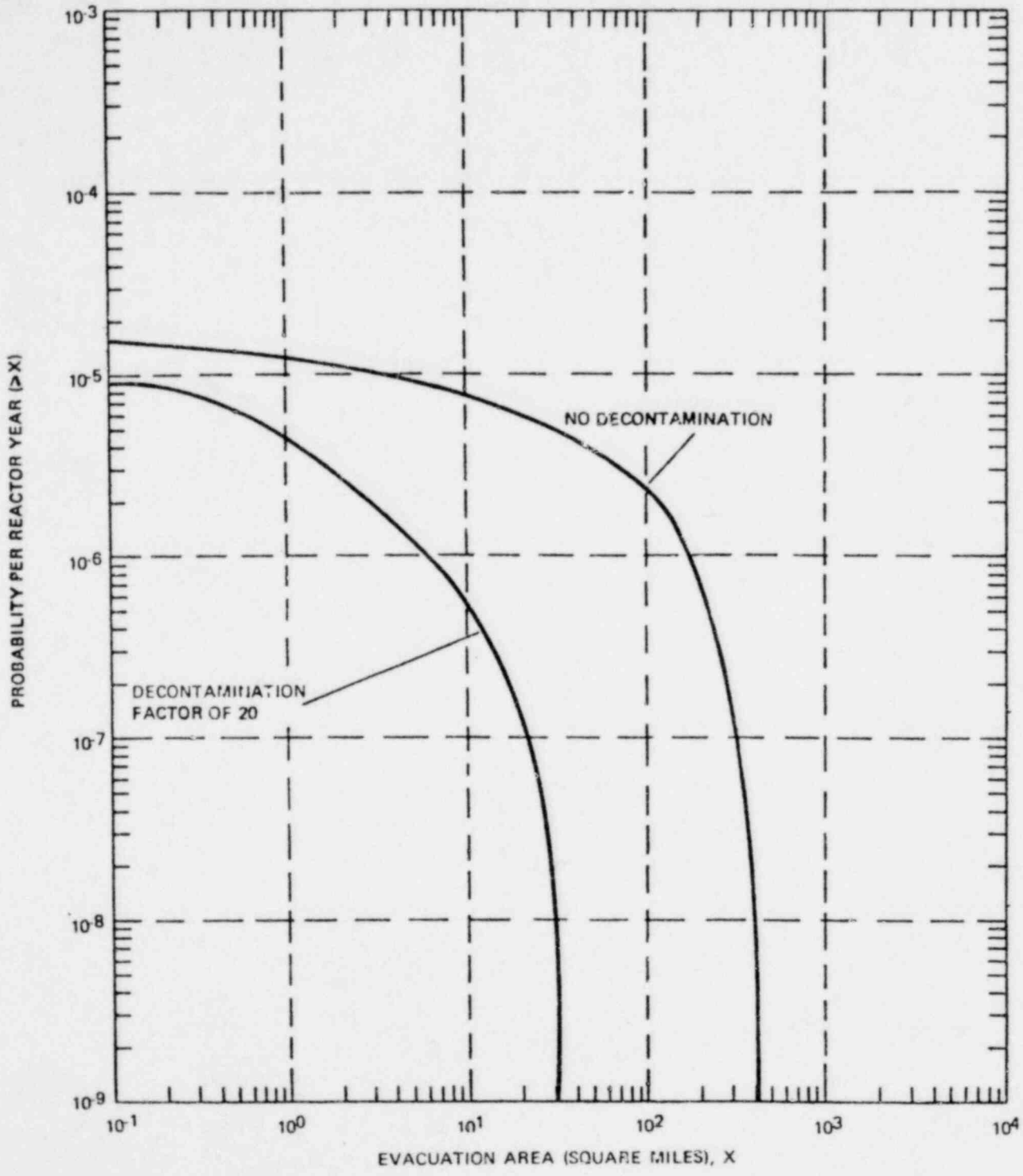
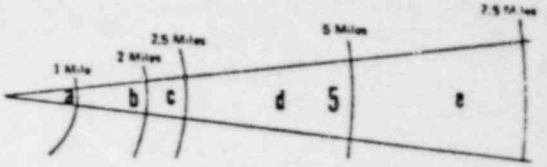


Figure 1. Probability Distribution of Evacuation Area per Reactor Year*

* Uncertainties can be accomodated by allowing variations in the " Decontamination Factor of 20" curve of factors of 1/3 and 6 in probability and 1/3 and 3 in consequence.

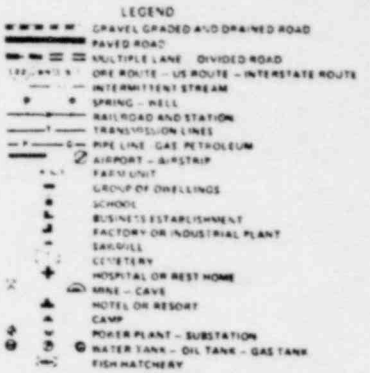


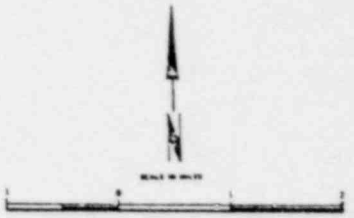
TROJAN WARNING SECTORS

POPULATION IN ANNULAR RINGS	
0 - 1	124
1 - 2	369
2 - 2.5	547

POPULATION WITHIN RADIAL DISTANCE of SITE	
1	124
2	493
2.5	1040

NOTE: 1973 ACTUAL POPULATION





TROJAN NUCLEAR PLANT

Figure 2. Site Vicinity & Population Map

Amendment 6
(May 1977)

