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CHIEF JOSEPH DAM, COLUMBIA RIVER, WASHINGTON, COMMUNITY IMPACT --ETC(U)
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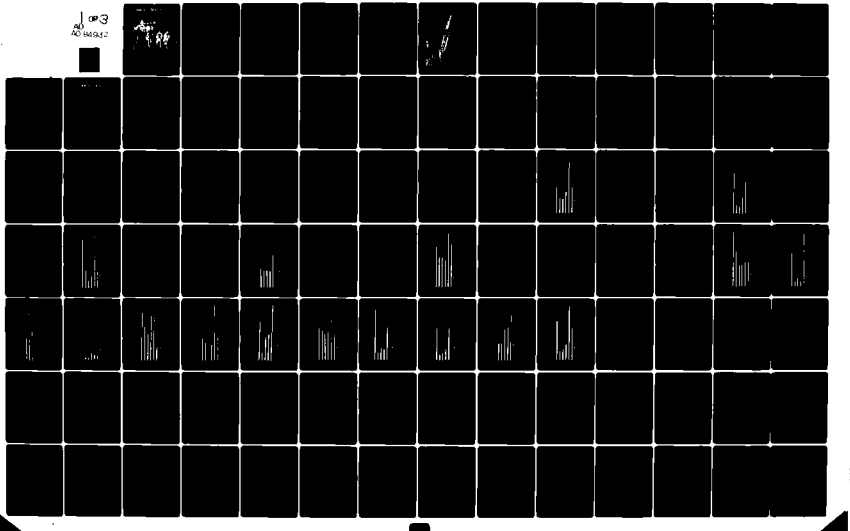
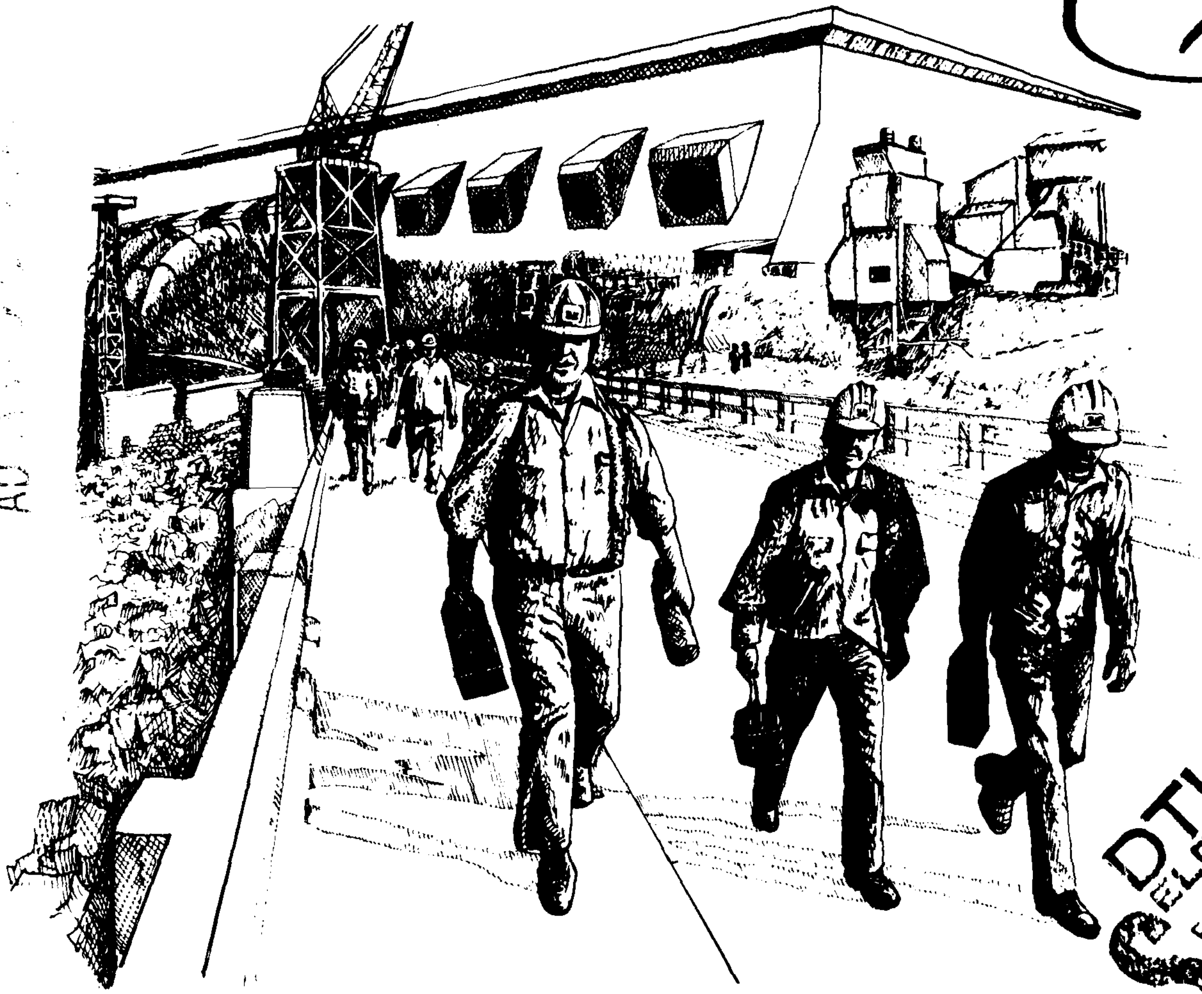