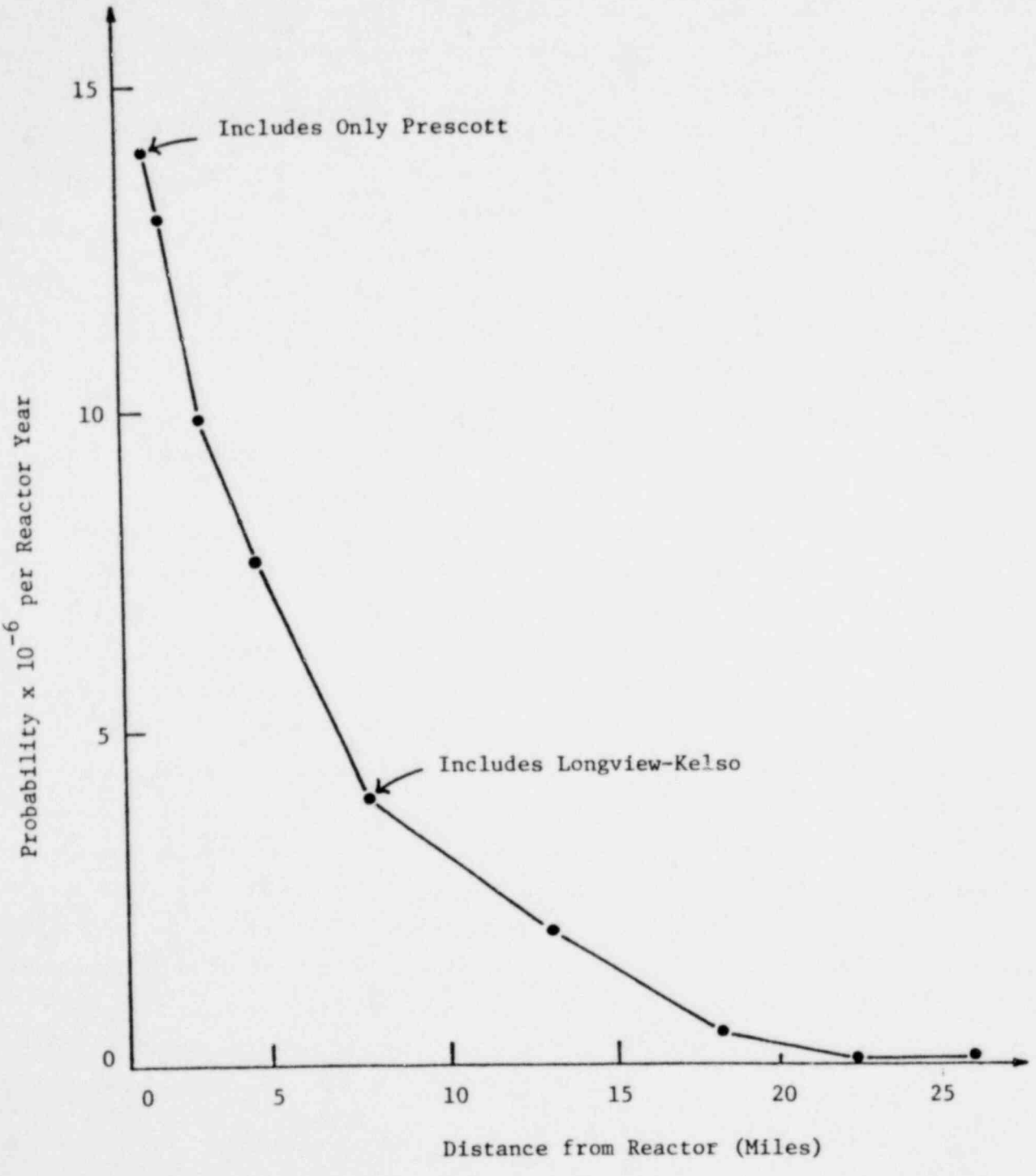


Figure 3

Clearly, evacuation beyond the 2½ mile low population zone outer boundary may be necessary. The significance of this for more distant areas is even greater than Figure 3 would indicate, because the affected area increases as the square of the distance from the reactor. Population, of course, will increase with increased area. The study team, therefore, concludes that the off-site emergency response plan should be designed and developed to cope with an evacuation of up to 100 square miles (15 miles distance from the reactor). Existing plans do not cover this large an area. Columbia County treats the 2½ mile radius low population zone boundary like a barrier across which no radiative materials can cross. In Cowlitz County, a radius of 7½ miles from the reactor building is recognized as a zone of possible action. This provides for coverage of the Longview-Kelso population center. However, no exercise has ever addressed the problems of evacuating Longview and Kelso, even though they lie in a likely downwind direction from the plant. DCPA consultants believe a prompt evacuation could be carried out. However, Cowlitz County officials are not able to estimate the length of time such an evacuation would take.

During the table top recovery phase of NAJORT IV there was considerable discussion about thyroid blocking as radiological protection for exposed emergency personnel and members of the public. The thyroid gland has a strong affinity for iodine; it will concentrate the iodine and retain it. Radioactive iodine isotopes are the most dangerous isotopes expected in the environment after a postulated nuclear plant accident. Thyroid blocking is a simple process to protect against those isotopes. It involves administering a large dose of non-radioactive iodine in the form of potassium iodide to persons threatened with exposure to radioactive iodine. Further uptake of iodine will be temporarily arrested before the body is exposed to the radioactive iodine.

Currently, there are no provisions for making potassium iodide available to the public in the Trojan community. The U.S. Food and Drug Administration (FDA) is ready to approve this use of potassium iodide as soon as a manufacturer evidences an interest in production and has issued a notice of intent to that effect in the Federal Register.[3] However, no applications have yet been received.*

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*Personal conversation with William Van Pelt, Region 10, United States Food and Drug Administration, Seattle, Washington.

Financing of Emergency Plans

PGE bears no burden of financial responsibility for off-site plans, but has a strong interest in seeing them in place. This is because it would have been difficult or impossible for Trojan to obtain an operating license with no off-site plans. This fact laid the ground work for some interesting negotiation. PGE ultimately emerged with all off-site plans in place at the cost of $3000, which it paid to Columbia County for upgrading the county Emergency Services Department.

The states or Cowlitz County could have held out for compensation before developing plans but they chose not to, after some initial resistance. The situation was such that Oregon would have been hurt as well as PGE in a standoff game. PGE is well aware that Trojan serves vital state needs. With limited BPA allocations and increasing electrical power demand, Trojan will eventually be vital to Oregon needs. Washington, with several existing nuclear facilities already and seven commercial nuclear plants in the planning stage, would have soon developed a state plan with or without Trojan.

Refusal by a state to provide any off-site plan at all would be a very drastic form of negotiating. Refusal of a state to work hard toward an adequate off-site plan would probably fail as a tool of negotiation. The reason is that the NRC evaluates off-site response plans and either concurs in them or does not. A plan which does exist but simply has not been concurred in by the NRC is not considered adequate cause for denying or suspending an operating license.

Determining the actual cost for Trojan emergency readiness is very difficult. Neither county keeps a separate accounting of emergency services costs as allocated to different threats.* Furthermore, plans developed at the state level have been developed not merely for Trojan, but for other fixed nuclear facilities in Oregon and Washington.** Some of these facilities already exist, such as the Hanford reservation federal government reactors. Others are under construction or anticipated such as the nine additional commercial nuclear power plants planned for the two states.

Emergency response plans at all levels of government are for multiple use applicability, not merely for Trojan alone or even fixed nuclear facilities alone. Indeed, funding is based on the premise that emergency

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*Personal conversations with Lou Ann Pederson, Cowlitz County Emergency Services Director and John de France, Columbia County Department of Emergency Services.

**Personal conversation with James Hall, Washington State Department of Emergency Services.

response plans have dual national defense applicability and other, or general, emergency applicability.*

It should be noted that the federal Interorganizational Committee on Radiation Emergency Planning and Preparation is presently assembling cost data for state and local fixed nuclear facility emergency response plans.** When this is completed, it should provide a valuable tool for comparing Trojan financial impacts with those of other nuclear plant communities.

The following subsections of this report attempt to quantify, to the extent possible at this time, costs to state and local governments of Trojan related plans.

Financing of State Plans

At the state level, the departments of emergency services receive 50% matching federal funds. The federal government compensates the states 100% for these personnel, but these personnel are in turn assigned back to the states' departments of emergency services to support those departments' activities. The net effect of this is that about 75% of the state departments of emergency services activities are federally funded.**

In Washington State, the development of a state plan was precipitated by Trojan. PGE personnel were afraid they would be unable to get an operating license without a state plan. Following considerable negotiation with Washington State, a plan was developed at a cost of just under $10,000. Federal support covered about 75% of that cost. NAJORT IV cost the Washington State Department of Emergency Services about $3000 with approximately 75% of that cost ultimately traceable back to federal funds.**

In Oregon, the Department of Emergency Services has neither the lead response or lead planning role for fixed nuclear facility emergency response plans. Their costs have therefore been correspondingly less, with about $1000 devoted to Trojan plan development and about $500 per year devoted to the annual exercise. Federal funding has covered over half of those costs. No federal money goes to either state's health agency radiological control groups, i.e. Oregon State Health Division or Washington State DSHS.*** There's a very major role in the state Trojan off-site plans, particularly in Oregon where the Health Division has the lead role in Trojan emergency preparedness as well as

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*Personal conversation with William Brown, Region 8, Civil Preparedness Agency, Bothell, Washington.

**Personal conversation, John de France, Columbia County Department of Emergency Services.

***Personal conversation with James Hall, Washington State Department of Emergency Services and Dr. Ellen Haars, Washington State Department of Social and Health Services.

emergency response. Both state health agencies have had serious funding problems partially because of this.

In Oregon the Health Division's annual costs because of Trojan have been between $3,000 and $6,000. Considerable money has been spent on special facilities. The major portion has been $10,000 for five mobile radio telephones. *

The Washington State Department of Social and Health Services has spent about $6,750,000 on emergency response plans and exercises which includes Trojan among others. Future expenditures for exercises is uncertain.

Financing of County Plans

At the county level, costs would be very high if it were not for federal support money channeled through the state department of emergency services and direct support for plan development and exercises.

Presently in Columbia County the staff of the emergency services department consists of a full-time director and one half-time secretary. According to the director about 50% of the department's time is spent on Trojan work. The remaining 50% is spent on general emergency services. Prior to Trojan's existence, the department was operated at a level of one man-day per week. In the first year of the department's full-time existence, PGE contributed $3,000 toward its initiation. This year the department's budget is $23,620. Of this amount the federal government pays approximately $10,000. The balance is funded by county taxes. The Trojan plant is furnishing a large percentage of county tax revenues.** Total county tax revenue, however, is held down by the 6% ceiling on annual increased revenue imposed by the state.

In Cowlitz County the situation was quite different. There were no tax revenues furnished by Trojan and PGE made no initial grant to support the existing department of emergency services activities in preparing for Trojan response capability.*** Cowlitz County thus has had no direct tax revenues from Trojan. Of the money spent, approximately 50% has been reimbursed by federal funds. Determining the amount of Cowlitz County general fund expenditures attributable to Trojan is more difficult than for Columbia County because the Cowlitz County Department of Emergency Services was in more than token existence before Trojan's time. The portion of Cowlitz County tax money, reasonably appropriable to Trojan, probably amounts to less than $2,000 annually.

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*Personal conversation with Marshall Parott, Oregon State Health Division.
**Personal conversation with John de France, Columbia County Department of Emergency Services.
***Personal conversation with Lou Ann Pederson, Cowlitz County Emergency Services Director.

PGE has taken the defensible position that it does not have to pay for any off-site emergency preparedness. As stated earlier, however, PGE contributed $3000 toward the upgrading of the Columbia County Emergency Services Department. Essentially the major purpose for the Columbia County Department of Emergency Services is to provide response capability for a Trojan incident. This is not necessarily to say that that capability, once in place, is not beneficial as a form of preparedness for other possible emergencies. The side benefits of this capability will be discussed further in a subsequent section.

Relations between PGE and the public have been described in detail in the main report. The position taken by PGE management is essentially that it has the responsibility to protect the interests of the investors and also the rate payers since the Oregon State Utilities Commission will set rates based on the costs incurred by the utility.

There are two facets to the problems of any incompletely compensated emergency preparedness capability. The first facet is merely the fact that state and local governments have to bear the cost burden imposed by emergency preparedness requirements. This can possibly be justified for taxing jurisdictions which receive taxes from the plant because presumably the tax the plant pays is to cover certain services afforded the plant by the community. It could be argued, however, that these services are of a special nature. Other large installations which do not require such services could justifiably ask for a reduction in tax rate.

The situation of course is quite different for Cowlitz County in Washington State which supplied emergency services with no tax revenues whatsoever.

The second facet of the financing problem is more serious than the first. With state and local government being compelled to pay 50% or more of the cost of emergency readiness, there is a very real danger that adequate preparation will not be made. The budget for county services has to be prepared by commissioners elected by the public. The budget for the state agencies are prepared by elected officials of the public. The public is assured by PGE that there is essentially no danger to them from the plant. Elected officials generally try to avoid appropriating tax moneys for activities without readily obvious benefits to the taxpayer.

Examples of this are the lack of notification and warning facilities in Columbia and Cowlitz County. As mentioned earlier, the sheriff must have his personnel go from door to door; in addition, local radio stations will make announcements and fire engines can operate their sirens. Residents will most

likely generally ignore the sirens because they think there is a fire somewhere. Two alternative methods of notification have been explored by Columbia County, air raid type sirens and electronic radio controlled home pager units. Sirens would not be effective everywhere in the county because the population is very dispersed. They have been considered for the Gobel area and the Prescott area, however. The Gobel area siren has been rejected because of cost and the Prescott siren has not even been proposed by the Department of Emergency Services because of cost.* A civil defense siren installation of this sort costs between $3,000 and $5,000.** Possibly half of the cost could be covered by the DCPA, since it could serve wartime emergency needs as well. The other half would be furnished by the local community taxpayers. Home pagers were considered and rejected because of cost. A single home paging unit would cost $100. Obviously, costs must be weighed against risks and benefits.

In Cowlitz County the cities of Longview, Kelso, and Kalama have dense populations which could well be served by civil defense sirens. Five sirens in Longview, 3 or 4 sirens in Kelso, each costing approximately $5,000 and 3 sirens in Kalama, each costing approximately $3,500 could serve an area of 41,000 people living less than 7½ miles from the reactor.** Portions of Kalama are, in fact, within the 2½ mile low population zone radius. This makes for a total of approximately $55,500 to serve approximately 41,000 people. That amounts to $1.35 per person. With the DCPA paying half, each individual's cost of this protection would be approximately $.67. Furthermore, the sirens would constitute a secondary benefit should any other type of natural or man-made disaster, e.g. a chlorine barge leak, dam break, or act of war occur. The county commissioners have rejected the idea of warning sirens.

Another area where a little money could make a large difference in the emergency response capabilities is communications equipment. NAJORT IV identified communications as one of the primary areas of the plans for further work. Cowlitz County has to rely heavily on volunteer amateur radio operators for its communications. It is true that these volunteers performed excellently during the NAJORT IV exercise.** It is also true, however, that a real emergency can occur at any time. Volunteers must be located and transported to the county emergency operating center and to remote locations in the field. The county should either have its own inventory of radio equipment adequate to do the job or at least have firm contracts with these amateur personnel so that it can be guaranteed that necessary personnel and equipment are on standby 24 hours a day. This again would require that the county commissioners appropriate more funds drawn from general tax revenues to the emergency services department.

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*Personal conversation with John de France, Columbia County Department of

Effect of Financing on the Adequacy of Emergency Response Plans

Responsible officials contacted by the research team had varying opinions on the likelihood that existing financial arrangements could inhibit the development of thorough and adequate response plans. Federal Preparedness Agency personnel observed that notwithstanding the present situation regarding financing, state and local communities have been eager to avail themselves of training which is offered and to work seriously and diligently toward developing thorough and appropriate plans. Indeed, the problems which we have seen have not been with the enthusiasm of the agencies involved in planning and response. The problems, if any, have been with those officials who hold the purse strings of these agencies. Examples are the failure of Cowlitz or Columbia County commissioners to appropriate funds for civil defense sirens, failures of Columbia and Cowlitz Counties to provide as much of the right kind of communications equipment as is needed, and problems of state health agencies getting funding.

At the state level, however, hindsight has made the energy facility site evaluation councils (EFSEC's) of both states considerably wiser. The conditions of future nuclear plant site certification agreements may compel utilities to make compensatory payments for emergency preparedness costs as well as other social and economic impacts.

There are two vehicles for the collection of these costs being studied by the states now. These would provide for compensatory payments to be made not only to the state agencies but to county and local governments or any other bodies suffering financially because of the necessary development of the emergency response plans. One vehicle would be to specify, in future site certification agreements, terms requiring that compensation be made for emergency response activities on grounds that they are social and economic impacts. Already the site certification agreements in Washington State for Washington Public Power Supply System (WPPSS) plants 1, 4, 3, and 5 and Skagit #1 and #2 require that the site certificate holder evaluate and negotiate in good faith and honor those claims by county school districts and other taxing districts for compensation due to an increase in financial burden where the claim is demonstrated to be caused by the construction of the power plant. In the case of WPPSS #3 and 5 and Skagit #1 and 2, the site certification agreements specify

that compensatory monies paid for the mitigation of these impacts are allowed to be recovered by the utility after construction, by withholding tax payments to the affected communities. Thus the mitigation effect is in the area of timing. Even as far as timing is concerned the mitigation is limited because, as specified in the agreements, the utility is required to make payments promptly at the time the impact occurs. This does not consider the time lag associated with the affected government's application of those monies to the construction of a school, larger roads or other public services.

The Washington EFSEC has taken the approach of compelling the utility to pay for emergency preparedness activities by classifying them as matters integral to certificate compliance auditing activities.* Washington Administrative Code (WAC) 463-12-115 requires that the applicant for an EFSEC certificate to construct and operate a nuclear power plant shall address health and safety issues by:

> "Provid(ing) a preliminary description of the emergency plan to assure the public safety both on and off site in the event of a natural disaster or a nuclear incident/accident."

80.50.071(c) Revised Code of Washington (RCW), enacted into law in 1977, provides that:

> "Each certificate holder shall pay such reasonable costs as are actually and necessarily incurred by the council (EFSEC) for inspection and determination of compliance by the certificate holder with the terms of the certificate relative to monitoring the effects of construction and operation of the facility."

Therefore, expenses related to on-going monitoring of the certificate holder's compliance with requirements of the certificate including emergency preparedness are reimburseable by the utility to the EFSEC. In practice, the EFSEC contracts out these reimburseable activities with other state agencies which have the expertise and resources. However, this provision would not cover the actual development of an emergency plan by a state agency or modifications to existing plans made necessary by construction of a new facility, but only monitoring activities. Furthermore, no assistance is available to local government through this mechanism.

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*Meeting, October 10, 1977.

Secondary Benefits of Emergency Plans

Equipment and training acquired for dealing with Trojan emergencies is also used considerably for non-Trojan emergencies. The Oregon State Health Division, for example, investigates about one radiation incident per month not related to Trojan. Health Division authorities indicate that radiation detection equipment and mobile radiotelephones provided to deal with Trojan have improved response capability for these non-Trojan incidents. Increased visibility from Trojan has enabled the Health Division to respond to many incidents which formerly would have gone unreported. Cowlitz County had an actual evacuation because of a flood late in November 1977. This occurred less than four months after exercising the Trojan plan. The Department of Emergency Services Director stated that the practice in the Trojan exercise was beneficial in responding to the flood.