COMMUNITY IMPACT REPORTS

Chief Joseph Dam

COLUMBIA RIVER, WASHINGTON



PRE-CONSTRUCTION SURVEY AND IMPACT PROJECTIONS

ASSISTANCE TO PUBLIC SCHOOLS

PEAK CONSTRUCTION ANALYSIS

PREPARED BY SEATTLE DISTRICT
U.S. ARMY CORPS OF ENGINEERS
FOR
INSTITUTE FOR WATER RESOURCES
FORT BELVOIR, VIRGINIA

MARCH 1980

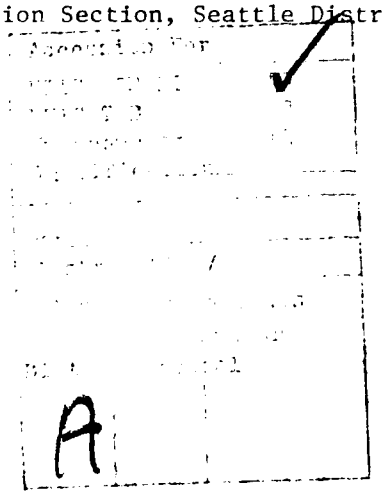
DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSEN-PL-E

March 1980

This volume contains reprints of Chief Joseph Dam Community Impact Reports published by the Seattle District between 1974 and 1978. The four reports project and monitor impact of construction workers on small rural communities. Coverage includes methodology used for preconstruction impact projections, a description of assistance to public schools, monitoring of impacts during peak construction, and a profile of the construction work force obtained by a questionnaire survey. The introduction to this report is a brief synopsis of the detailed volumes.

The reports have been used as a model to help planners project possible community impacts from construction activities for projects across the nation. Follow-up reports to complete the series will cover the period after the project is completed and workers leave the area. Dr. J. Deli Priscali, Institute for Water Resources, Fort Belvoir, Va., has assisted in the preparation of these reports. Research, analysis, and publication of the reports have been under the direction of Arthur A. Harnisch, Chief, Economic and Social Evaluation Section, Seattle District.



Sincerely yours,

LEON K. MORASKI
Colonel, Corps of Engineers
District Engineer

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report consolidates four studies concerning economic and social community impacts related to construction activities at a hydropower dam in a rural area. Coverage is from preproject conditions and impact projections to a period of peak construction activity when projections were verified. Methodology for projecting number and place of residence of workers and related population is presented. Techniques for estimating capacity of community utilities and services is explained. Details are provided on mitigation methods to alleviate impacts to public schools. An indepth survey and analysis of the construction work force provides data on worker profiles and construction-related population.

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CHIEF JOSEPH DAM
COMMUNITY IMPACT REPORTS

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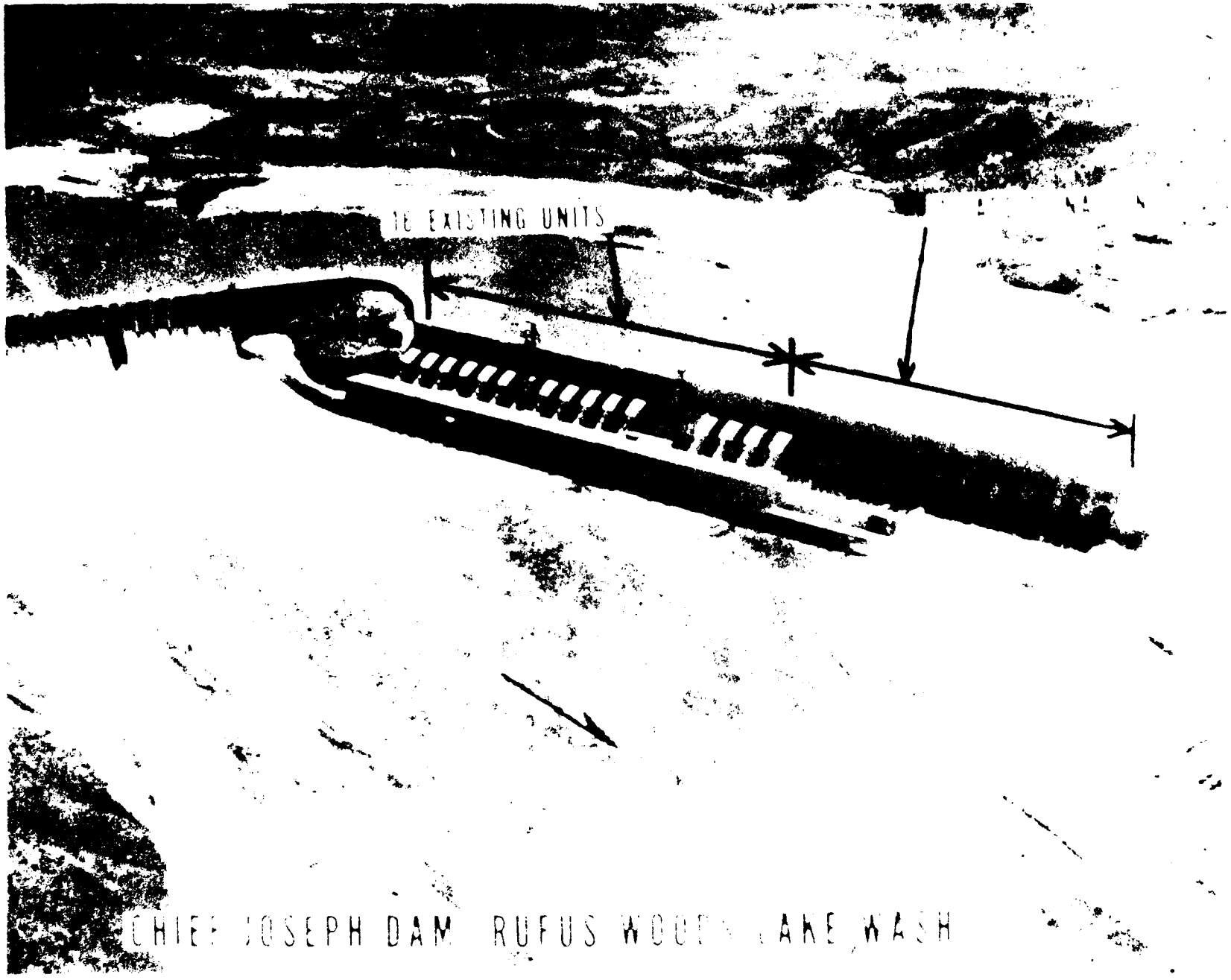
16 EXISTING UNITS
CHIEF JOSEPH DAM
RUFUS WOOD
LAKE WASH

INTRODUCTION

Large construction projects in rural areas have significant economic and social impacts on local communities. The influx of a large number of construction workers into a community on a short-term basis may burden public facilities such as schools, water and sewer systems, and may cause a shortage of local services such as medical care and police and fire protection. A large construction work force may also have significant impacts on housing, highway traffic, visual landscape and patterns of land use, recreational facilities, civic organizations, and community growth and cohesion.