Public Involvement in Emergency Planning

Public involvement in the emergency response plans is essentially nonexistant. The public was not involved in NAJORT IV in any significant way. Throughout the time period prior to and after the exercise, the researchers noted a reluctance on the part of both public and private officials involved in the emergency plan to keep the public apprised of emergency preparedness activities. We had considerable difficulty getting a copy of one of the county plans, even after we had identified ourselves and our client, and promised to pay the full cost of photocopying the plan. We were unable to get the Columbia County Sheriff to discuss the NAJORT IV exercise over the phone. In another instance at the August 11th pre-exercise briefing, a woman who identified herself simply as a member of the public was denied her request to observe the exercise at the Trojan emergency operating center or anywhere else by an exercise coordinator representing the Defense Civil Preparedness Agency. This caused some embarassment, and subsequently she was permitted to observe the exercise from the Cowlitz County Emergency Control Center.

It is easy to understand why PGE and involved public officials would not want to advertise emergency preparedness activities. PGE and most of the governmental bodies at the local, state and federal level have experienced some

problems trying to calm public fears of the Trojan nuclear power plant. To give widespread publicity to the fact that expanded emergency plans were being developed would be tantamount to suggesting that a real and severe danger did indeed exist at the Trojan plant. There is, however, good reason to believe that an informed public will be able to respond more rapidly and appropriately if an actual emergency ever does occur.

The importance of an informed populace is made clear in a National Academy of Sciences National Research Council Report, Social Aspects of Wartime Evacuation of American Cities.[4] The study was performed ten years after the end of World War II and is based upon observation of evacuations in Europe and Japan. Actually, motivating people to evacuate has been a problem and two basic principles of motivation have emerged: (1) The importance of the perception of danger, and (2) lack of alternative courses of action. The perception of a radiological danger is wholly dependent upon public education. A nuclear plant incident will likely result in no smoke, flames, or strange odors. The public must be told that the invisible threat is present and understand the importance of responding promptly to a recommendation to evacuate. Panic can be avoided if members of the public are aware of the proper routes for evacuation. The National Academy of Sciences report indicates that in World War II, panic was not a major problem except where apparent escape routes were blocked.

Unfortunately there has been no effort to educate the public in the community as to the possibility of an incident involving radiological danger. Potassium iodide for thyroid blocking is not available in anyone's medicine chest. No mitigation measures, such as breathing through a folded wet towel and staying indoors, have been explained to residents. The locations of reception centers and the importance of going to one if an incident occurs has not been explained to residents.

In instances wherein the public has been involved, valuable feedback has resulted. In Cowlitz County during the mock evacuation, the sheriff actually had his personnel go to houses, knock on the door and hand out information. The information explained the exercise, and explained what the people would be asked to do if there had been an actual emergency. This provided important informal feedback to the sheriff's department as to the effectiveness of the public notification method.[5]

The sheriffs of both counties fear that not all people will go to the reception centers. There are no controls to prevent people from leaving and carrying contamination to other locations or foregoing essential medical care for themselves.[6] At high levels of exposure, there is serious blood cell and other tissue damage which greatly increases the individual's vulnerability to hemorrhage and bacterial infection. Prompt and adequate medical care can make the difference between survival and death. An individual may experience no symptoms other than nausea initially, but without medical care could subsequently suffer hemorrhage or severe infection followed by death. These are facts that anyone living near a nuclear power plant should be aware of.

A final and most important reason for public involvement is related to the comments given previously in the section on financing of response plans. County commissioners and state legislators have to make decisions on how much money to spend on response plans or on equipment and facilities related to them. These same public officials have to answer to the public which elects them. If the public is unaware of the need for plans, the fact that plans even exist, or the scope of plans which do exist, then they are not likely to be supportive of public officials who ask for money to develop and maintain such plans.

There is, however, a dilemma. How can the public be made sufficiently aware of the need for funding the development of emergency response plans, the need for funding aquisition of emergency response equipment, the appropriate responses in the event of an actual emergency, and so on, without imposing psychic and even economic impacts? Public awareness of the necessity for emergency preparedness might raise fears and stresses which are not substantially lessened by being made aware of the fact that the probability of an actual emergency is small. These fears could also have adverse effects on property values in the Trojan community. On the other hand, public anxiety may not be as big a problem as some officials feel it is. The study team has interviewed numerous local officials, business persons, ordinary community citizens, and representatives of groups dedicated to immediate decommissioning of Trojan. There is little evidence in the local community of feelings of antagonism or insecurity caused by Trojan. Throughout Trojan's operating history there have been several demonstrations by outside groups with gas masks and signs which warn of death and deformity. Numerous essays have appeared on television and in newspapers suggesting that nuclear plants portend serious radiological dangers. If these events have not aroused

significant local fear and opposition, public involvement in Trojan off-site emergency plans would not be expected to arouse local fear and opposition. This is provided, of course, that public officials continue to stress the small likelihood of Trojan accidents, and present the plans somewhat as multiple use plans, i.e., Trojan plans, nuclear attack plans, river and rail transportation accident plans. It is clear that an informed public is required if a democracy is to work. This should apply equally to emergency preparedness as well as to less controversial functions of government.

RECOMMENDATIONS

A list of recommendations with very specific supporting detail was presented in the previously referenced DCPA report on NAJORT IV. That report should be reviewed in conjunction with this report. It has been the goal of the study team to produce a product complementary to, rather than redundant to, existing reports available to the NRC. Thus, the only recommendations made herein are ones which are more generic than those identified in the DCPA report. We wholly concur with the recommendations of the DCPA report.

Revised Geographical Area

The plans should be written for coverage of a larger area, perhaps fifteen miles in radius. As previously discussed, the likelihood of an accident affecting areas out to fifteen miles from the plant, is not much less than the likelihood of the low population zone only being affected. In order to provide adequate safeguards to the public, existing emergency response plans should be modified to reflect this.

Costs Charged to Licensee

In a report to Congress submitted by the Comptroller General on December 31, 1975,[7] it was recommended that the NRC be given authority through the Federal Preparedness Agency to provide funds to supplement states in developing emergency response plans. We endorse this recommendation. We further recommend that the NRC pass the charges on to the licensee. The charges should not

be recoverable by the utility by claims against future tax payments. There are two reasons for this. One is that emergency response plans are an extraordinary requirement placed upon local governments uniquely by nuclear facilities. The second and more important reason is that the purpose of financing is to ensure that an adequate plan exists and not merely to save money for the local community. If state and local governments were aware that they would ultimately have to pay for the plans themselves by claims against tax revenues, then the incentive to develop and test plans adequate in scope would be diminished. Many impacted governments, of course, are presently negotiating with utilities for up-front money to mitigate other socioeconomic impacts which subsequently will be claimed against tax revenues. The previous comments are not meant to suggest that this is an inappropriate action for impacts other than emergency preparedness impacts.

Public Involvement in Emergency Preparedness

It is essential that the public be more involved in emergency preparedness activities. At the very least, this involvement should include the public being informed as to the nature and extent of the risks, appropriate responses in the event of an actual Trojan-related emergency, the function and location of reception centers, evacuation routes and procedures, and so on. It would not be unreasonable to expect some form of direct citizen involvement in the development and exercise of emergency plans. The possible adverse consequences of such involvement in terms of fear and loss of property value deserves further research. However, it is our opinion that, if dealt with in a direct and honest manner, such adverse consequences need not occur.

Thyroid Blocking

Strong consideration should be given to providing potassium iodide to persons living within the expanded geographical area for emergency planning. Since private industry has not met this need, such a program should be federally sponsored and paid for by the licensee as a cost of plant operation.

ATTACHMENT TO APPENDIX B

TROJAN EMERGENCY PLAN

PGE PLANS

The PGE Trojan plans are expansive and highly technical. They involve assessing the accident and forecasting the dossimetry associated with the accident, providing for on-site protection and/or evacuation of personnel, and interfacing with off-site groups. The Trojan Radiological Emergency Response Plan (REKP) includes the following:

1) Identification of responsible PGE and non-PGE personnel, their authority duties, and the organization for coping with radiological emergencies;

2) Criteria for determining the magnitude of the release of radioactive materials, t[illegible]ed for notification and participation of local and state agencies, the Nuclear Regulatory Commission, other federal agencies, and the names of the appropriate contact persons in these agencies;

3) Criteria for determining when protective measures should be implemented inside and outside the site boundary to protect the public and Trojan personnel and prevent damage to property;

4) Procedures for emergency notification of persons assigned to PGE's emergency organization and appropriate local, state, and federal agencies with the responsibilities for coping with emergencies;

5) Procedures for implementing agreements reached with local, state, and federal officials and agencies for the early warning of the public and for evacuation or other protective measures should such measures become necessary;

6) Criteria to be used to determine when, following an accident, re-entry of the facility is appropriate or when operations should be continued;

7) Emergency supplies, equipment, and facilities for guidance, communications, radiation survey and monitoring, sampling, contamination control, personnel anti-contamination, minor repairs, first-aid, decontamination, meterological instrumentation, administration, and transportation;

8) Medical support, including arrangements for the services of a physician and other personnel qualifed to handle radiation emergencies, and arrangement for transportation and treatment of injured and contaminated individuals at facilities outside the site boundary;

9) Provisions for training PGE employees and other interested citizens who are either assigned specific authority or responsibility or whose assistance may be needed in the event of a radiation emergency;

10) Provisions for testing by periodic drills to assure that PGE employees and other interested citizens are familiar with those duties which may be needed in the event of a radiation emergency; and

11) Provisions for review and updating of the plan.

As a starting point it is important to understand the emergency organization established by the PGE Trojan plan. There are three distinct emergency staffs involved in the emergency organization. They are the Emergency Operating Staff, the Emergency Control Center and the Company Control Center. The emergency operating staff consists of those personnel responsible for the actual operation of the plant. They are trained to evaluate all abnormal situations and to initiate protective measures and phases of the Trojan plan that may be necessary to eliminate and control radiation exposure.

In addition to the control center staff is the emergency operating staff. At the top of the command chain of the emergency operating staff is the shift supervisor whose responsibility it is to direct the operating crew in coping with the emergency. The control room operator carries out the physical operations necessary to control or contain the emergency under the direction and with the assistance of the shift supervisor. The auxiliary operator carries out normal or special responsibilities of plant operations as directed by the above personnel.

Emergency control center staff, when activated, consists of emergency teams with special responsibilities which include radiation protection, instrument and control, engineering, and maintenance. The Emergency Control Center staff will set up operation in the Visitor's Information Center auditorium, which, at that time, will become the Emergency Control Center (ECC). The Visitor's Information Center was selected as the Emergency Control Center because it is convenient to the plant access road and yet is about half a mile away in the direction of low wind probability.

The Company Control Center staff consists of the top management of Portland General Electric. If activated, the Company Control Center will be established in the downtown Portland offices of Portland General Electric. The Company Control Center staff (CCC) has the ultimate responsibility and authority for coordinating and directing overall activities involved in

responding to the emergency and notifying outside agencies.

In charge of the Emergency Control Center is the plant superintendent, or if not available, the assistant plant superintendent, operations supervisor, or engineering supervisor, in that order. The Emergency Control Center director has responsibility for directing the combined operations of all plant emergency teams and the ECC staff. It is his responsibility to activate the Company Control Center when he determines it is needed. Prior to activating the Company Control Center, he is to notify whatever outside agencies that may need to respond. Under the ECC director is the operations supervisor, whose responsibility is to direct the efforts of the operations emergency team that deals with the situation on site. The engineering supervisor is the technical person with responsibility for directing evaluation of the extent and significance of the emergency. The chemical and radiation protection supervisor has responsibility for directing the radiation protection emergency team technicians except for those technicians assigned to the shift supervisor in the control room. The radiation protection emergency team has responsibility for determining the existing radiation levels and trends in the plant and surrounding area and for controlling human access to those areas. The maintenance supervisor has responsibility for directing the maintenance emergency team, consisting of the particular maintenance crew on shift. An important part of the maintenance supervisor's responsibility is simply to account for the whereabouts and safety of the persons on the maintenance team. The administrative supervisor's responsibility is to keep track of everything that is going on including administrative and security personnel and visitors. The quality assurance supervisor has the responsibility simply of accounting for the presence and safety of all quality assurance personnel.

The Company Control Center staff is directed by the PGE Assistant Vice President of Thermal Plant Operations and Maintenance or his designated alternate. His responsibility is to direct all company efforts at resolving the emergency on-site and to coordinate company actions with off-site agencies. The second in command of the Company Control Center is the operations advisor who is the PGE manager of power operations. His function is to gather and organize all information pertaining to the emergency and to advise the CCC director accordingly. The third in command of the CCC is the engineering advisor, who is the PGE assistant vice-president of general engineering and

construction. It is his responsibility to coordinate and direct all technical activities involved in responding to the emergency. The public information advisor is the PGE director of public information, who is to coordinate with federal and state agencies for the timely and appropriate release of pertinent information to the public. The communications advisor is the PGE superintendent of communications, who is to establish and maintain all required telephone and radio communication services. He has the responsibility in advance of an emergency to prepare for an efficient and reliable system by providing the necessary facilities and manpower. Reporting to the manpower assistant is the PGE manpower required to respond to the situation. The logistics advisor is the PGE superintendent of maintenance and construction, responsible for providing supplies and any required transportation. The environmental sciences advisor is the assistant vice president of environmental and analytical services, responsible for providing additional environmental monitoring equipment services and analysis as required. He is also to provide consultation in the area of health physics. The medical advisor is one of several PGE consulting physicians. His role is to provide guidance in dealing with injuries and health physics problems and to assure that proper medical attention and facilities are provided. The legal advisor is the PGE corporate counsel, who is responsible for advising the CCC director on all legal matters associated with the emergency.

The Trojan accident response plan provides dosimetry guides as thresholds for on-site and off-site protective action. On-site protective action, including evacuation of the exclusion area, is required for a dosimetry rate of 2 millirems per hour whole body, or 6 millirems per hour thyroid. The dosimetry prognosis for off-site protective thyroid must be predicted in order to initiate off-site protective actions.

Prior to activation of the Emergency Control Center, the shift supervisor and/or the plant superintendent is to direct the evacuation of the exclusion area and to notify the appropriate local, state, and company officials. After the Emergency Control Center is activated it is the responsibility of the ECC director who is to notify appropriate outside agencies. If the Company Control Center has already been activated, then it is the responsibility of the ECC director to request the assistance of the CCC and if appropriate to recommend that the CCC notify the NRC and any other outside agencies who might be affected, including local and state government agencies.

Communication and proper notification are stressed in the RERP. Figure 1.5-1 from the PGE plan is reproduced on Figure 4. It depicts the chain of responsibility regarding notification of outside agencies. As can be seen, the plant superintendent, who becomes the ECC director, is a key person in the overall notification scheme, with responsibilities for notifying the Columbia County sheriff, Cowlitz County sheriff, Oregon Emergency Services Division, Washington Department of Emergency Services, Oregon State Police, Washington State Patrol, and, via the PGE loads dispatcher, the PGE management.

Perhaps the most important element in the proper notification and coordination of emergency response activities is the communications network. Communications between the control room and various other on-site areas outside the control room are by way of an Executone on-site telephone system and a PA system, with portable radios used as backup. Communications with the ECC are by way of the on-site telephone system with portable radios used as a backup. Communications between the reactor control room and off-site locations are simply to be the Pacific Northwest Bell telephone system. There is, however, a control room microwave system which will allow direct communication with the CCC in Portland. A base radio station exists which can be controlled either from the control room or the security building. Receivers for the base station are located in the Cowlitz County and Columbia County sheriff's offices. Communications between the Emergency Control Center and emergency teams will be by radio. Communications with the CCC and other off-site agencies will be by the normal telephone system. The ECC also has remote control of the base radio station at the plant in order to monitor control room transmission over that system. The CCC, in addition to normal telephone communications and the aforementioned microwave communications with the ECC and the control room, has radio communication with outlying areas and with PGE mobile units. Radio communications can also be established with the sheriffs of Columbia and Cowlitz Counties. PA systems are installed within the exclusion area in order to warn members of the public outdoors in that area.

There is a possibility that groups or persons with malicious intent could tamper with the communications network and generate spurious messages. To reduce this danger, authentication of emergency communications is to be accomplished by verification with the CCC. To facilitate emergency response

communications there is a regularly up-dated telephone roster included in the PGE Trojan plan. The telephone numbers of any person or organization which might need to be phoned by any other person or organization in responding to an emergency are included.

Technical assessment of the emergency and projection of off-site dosimetry is the responsibility of the emergency operating staff under the direction of the shift supervisor. These personnel receive indications from radiation monitoring equipment which includes sensors located at all the major plant vents where release of radioactive material could take place. Using data from these instruments in conjunction with meterological data, the emergency operating staff form an assessment of the emergency situation. The plan contains cookbook-type instructions for computing off-site dosimetry from known release rate and meterological conditions. The information produced by the cookbook technique takes the form of constant dosimetry isopleths superimposed on a map of the area. A polar coordinate grid centered at the reactor building is used to define geographical areas. A reproduction of the grid is included on page 14 . The coordinate grid is divided into 16 segments which correspond to the 16 points of the compass, with segment number 1 being north and the numbering system proceeding clockwise that segment. When the threshold for response is reached in the downwind sector, the same actions which are recommended for that sector are also recommended for the two adjacent sectors. All responding agencies have similar maps with the same corresponding polar coordinate grid and can utilize appropriately the information received.