The Seattle District, U.S. Army Corps of Engineers, in conjunction with the Institute for Water Resources, Fort Belvoir, Virginia, published a series of reports concerning community impacts related to construction of additional power units at an existing hydroelectric dam located on the Columbia River in a rural area of the state of Washington. The series of documents entitled CHIEF JOSEPH DAM, COLUMBIA RIVER, WASHINGTON, **Community Impact Report,** are reprinted in this volume. The basic report published in February 1974 documented preconstruction community conditions, projected increased population, and determined "people capacity" of community facilities and services. Forecasted shortages and needs were identified. A synopsis of possible economic impact assistance from state and local agencies was provided. The second report, **Update I**, was published in October 1974 at the initiation of construction and included revised projections of population and allocation of construction worker-related population to communities. The third report, **Update II,** April 1978, was entitled **Measuring Construction-Related Impacts on Local Schools.** This report documents the impact on local schools of students related to construction workers. Facility needs and reimbursement to local schools for additional operation and maintenance expense were identified and funds provided for mitigation. The report provides an example of cost sharing with Federal plus community funds to provide permanent school facilities. The fourth report, **Update III,** entitled **Conditions at Peak Impact,** was published December 1978. This report provides a case history documentation of economic and social impacts on rural communities during peak construction activities. A profile of the construction workforce is also provided.

Existing legislation does not provide the Army Corps of Engineers with authority to mitigate off site social and economic community impacts. Local governmental units generally have to measure the impact and request funds for mitigation through other Federal agencies or congressional delegations. In the case of Chief Joseph Dam, the Seattle District attempted to provide a planning tool for local planners, Government officials, and others concerning possible economic and social impacts on communities. Documentation of actual impact experience with local schools and economic and social conditions at peak impact provides information which can be utilized in forecasting possible impacts of project construction in other areas of the nation.

BACKGROUND.

In early 1973, the Corps of Engineers announced that funds would be available for adding 11 hydropower units to an existing hydroelectric dam on the Columbia River in the central part of the State of Washington. Construction expenditures were planned to amount to about $300,000,000. Construction activity would take place in a rural, agricultural area, with most nearby communities having a population of about 1,000 people or fewer. During construction of the original dam and 16 hydropower units in the early 1950's, these local communities suffered hardships in not having enough public facilities to handle the influx of construction workers. Unplanned, rapid expansion of public facilities and commercial activity took place resulting in an economic boom. When

construction workers left the scene, there was an economic downturn which led to unused public facilities and vacant commercial buildings. Due to this past experience, local citizens and town officials were fearful of the anticipated wave of new construction workers into the area. During the summer of 1973, Seattle District economists and sociologists took up the task of attempting to identify possible impacts so that local planning could provide for peak construction-related population.

STUDY PROCESS TO PROJECT AND IDENTIFY COMMUNITY IMPACTS

GENERAL.

The Corps of Engineers has no specific authority to (a) produce separate community impact planning reports, or (b) mitigate social and ecnomic impacts due to project construction. Authority is provided to mitigate damages or potential damages related to the project site. For example, projected damages to fish and wildlife are generally mitigated by provision for the cost of a fish hatchery or purchase of additional lands for wildlife. These costs are included with the project cost and included in the benefit cost ratio. Recently authorization has been provided to investigate archeological or cultural resources that might be damaged by the construction. The cost is limited to one percent of the project cost and included in project costs but benefits are not included in the benefit cost ratio. General authority for research and analysis of ecnomic and social community impacts is identified in:

> Title I, Public Law 91-190, (83 Stat. 852), **National Environmental Policy Act,** 1 January 1970;
>
> Section 122, Public Law 91-611, (84 Stat., 1818), **River and Harbor and Flood Control Act of 1970,** 31 December 1970; and
>
> Water Resources Council, **Principles and Standards for Planning and Water and Related land Resources,** 38 FR 24778-24869, 10 September 1973.

The purpose of Chief Joseph community impact evaluation was aimed at: (1) identifying population impact problems which could be expected to occur; (2) providing guidelines for possible action if economic and social problems should occur; and (3) identifying potential sources of financial assistance to impacted communities. During the summer of 1973 the Seattle District initiated studies for a report to be straightforward, uncomplicated, and accomplished in the most economical manner. This was approximately 1 year before a significant number of construction employees were expected at the project. The staff conducting the research activities were essentially entry level economists and sociologists. The report readers were assumed to be responsible officials and employees in local community government, county level people such as planner and engineers, and other state and Federal agencies involved in providing financial or other assistance to local communities.

PROJECTION OF CONSTRUCTION EMPLOYEES.

Two methods were used to estimate the number of construction workers expected to be employed at the project. Usually the only information available for an early preconstruction employment projection is the budget for the project. This "budget method" involves: (a) budget expenditures for each element of construction by month; (b) estimated percent of budget

expenditures for labor (e.g., 30 percent); (c) average cost of labor (e.g., $14 per hour); (d) actual number of working hours available per month. This information was plotted on a graph showing number of construction workers over time. The maximum number of employees onsite determined the number used for the community impact analysis. Based on scheduled budget expenditures in 1973 this method produced a number of peak employment at approximately 756 employees during 1976 and 1977. A later projection utilizing this method in September 1974, when construction workers were beginning to arrive on the scene, developed a peak employment of 825 construction employees during an 18-month period between 1976-78. The actual peak count occurred in mid-1977 with 894 actual employees working on the construction project. Funding and construction schedule changes can be expected to cause the number of employees to fluctuate until contracts are actually awarded.

Another method which may be utilized in projecting construction worker employees is the "contract schedule" method which was utilized to measure construction-related impacts on local schools **(Update II)**. This method utilized employee requirements for each contract and subcontract. This information was based on data received from construction management personnel in both the Government and private sectors with knowledge of number of employees required for similar contract work. Due to the relatively moderate climate in the region where the project was located, construction operations were assumed to remain stable through all seasons.

CONSTRUCTION-RELATED POPULATION INCREASE.

For the derivation of project-induced population the construction work force was divided into categories of workers with families, bachelor workers, geographical bachelors (married workers without accompanying families), and workers hired from the local labor market. Workers hired from the local labor market were assumed not to have any impact on induced population. Bachelor workers and geographical bachelors moving in to the area were considered to represent an equivalent population increase of one. Workers with families were assumed to provide a population increase of 3.58 people per worker. The 3.58 factor represented average family size in the State of Washington in the 1970 Federal Census. A construction survey, December 1977, showed actual family size of married respondents with family present to be 3.25 for nonlocal workers and 3.64 for local workers. In 1973, determination of project-induced population increase was based on actual experience during recent construction activities on the third powerhouse and additional hydropower units at Grand Coulee Dam. In addition to population increase induced by the project, the area was also expected to experience population changes attributable to natural increase and migration. This normal population increase was derived after the selection of communities most likely to be impacted by project construction.

IDENTIFICATION OF COMMUNITIES SUBJECT TO IMPACT.

In the case of construction at Chief Joseph Dam there were 76 communities within a 50-mile radius. With the assistance of county planning personnel, this number was reduced to 17 communities most likely to attract new people moving into the area. Criteria utilized in the selection of most likely communities were: commuting distance to the project, with a 60-mile road distance assumed as the likely commuting limit for all but a few employees; and existing schools, retail and service establishments, public facilities, and other amenities such as attractiveness of the town. Of the selected communities which most likely could be expected to receive a construction-related impact, the largest rural community consisted of about 5,000 people. The towns nearest the site of Chief Joseph Dam construction were Bridgeport (4 miles) and Brewster (14 miles), each with a population of about 1,000 people.

COLLECTION OF COMMUNITY DATA.

For each of the selected communities, population projections were made for "without-project" conditions for both natural increases and migration over the impact or construction period. An analysis was performed to determine the people capacity of public facilities such as water supply, sewer system, schools, and services such as police, fire, medical facilities, and housing. The analysis determined the number of people currently being served or present service load. The difference between capacity and existing service load indicated the number of people each service or facility could handle before additional dollars would be needed to increase capacity. This analysis was based on readily available information obtained from Federal and state agencies as well as county and city personnel. Most knowledgeable people in each community such as the mayor, city engineer, or city clerk were interviewed to obtain information on various facilities. This approach quickly zeroed in on the major elements of needed data. If information was not readily available, proxy data were utilized.

ALLOCATION OF POPULATION.

Work thus far has provided:

POPULATION. (1) Normal population change with natural increase and migration based on the expectation of without-project construction for each community; and (2) total number of people induced into the area by construction activities.

FACILITIES AND SERVICES. Inventory of public and private facilities and services needed to serve people in each community with an indication of present use or load with current population. In addition, current unused capacity in terms of numbers of people that could be served was determined.

Perhaps the most difficult problem in a community impact analysis is in the allocation of expected new people into various communities. How many people will live where? In the case of Chief Joseph Dam, construction workers and their families were expected to have the choice of approximately 17 communities. Practically all of the communities currently had less than 2,000 inhabitants each. Three methods were considered to forecast the distribution of population to communities:

- *JUDGMENTAL ATTRACTIVENESS FACTORS.* Researchers conducting the study asked themselves, "If I were a construction worker where would I live?" Judgmental weights were given to commute distance, shopping conveniences, unused capacity of schools, quality of schools, unused sewer capacity, unused water capacity, and general town attractiveness. With this method, six communities within a 4-to 39-mile radius of project construction were expected to absorb new residents.

- *TIME-DISTANCE.* This allocation alternative relied on time-distance from the project, with full housing availability assumed in each town. The assumption was made that all vacant lots would be used to accommodate mobile homes or travel trailers, and that local governmental officials and planners desired to attract new population.

- *HISTORICAL.* This alternative was based on historical population distribution at the time the original Chief Joseph Dam was constructed in the early 1950's, and the assumption that where people resided during previous construction they would reside again. This alternative introduced a new possibility into the analysis that was an unincorporated area located between two nearby towns. During original construction this area became a "shack city." The assumption was made that workers would move trailer living units into this location.

Judgmental Attractiveness Factors method was utilized in the basic Chief Joseph Dam community impact report in 1973 and the other methods were developed when construction workers began arriving on the scene in late 1974. For allocating construction worker related population to communities, more data is needed on the preferences of construction workers to move to certain communities. In the case of Chief Joseph Dam, time-distance to the project site was a factor more important than general attractiveness.

OTHER IMPACTS.

Other impacts that were quantified were secondary employment in retail, service and government operations; state and local tax revenues; social effects and impacts of automobile traffic on rural roads. Prior to construction activities, no analysis was performed to forecast the attitude of local residents to new worker-related population or impact of this new population on community cohesion. However, these aspects were covered in **Update III, Conditions at Peak Impact.**

SCHOOLS

SCHOOL IMPACT FUNDING.