COLUMBIA COUNTY RESPONSE PLAN

The Columbia County plan provides for the following: the establishment of traffic controls for inbound vehicles; auto evacuation of any affected areas; the implementation of any recommended protective action specified by the Oregon State Health Division Radiation Control Section Accident Response; the establishment of reception centers for processing evacuees; and the maintenance of security in the evacuated areas.

The key to the smooth operation of the Columbia County plan is the communications network. Figure 3.2-40 from the PGE Trojan Plan, reproduced as figure 4 depicts the communication network. The central dispatch operator in Columbia County is the physical interface between the Trojan plan and the Columbia County plans. As can be seen, a large number of organizations are involved. The activities of all the organizations must be coordinated via the communication network.

The individual responsible for the content of the Columbia County plan is the Columbia County Director of Emergency Services. In addition to the development of the plan he has responsibility for activating the County Emergency Operations Center (EOC) in the event of an emergency. If there is to be an evacuation it is his responsibility to activate one or both of the two reception centers with the appropriate personnel. It is also his responsibility to establish the priorities for county operations in conjunction with the county sheriff and to call on whatever outside assistance may be required for public protection.

If an emergency should occur, however, the key person orchestrating the response is to be the county sheriff. The sheriff will supervise the evacuation, assisted by the municipal police departments and also by the local fire district personnel. For his role in the emergency situation he assumes the title of Chief of Police Services and directs the activity of five city police forces--the cities of Rainier, St. Helens, Scappoose, Clatskanie and Vernonia. He directs communication to his own personnel, to search and rescue personnel, ambulance personnel, and to the state police office in St. Helens or Milwaukee. A primary responsibility of the sheriff is vehicle traffic control with the municipal police assisting under his direction. The Oregon State police are also to assist upon his request. Notification of the people to be evacuated

TROJAN EMERGENCY ALERT & CALL PLAN CHART

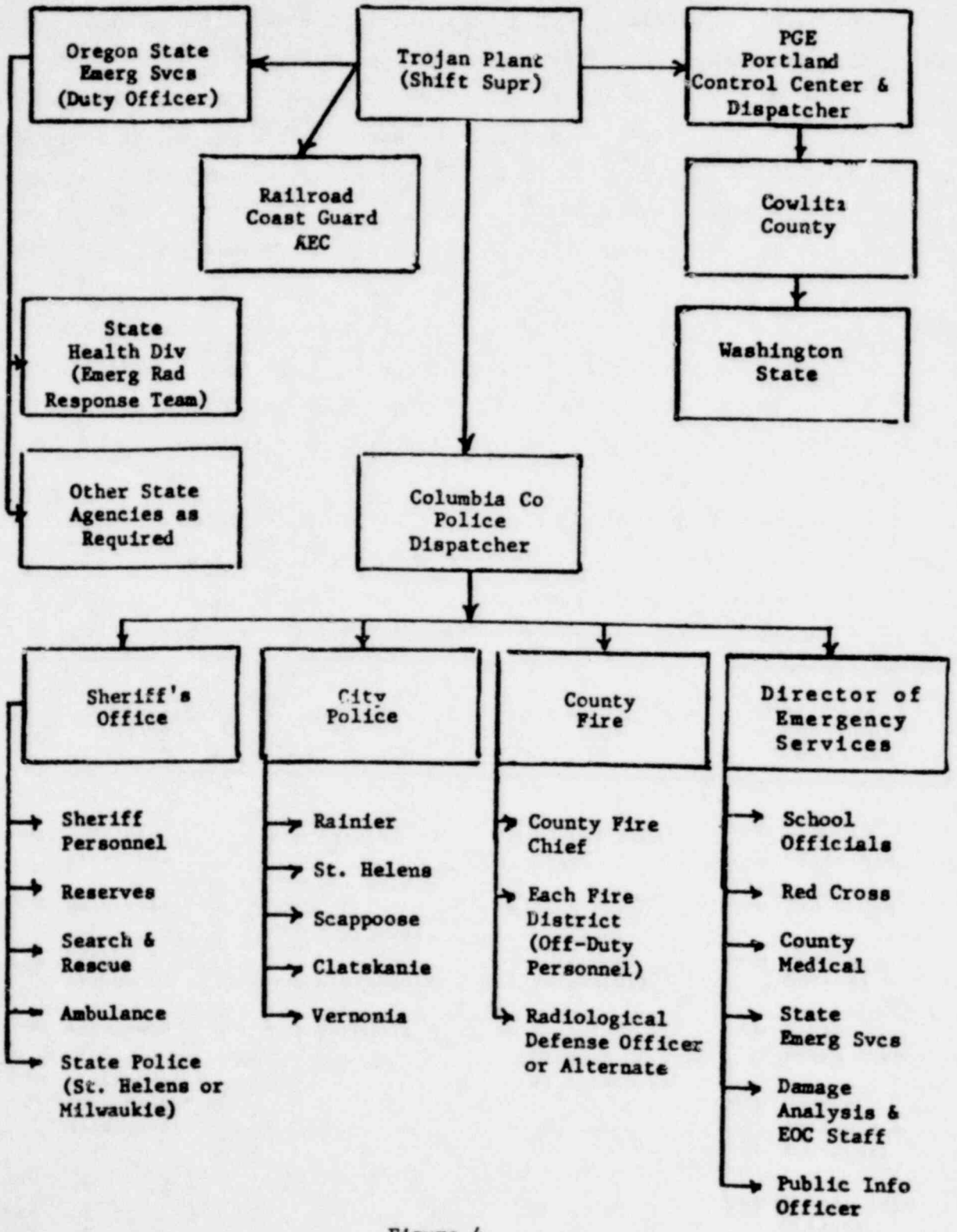

Figure 4

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is to be by house-to-house visits, supplemented by broadcasts from local radio stations. The evacuation personnel will direct all evacuees to the appropriate reception center. There are two such centers in Columbia County, either of which or both may be used. One center is the St. Helens Junior High School, about 12 miles south of the plant in St. Helens. The other is the Rainier Elementary School in Rainier, about 3 miles north of the plant. At the reception center the evacuees will be checked for contamination, cleaned up if necessary, and dispatched elsewhere for further medical care, or for temporary lodging.

OREGON STATE RESPONSE PLAN

The agency with lead responsibility for radiological emergency response in Oregon State as well as Washington State is the health department, specifically the Oregon State Health Division Radiation Control Section.

The Oregon State Department of Emergency Services does not have a major role with respect to planning for, or responding to an incident at Trojan. The department does play a part in the warning function. It would assume the lead response, however, only for a very major accident. The Health Division has lead responsibility because of the small magnitude of accidents anticipated by the developers of the response plans. The entire evacuation would be supervised by the county Department of Emergency Services level. The requirements placed upon the state would be the provision of services in the area of health physics and other recovery areas. These would not be available at the county level. It is only at the state level that sufficient expertise exists to interpret and properly react to information on releases, given by the Trojan plant superintendent or shift supervisor.

Various state agencies other than the health division also become involved. They include the Oregon State Police, the Oregon Department of Environmental Quality, the Energy Facilities Siting Council, the Oregon Department of Agriculture, the Oregon State Department of Transportation, the Public Utility Commissioner, and various state bodies which have environmental-radiological monitoring equipment expertise, such as the University of Oregon Medical School, Oregon State University, University of Oregon, Oregon State Emergency Services Department, the Military Department, and Radiological Instruments Repair Shop. All of these agencies assist the health division in

accident assessment and protection of public health.