Chief Joseph Dam, Community Impact Report, Update II: Measuring Construction-Related Impacts on Local Schools, April 1978, documented the experience of the Seattle district in assisting the local school districts of Bridgeport and Brewster. Authority to provide school facilities for dependents of persons working on Chief Joseph Dam was granted by virtue of Section 151, Public Law 94-587, 94th Congress, approved 22 October 1976. However, funding was not permitted until Fiscal Year 1978. Since the peak impact was expected to occur during the 1977-78 school year, the school districts, with support of their congressional delegations, obtained funding through passage of Section 305, Title III, Public Law 95-26, 95th Congress, approved 4 May 1977. Bridgeport schools received $1,569,000 to help finance new facilities, and Brewster received $987,000.

CONSTRUCTION PLANNING.

Age and condition of the existing elementary school at Bridgeport and the high school at Brewster, coupled with inadequate land for construction, made temporary additions infeasible. Construction authority had been granted for the provision of temporary facilities to cover the impact period. The cost of temporary facilities was approximately 80 percent of the cost of new permanent construction. New permanent facilities were constructed to house the impact students with the Federal Government contributing the value of temporary facilities and the local school districts funding the balance needed for permanent construction. Voters in the Brewster School District approved a $825,000 bond issue, and Bridgeport voters suported a $175,000 bond issue. The school districts purchased land for the permanent facilities and developed conceptual designs. Pre-construction planning provided an analysis to avoid construction of facilities in excess of those that could be reasonably utilized and maintained after construction activities ceased. Population and student projections were made for the postconstruction period up to 1990. Construction design plans were prepared for maximum flexibility so that rooms utilized as classrooms during construction could become special-purpose rooms after impact. Personnel from the Seattle District, Corps of Engineers worked closely with the impacted school districts to assess physical plant needs and provided necessary engineering and financial support. A report, not included in this volume, **Chief Joseph Dam Additional Units, Design Memorandum 51, Support to Local School Districts,** (Seattle District, Corps of Engineers, May 1977), provides substantial detail on construction plans, cost estimates, and legal considerations.

OPERATIONAL AND MAINTENANCE COSTS.

Funding for schools in the State of Washington depends heavily on local property taxes. Construction workers moving into the area to work on Chief Joseph Dam resided mostly in travel trailers or mobile homes which contributed little towards the financial support of local schools. The same construction workers, however, were responsible for a large influx of new students into the local school districts. Authority was obtained from Congress to provide Federal funds to cover any increased operating costs of the schools. Several methods of estimating increased operational costs were evaluated. The selected method provided reimbursement based on actual cost increases per impact student not covered by existing Federal or state programs. A ceiling of expenses per student was determined by average expenditures per student at 10 comparable local schools. Final methodology was coordinated with local school districts; Washington State Office of Superintendent of Public Instruction; and U.S. Department of Health, Education, and Welfare.

COMMUNITY IMPACT CONDITIONS AT PEAK EMPLOYMENT

In late 1977, most construction workers were employed at Chief Joseph Dam. During this period research was conducted to determine the social and economic effects of worker related population on local communities. A survey of the construction work force provided a construction worker profile. This information is documented in **Chief Joseph Dam, Community Impact Report - Update III, Conditions at Peak Impact,** December 1978.

FINDINGS.

Most construction workers preferred to live close to the project rather than in a community a short distance away which had more social and economic amenities. The town of Bridgeport,4 miles from Chief Joseph Dam, experienced a 65 percent population increase from 1975 (preimpact) to 1977 (peak impact). Almost half of the construction work force preferred to live in Bridgeport. The town of Brewster, 14 road miles from Chief Joseph Dam, was the place of residence of 18 percent of the construction work force. The balance of the construction work force was relatively scattered in other towns up to about 60 road miles from Chief Joseph Dam. Severe strains were placed on many local facilities and services in the towns of Bridgeport and Brewster. Quality and availability of housing were insufficient. Much of the construction-related population lived in mobile homes or trailers, apparently preferring these to available substandard housing. Local schools received the major impact and enrollments rapidly exceeded capacity. Release of authorized Federal funds for temporary school facilities and operational expenses was delayed and expanded school facilities were available approximately 2 years after they were actually needed. Sewer and water utilities operated at or in excess of capacity. Local communities had only limited success in applying for financial assistance from Federal and state agencies with funding authority for expansion of utilities. Although local health facilities were minimal, they appeared adequate during the peak impact period.

Of the two primarily impacted communities, Bridgeport was less able to provide local funds for alleviation of worker related population impacts. The Corps of Engineers only had special congressional authority to assist the community in school impacts. Relations between the community and the Corps of Engineers became significantly strained over responsibility for alleviating other impacts such as on water and sewer utilities. People in local small communities viewed the Corps of Engineers as the "Federal Government" and delay or lack of mitigation of local

impacts was considered to be due to ineffective planning or apathy on the part of the Corps of Engineers. The town of Brewster absorbed the impact with much less difficulty due to a smaller impact population, larger tax base, and more diversified economy. Other than new school facilities and crowded trailer courts the local communities exhibited little physical change from preimpact conditions.

CONSTRUCTION WORKER SURVEY.

Approximately 82 percent of the construction work force (415 out of 507) participated in the survey. The survey results indicated that over half the work force (58%) was considered local in that they lived in the same town before employment on the project. The balance (42%) were nonlocal in that they had lived in a different town prior to starting work on the project. A significant finding of the survey indicated that almost 60 percent of all workers had some unemployment in the 6 weeks prior to working on the project. Over one-fourth of all workers had been out of work for 31 or more days in the 6 weeks prior to project employment. The local labor market provided substantially more craftsmen and laborers than did the nonlocal work force. The substantial number of local craftsmen was unexpected. Apparently, many skills acquired by the local work force in agricultural and local construction jobs were available and transferable to project needs. Median age of the work force was 42.8 years. There was little difference in age distribution between local and nonlocal workers. Local workers appeared to have slightly larger families than nonlocal workers. About 40 percent of nonlocal married workers were not accompanied by their families to the project area. Approximately 229 people per 100 nonlocal construction workers moved to the impact area. For every 100 local construction workers there was an associated population of 282. For all construction workers 260 persons were associated with every 100 workers. The student-to-employee ratios were 0.81 students in the Bridgeport schools for each employee and 0.97 students in Brewster schools for each employee.