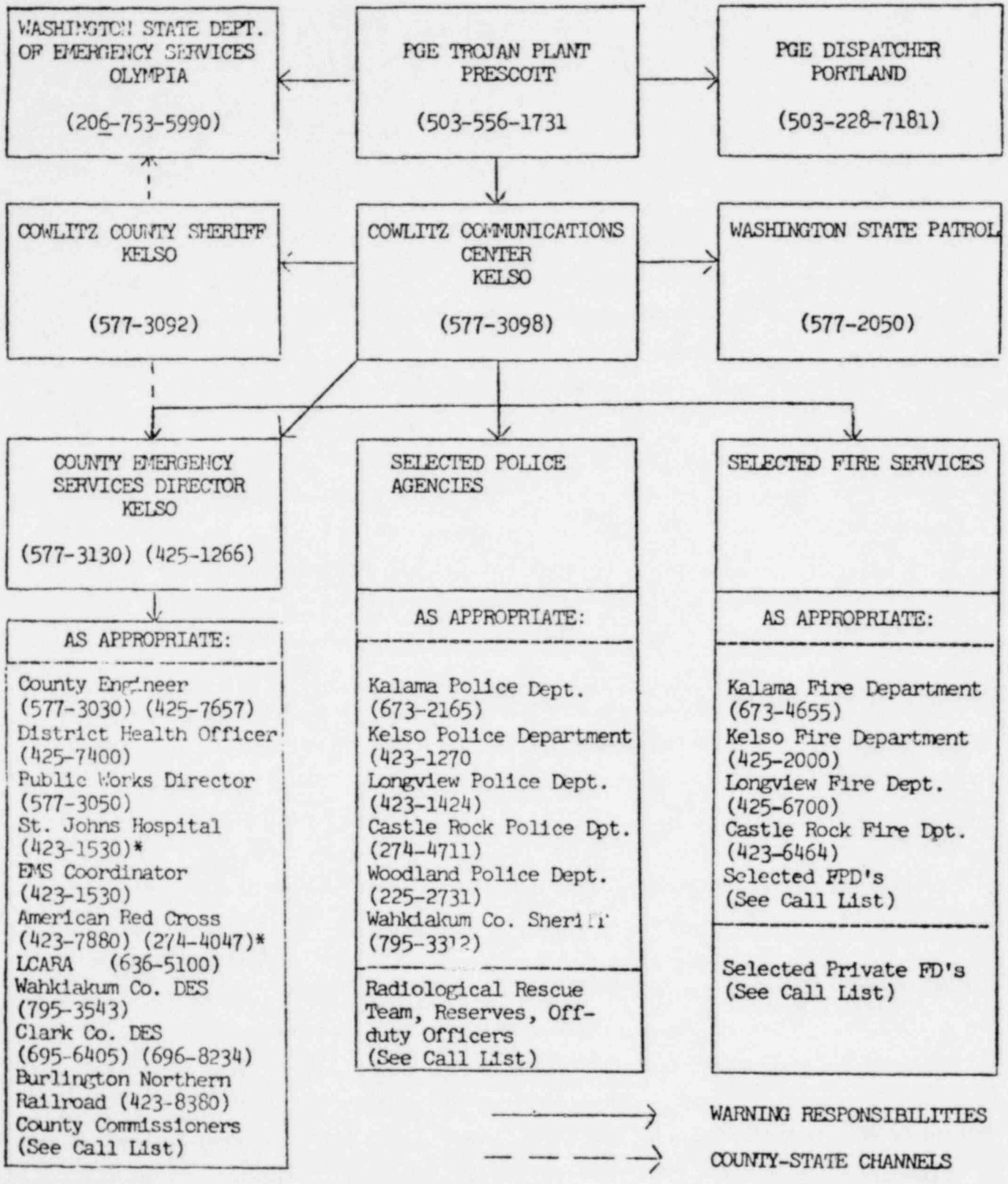
If the nuclear incident is of such severity that it exceeds a design basis accident, the Health Division notifies the governor who may, at his own discretion, declare a state of emergency disaster. Under this condition, the radiological defense of the Oregon State emergency operations plan is put into effect and the Emergency Services Division shall assume lead responsibility for coordinating and directing overall emergency response operations.

Cowlitz County Response Plan

In Washington State, Cowlitz County is the primary responding governmental body. The situation in Cowlitz County is quite different from Columbia County because the population is much greater. Although the plant is not located in Cowlitz County, it is on the Columbia River, which forms the border between Columbia and Cowlitz Counties. Portions of the city of Kalama in Cowlitz County are within the two-and-a-half mile radius of the designated low-population zone. Seven miles from the plant are the cities of Longview and Kelso, with a metropolitan population of approximately 40,000. The emergency response resources of Cowlitz County are therefore greater, but so is the task at hand.

As with Columbia County, the sheriff has responsibility for directing the emergency response. Although the emergency services director has lead responsibility for developing and maintaining the emergency response plan, she will take orders directly from the sheriff at the time of an actual emergency. In reality this is very much a cooperative relationship. The key feature in the sheriff's orchestration of the response is use of the county emergency communications center. The center is a central receiving and dispatch station for all communications relating to emergencies. It is secured against intrusion, and is well equipped with radio and wire communications systems. It is located in the Cowlitz County Hall of Justice, which is the same building that houses the Cowlitz County Department of Emergency Services and the Sheriff's Office. The flow of information from the Cowlitz County communications center is illustrated by the diagram in Figure 5 from the PGE Trojan plan. It is reproduced on page 146.

ALERTING AND WARNING SYSTEM FOR TROJAN RADIOLOGICAL INCIDENTS



* 24-hour number

March 1976
Amendment 4
(August 1976)

Figure 5

There are a number of important individuals and agencies at the county level who would be involved in responding to the emergency under the direction of the sheriff. It is important to understand their responsibilities. The Emergency Services Director provides warning and communications support to the sheriff, and coordinates specified emergency activities on behalf of and under the direction of the sheriff. The Director also provides overall supervision for local radiological monitoring and local public information activities. It is her responsibility to establish reception centers if and when required. She must also coordinate and direct the work of other organizations such as the Red Cross and welfare services, on behalf of local government. Perhaps her most important responsibility is the activation of the Emergency Operations Center at the time of an emergency. The County Office of Emergency Services becomes the Emergency Operations Center. It is conveniently located in the same building as the Sheriff's Office, and the Emergency Communications Center.

The county radiological defense officer has the responsibility of supporting the state Radiation Control (RADCON) field team by establishing a radiological monitoring network and collecting radiological data therefrom. It is his responsibility to assist in monitoring individuals' exposure levels and in keeping radiological monitoring records. The county engineer has the responsibility of supporting the warning effort, by providing emergency barriers, signs and other transportation-related aids. He has responsibility along with the radiological defense officer for performing mobile monitoring and area decontamination functions, primarily during the recovery period. The public works director supports the emergency activities of the county engineer with public works resources. He coordinates with the public health officer and municipal water departments, to ensure that proper actions are taken to control and minimize radiological contamination of domestic water supplies.

The local health officer is a medical doctor, and has the responsibility of assisting the state RADCON field team and coordinating the committment of available medical resources in support of the emergency. This would involve providing medical support at reception centers and the arranging for medical evacuation of the sick and injured. He will be assisted by the emergency medical services coordinator.

Several other entities become involved to a minor extent. The cooperative extension service provides advice to farmers on health hazards to animals and

contamination of crops resulting from an incident. Municipal emergency services personnel (i.e., fire and police) in Longview and in Kelso will provide necessary support to the county sheriff, assisting in the warning effort, protecting the evacuated areas, and assisting with mobile monitoring and decontamination operations, including area decontamination.

If an evacuation is necessary, the sheriff can use various methods of notifying the public, including notification of local radio stations, door-to-door calls, and sirens on emergency vehicles. Evacuees will be removed by a variety of methods, which will include private automobiles, walking, use of school buses, and railroad cars. Initially the decision to evacuate an area will be determined by communication with the Trojan shift supervisor. If there is a loss of communication or if information obtained from local field monitoring contradicts information received from the Trojan plant, the sheriff will make his own determination of proper local response. This could include evacuation or recommending other precautionary activities such as remaining indoors and inactive. In making this determination the sheriff will use criteria known as Protective Action Guides (PAGs) which have been established by the U.S. Environmental Protection Agency and usually adopted with little modification as state and local guides. They are incorporated into the Cowlitz County emergency response plan.

The sheriff will coordinate with the state highway department, state patrol, and county engineer concerning control traffic. The sheriff himself will be in charge of the traffic control. Evacuees will all be directed to reception centers. This, as in the case in Columbia County, is for purposes of accomplishing thorough and systematic protection of public health and safety and to facilitate post-incident claims for financial reimbursement. In Cowlitz County there are several reception centers, including Kalama High School, Kelso High School, Lower Columbia College in Longview, Castle Rock High School in Castle Rock, and Woodland High School in Woodland. The functions of the reception center are the same as the reception center functions in Columbia County. The Emergency Services Director will be responsible for the activation of the reception centers. She will coordinate, as required, with the Red Cross, the state RADCON team, and radiological defense officer, appropriate school officials, Grange officials, and other interested agencies.