GENERAL OBSERVATIONS.

Despite major increases in retail sales and bank deposits, new businesses were not attracted to the impact area. The city revenues in the primary impact communities did not expand sufficiently to meet increased need for services. Local schools received the major impact and need for financial assistance. Community reaction concerning overcrowded schools and deteriorating services was primarily directed at the Corps of Engineers and not the construction workers. There appeared to be no permanent social or political changes taking place in the towns. Small rural communities need funds and technical assistance in applying for Federal or state financial aid with such support provided on a timely basis.

COMMUNITY IMPACT REPORT

Chief Joseph Dam

COLUMBIA RIVER, WASHINGTON

PRE-CONSTRUCTION ANALYSIS

FEBRUARY 1974
REPRINT MARCH 1980

CHIEF JOSEPH DAM
COLUMBIA RIVER, WASHINGTON

COMMUNITY IMPACT REPORT

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FIGURES

CHIEF JOSEPH ADDITIONAL UNITS
COMMUNITY IMPACT REPORT

INTRODUCTION

1.01 Purpose. This report provides information to planners, Government officials and others concerning the possible economic and socio-economic effects communities may experience as a result of raising the pool and installation of additional hydroelectric units at Chief Joseph Dam, Bridgeport, Washington. This is a planning tool which:

a. Presents results of studies to identify population impact problems that may be expected to occur;

b. Provides guidelines to selected communities to deal with problems, if they should occur; and

c. Identifies potential sources of assistance to impacted communities.

1.02 Scope. The geographic scope of the area considered for possible impact is shown on plate 1. Construction activities are expected to be initiated in late 1974 and extend to 1980. This report:

a. Projects total number of workers and their families associated with construction activities;

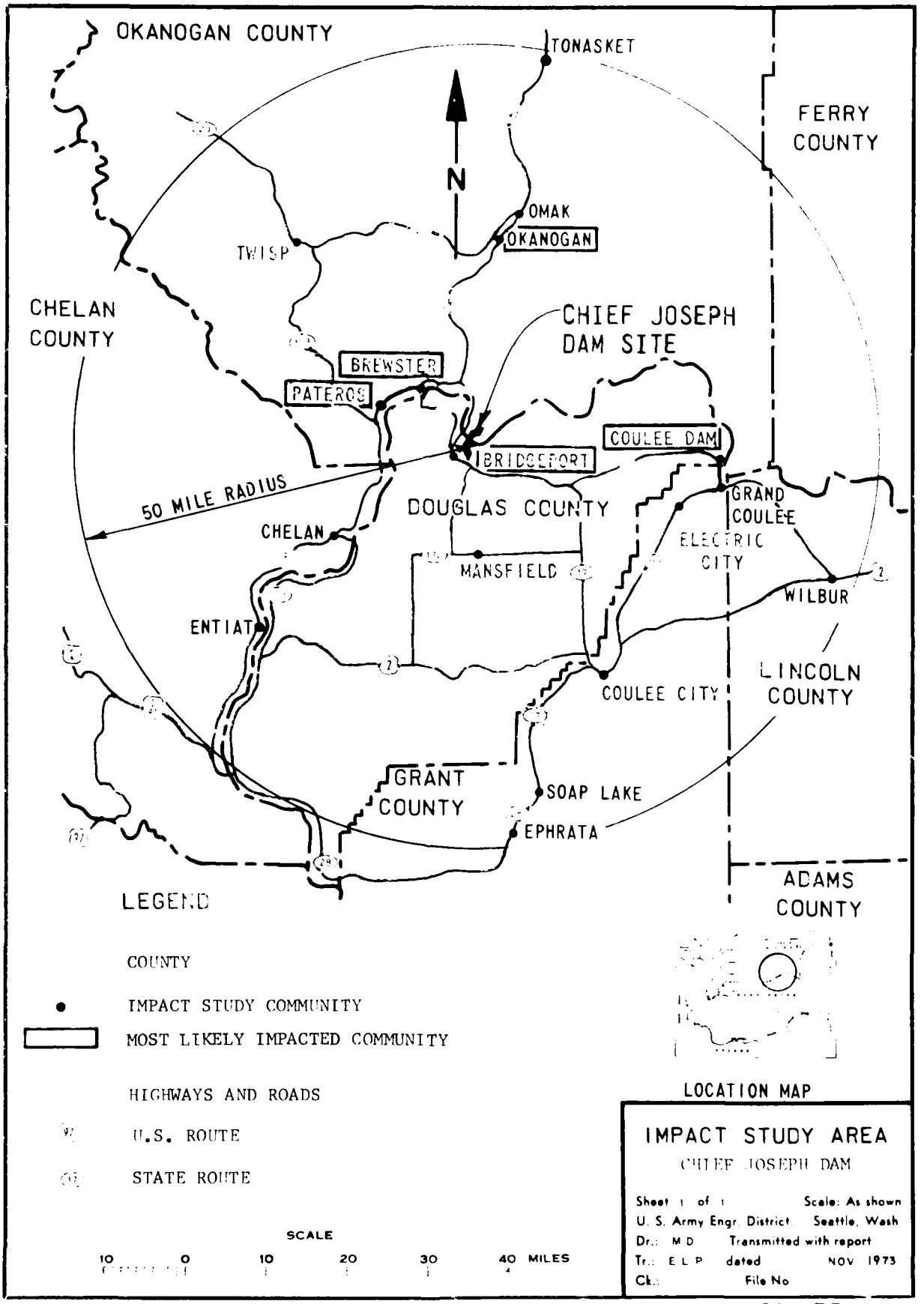
b. Inventories community public facilities and services within a normal commuting distance and for each facility or service determines current population capacity, present use and excess or deficient capacity to service additional people;

c. Identifies the most likely impacted communities and estimates normal population growth and project-related population increases; and

d. Projects potential public facilities and service problems and enumerates sources of possible financial assistance.