Washington State Emergency Plan

Washington State has long needed to deal with radiological incidents because of the existence of nuclear facilities at Hanford. These include a nuclear waste storage area, operating and non-operating reactors for the production of plutonium for use in nuclear weapons, and reprocessing facilities used in isolating the plutonium produced in the operating reactors. In addition, there are three commercial nuclear power plants under construction in the Hanford vicinity, two nuclear power plants under construction in Gray's Harbor County, and two additional nuclear plants in the planning stage in the Skagit River Valley. There is also an experimental breeder reactor known as the Fast-Flux Test Facility under construction in the Hanford area. In the Bremerton area, nuclear ships are in dry dock or tendered for service. The Trident submarine base will be located near Bremerton. Each Trident submarine is not only powered by a nuclear reactor, but is armed with a massive megatonage of nuclear missile warheads.

A number of agencies in Washington State are involved in preparedness for a fixed nuclear facility incident. The agency with lead reactive responsibility is the Department of Social and Health Services, whose responsibility it is to assess the radiological situation, to promulgate protective action guides, to coordinate emergency medical support, and to provide information and guidance to the public. The Department of Emergency Services also plays a very important role. That department has the lead planning responsibility for communication and coordination of emergency response activities. The Washington State Patrol provides emergency traffic control, coordination, communications support, and mobile radiological monitoring. The Department of Transportation assists the affected local governments mainly by providing traffic control support. The state Aeronautics Agency provides emergency transportation and aerial radiological monitoring. The Department of Agriculture is responsible for assessing contamination of agricultural lands and agricultural products. The National Guard assists locally as directed by the governor. The Department of Fisheries assists the State Patrol in emergency traffic control and the Department of Game does likewise. The Department of Ecology assists in damage assessment and reclamation by monitoring radiological contamination of water in cooperation with the department of Social and Health Services RADCON Unit.

As with the other governmental bodies, Washington's communications network is very important. Figure 6 of the PGE Trojan Plan is reproduced as Figure 6. It illustrates the notification responsibility in Washington State. The Department of Emergency Services is to be notified by the Trojan Shift Supervisor and redundantly by the Cowlitz County Sheriff. It is then the responsibility of the Department of Emergency Services to notify the state Department of Social and Health Services (DSHS) RADCON unit supervisor of the incident. The state Department of Emergency Services will then establish communications with the Cowlitz County Department of Emergency Services, and notify other key state and federal agencies as appropriate. An important part of the Department of Emergency Services responsibility is to serve as a junction for all emergency communications between other state agencies and local affected jurisdictions. When the DSHS RADCON Team is in the field, however, they will report information to and receive information from a centralized information control center which will be the Cowlitz County Emergency Operations Center.

Federal Responsibility for Radiation Emergencies

There are a number of federal agencies with emergency response plans which are relevant to the Trojan plant community. The Department of Energy (DOE) coordinates the activities of the federal agencies which are parties to the Interagency Radiological Assistance Plan. It is an agreement among federal agencies to cooperate in the effective use of federal resources to minimize the radiological impact of a nuclear incident. In the event of an emergency DOE will assist in radiological monitoring, give medical advice, assist in evaluating radiological exposure and radiation health hazards, and in general provide technical advice on radioactive contamination.

A number of agencies provide assistance in the pre-emergency period in planning for emergencies and in training of personnel. The NRC provides state and local planning guidance, training and reviews and evaluates state and local plans. The Environmental Protection Agency establishes radiological protective action guides and recommends appropriate protective actions. EPA also provides planning assistance. The Federal Preparedness Agency of GSA provides overall planning guidance, facilitates state and local contacts, and in general monitors coordination of the active federal process. The Federal Disaster

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Warning and Notification Chart

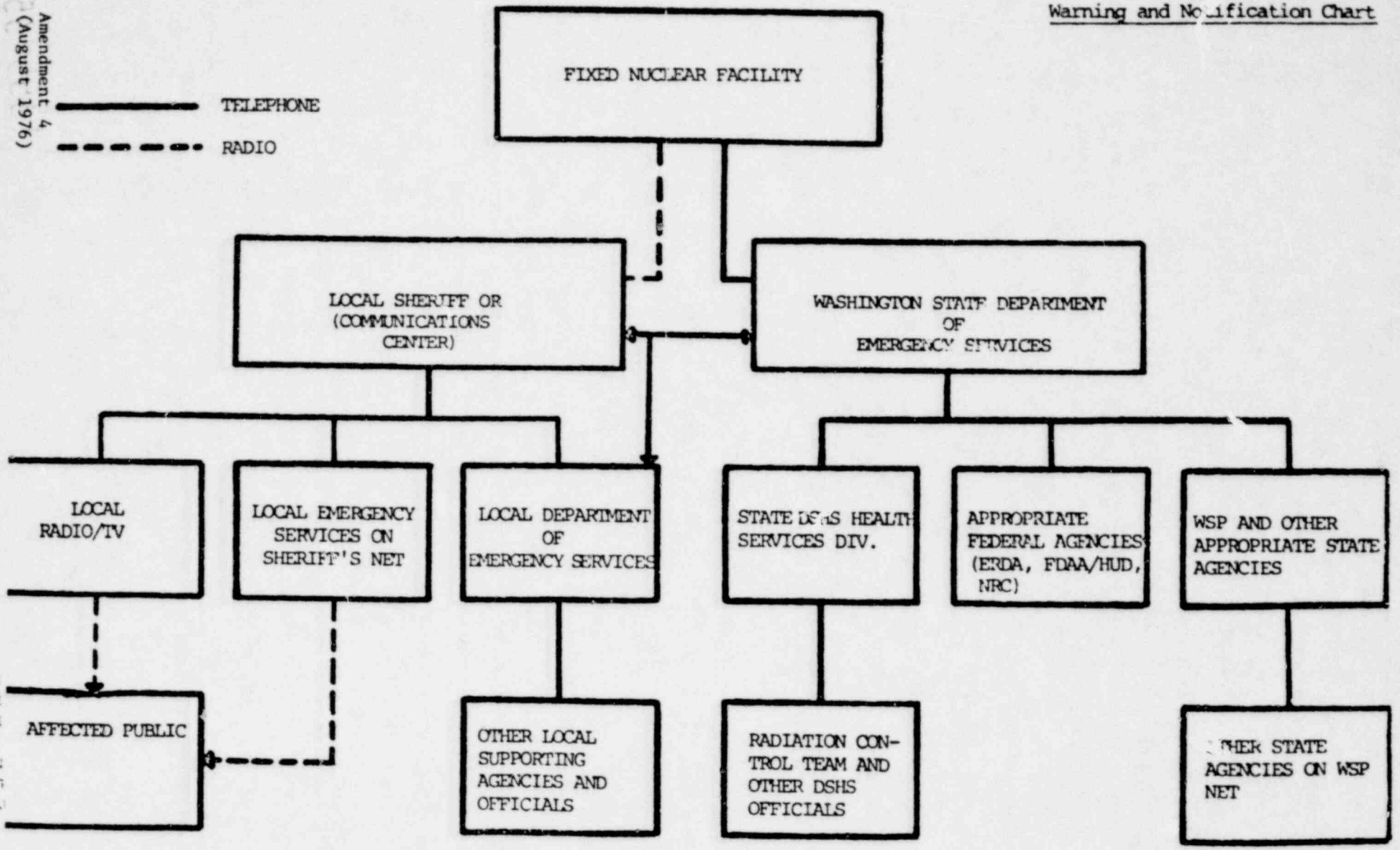

Figure 6

Assistance Administration, which is a part of the Housing and Urban Development Administration (HUD) provides coordination of available federal and emergency resources for recovery from a major incident. The Defense Civil Preparedness Agency provides training and financial support and assists in development of comprehensive coordinated plans.

Other federal agencies become involved to a lesser extent; the Coast Guard will assist in blocking river traffic, the U.S. Department of Agriculture will assist in determining safety of agricultural products, the National Oceanic and Atmospheric Administration and the Corps of Engineers will control marine and river traffic as required.

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The report is the result of a confirmatory assessment project to identify social and economic impacts on surrounding communities of the construction and operation of a nuclear power plant. The Trojan nuclear plant located 32 miles northwest of Portland, Oregon was chosen for a case study. A background of the physical, demographic, economic, and political context of the communities is provided. This is followed by an evaluation of the impacts of plant construction and operation including local taxation, employment, business activity and income, demography, public utilities and transportation, land use, housing, recreation, culture and lifestyle, public safety, education, health care, and politics and institutions.

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