1.03 Construction Activity. Improvements to Chief Joseph Dam will consist of construction and installation of hydroelectric turbine units 17 through 27 and raising the pool 10 feet to elevation 956 feet. Planned construction will temporarily occur in three stages: (1) phasing-in of construction activities in late 1974; (2) peak construction activities with approximately 56 Corps of Engineers employees and 700 contractor employees on site from early 1975 through mid-1978; (3) a phasing-out of the construction work by 1980. After 1980, the small number of permanent employees operating and maintaining the additional hydroelectric units is assumed to have a very minor impact on surrounding communities. Workers on the project will be in engineering, technical and construction fields. A large part of the work force is expected to come from outside the local area. The number of workers, plus family members, could increase local population by about 2,000 persons.

CORPS OF ENGINEERS U. S. ARMY



IMPACT STUDY AREA

CHIEF JOSEPH DAM

Sheet 1 of 1 Scale: As shown
U. S. Army Engr. District Seattle, Wash
Dr.: M D Transmitted with report
Tr.: E L P dated NOV 1973
Ck.: File No

PLATE 1

SECTION 2 - DESCRIPTION OF STUDY AREA

2.01 General. Existing physical, social and economic conditions within a 50-mile radius of Chief Joseph Dam were identified. This information provides a base for evaluation of social and economic impacts due to construction activities. The study area is delineated on plate 1.

2.02 Climate. The climate exhibits seasonal characteristics of both maritime and continental air masses with warm to hot summers and moderate to cold winters. The average yearly precipitation ranges from 12 to 15 inches in the northwestern part to less than 10 inches per year in the southeastern portion. Maximum summer temperatures have been recorded over 100° F., while winter temperatures can be below zero. In the northern portion of the study area, temperature averages are in the 70's during the summer with winter averages in the 20's. The southern portion of the area is characterized by summer temperatures which average in the high 80's, and winter averages in the low 30's. Thunderstorms are frequent occurrences in the northern and western portions. High winds and blowing dust are often experienced in the more southerly portions.

2.03 Geography. The topography of the region is extremely diverse. The foothills of the Cascade Mountain Range are adjacent to the western boundary, while the less precipitous Okanogan Highlands rise toward the northern boundary of the study area. In the southern portion, the terrain begins to flatten out into the Waterville Plateau and further east into the Columbia Basin. The study area lies in the drainage basin of the Columbia River which flows south and westward, eventually emptying into the Pacific Ocean. A major geographic feature in the southeastern portion of the study area is Grand Coulee - a gorge carved by melt waters during the Ice Age.

2.04 Land Use. Most of the land in the study area is forest, range, or pasture land, or is used for agricultural purposes. In the northern portion irrigated fruit crops constitute much of the agriculture. In the southern portions of the study area, dry-land wheat farming and irrigation agriculture predominate. Rich soil, abundant summer sunshine, and the availability of irrigation water provide for highly productive agricultural activities.

2.05 Economic Activity. The economy is based primarily on agricultural activities. Principal crops are fruit, such as apples, and beef cattle in the less arid northern and western areas. In the more arid southern and eastern areas, dry-land wheat farming and irrigated crops such as potatoes and sugar beets predominate. Directly related to the agricultural sector are food processing and storage industries which provide a major source of employment. Forested areas in the north and east provide raw materials for an active lumber and wood products industry. Wholesale and retail trade and personal services, as well as tourist-related activities, constitute a significant portion of the economic base of the study area.

2.06 Recreation. An abundance of lakes and streams offer ample opportunity for water-oriented recreational activities such as fishing, boating, and swimming. Deer and elk in the hills and valleys of the northern and western portions of the area offer hunting opportunities. Due to irrigation in the southwestern portion of the area, upland birds and waterfowl abound. Winter sports include skiing, ice-skating, ice-fishing, snow-tobogganing and snow-touring within easy driving distance of most communities. Community recreation and entertainment vary with community size, and range from concerts, historical museums, and movie theatres, to parks, bowling alleys, swimming pools, golf courses and tennis courts.

2.07 Forms of Government. Incorporated communities generally have a mayor-city council form of government. The majority of the incorporated communities have planning commissions. Many communities have zoning ordinances and building codes. In some communities which do not have a planning commission, building codes and zoning ordinances are enforced. Unincorporated communities generally have no formal governing bodies and are under the jurisdiction of the county. Another form of government is the Colville Indian Nation. The Confederated Tribes of the Colville Indian Nation are governed by the Colville Business Council, the chairman of which is the titular head of the community. Business Council has authority for establishing such regulations as building codes and zoning ordinances. The area within the Colville Reservation has building codes and zoning ordinances.

2.08 The Communities. The communities within a 50-mile radius of the project are listed in the following table.

TABLE 1

COMMUNITIES WITHIN 50-MILE RADIUS
OF CHIEF JOSEPH DAM

	County	Community	Road miles from Chief Joseph Dam	Population 1960	1970	1973
1.	Douglas	Bridgeport*	4	876	952	1,060
2.	Douglas	Pearl	10			
3.	Okanogan	Monse	13			
4.	Okanogan	Brewster*	14	940	1,059	1,143
5.	Douglas	Leahy	16			
6.	Okanogan	Wakefield	17			
7.	Douglas	Mansfield*	18	335	273	303
8.	Okanogan	Pateros*	21	673	472	530
9.	Douglas	Del Rio	21			
10.	Douglas	Withrow	25			
11.	Okanogan	Malott	29			
12.	Okanogan	Okanogan*	31	2,001	2,015	2,225
13.	Okanogan	Methow	31			
14.	Chelan	Azwell	31			
15.	Okanogan	Omak*	36	4,068	4,164	4,400
16.	Grant	Grand Coulee*	38	1,058	1,302	1,586
17.	Douglas	Saint Andrews	38			
18.	Grant	Electric City*	39	404	651	864
19.	Douglas) Grant) Okanogan)	Coulee Dam*	39	1,344	1,458	1,652
20.	Okanogan	Elmer City	40	265	324	399

*Selected for IMPACT ANALYSIS.

	County	Community	Road miles from Chief Joseph Dam	Population 1960	1970	1973
21.	Okanogan	Conconully	41	108	122	135
22.	Chelan	Chelan*	41	2,402	2,837	2,920
23.	Grant	Coulee City*	41	654	558	588
24.	Chelan	Chelan Falls	44	2,402	2,430	
25.	Okanogan	Riverside	44	201	228	255
26.	Okanogan	Disautel	46			
27.	Chelan	Manson	49			
28.	Douglas	Beebe	50			
29.	Okanogan	Twisp*	50	750	755	777
30.	Grant	Hartline	50	206	189	176
31.	Okanogan	Carlton	51			
32.	Chelan	Winesap	51			
33.	Okanogan	Nespelem	56	358	323	335
34.	Lincoln	Wilbur*	57	1,138	1,074	1,140
35.	Grant	Soap Lake*	57	1,591	1,064	1,206
36.	Okanogan	Tonasket*	59	958	951	970
37.	Grant	Hanson	60			
38.	Chelan	Entiat*	60	357	360	373
39.	Grant	Ephrata*	62	6,548	5,255	5,150
40.	Ferry	Nine Mile	65			
41.	Chelan	Farris	65			
42.	Lincoln	Govan	65			
43.	Chelan	Wagnersburg	65			

*Selected for IMPACT ANALYSIS.

	County	Community	Road miles from Chief Joseph Dam	Population 1960	1970	1973
44.	Douglas	Orondo	67			
45.	Okanogan	Winthrop	68	359	371	378
46.	Grant	Stratford	68			
47.	Douglas	Douglas	68			
48.	Chelan	Ardenvoir	69			
49.	Lincoln	Almira	69	414	376	405
50.	Okanogan	Aeneas	71			
51.	Douglas	Waterville	72	1,013	919	950
52.	Grant	Winchester	74			
53.	Grant	Wilson Creek	76	252	184	206
54.	Ferry	Keller	77			
55.	Chelan	Olds	77			
56.	Grant	Krupp	82	99	52	77
57.	Douglas	East Wenatchee	82	383	913	1,003
58.	Chelan	Wenatchee	82	16,726	16,912	17,950
59.	Chelan	Monitor	82			
60.	Grant	Moses Lake	83	11,299	10,310	10,200
61.	Chelan	Appleyard	84			
62.	Chelan	Cashmere	85	1,891	1,976	1,987
63.	Douglas	Farmer	85			
64.	Ferry	West Fork	86			
65.	Chelan	Brief	90			
66.	Chelan	Malaga	90			
67.	Douglas	Rock Island	90	260	191	222

	County	Community	Road miles from Chief Joseph Dam	Population 1960	1970	1973
68.	Chelan	Holden	92 (43 via ferry)			
69.	Chelan	Moore	94 (45 via ferry)			
70.	Chelan	Leavenworth	94	1,480	1,322	1,322
71.	Chelan	Chumstick	96			
72.	Chelan	Stehekin	99 (50 via ferry)			
73.	Chelan	Lucerne	101 (43 via ferry)			
74.	Chelan	Plain	105			
75.	Douglas	Appledale	107			
76.	Douglas	Palisades	111			

2.09 As of 1973, about 66,000 people resided within a 50-mile radius of the project. Only those communities within about 60 road miles of the project are expected to experience some impact from the construction work force. Seventeen communities with existing public facilities, personal services and commercial establishments were selected as the most likely to be the most convenient and attractive to new residents. The 17 communities which are underlined and starred in the above table are shown in the map on plate 1. The 1973 aggregated population of these communities was 26,887. The Colville Indian Reservation, established in 1872, is a viable and functional community. The project is located adjacent to the southwest corner of the reservation which covers about 2,030 square miles. The reservation land area near the project is sparsely populated with a few dwellings and scattered farms and ranches. Minor impact of construction activity is expected to be confined to employment for some reservation inhabitants and a few residential homes for construction workers.

2.10 Public Facilities and Services.

a. Transportation. The main highway transportation network is shown on plate 1. U.S. Highway 97 and State Highway 17 are the major north-south routes. U.S. Highway 97 bisects the northern half of the area and State Highway 17 crosses the southern half. These two all-weather highways will quite likely serve as north-south access routes to the project for construction workers commuting from many of the towns in the area. U.S. Highway 2 follows an east-west course through the southern portion of the area. This highway provides year-round access to the Puget Sound area via Stevens Pass as well as to Spokane, Washington,

and routes to the northern United States. In addition, U.S. Highway 2 intersects State Highway 17 near Coulee City and thus will likely serve in conjunction with State Highway 17 as a major access route to the project site. A system of good county roads supplements the above highways and provides good access to all towns in the area. Rail service for freight hauling is provided to all counties and to many of the individual communities. A commercial airport is at Ephrata in the southern portion of the study area and several landing strips serve smaller towns. Minor airports nearest to the project are at the towns of Brewster, Electric City, Chelan, Mansfield, and Omak (Riverside).

b. Electricity Distribution. Relatively low-cost electrical power is provided primarily through public utility districts. Existing power services appear to be adequate in meeting foreseeable residential and commercial demands.

c. Communication. Telephone service is provided by Pacific Northwest Bell, General Telephone Company, and local telephone companies. Areas around Omak and Ephrata, Chelan and Coulee Dam - Grand Coulee, are served by local radio stations. Several weekly newspapers are available to local residents.

d. Schools. Schools in the 15 high school districts are accredited by the Washington State Board of Education. While differences in accreditation rating numbers indicate that some of the school districts have fewer educational problems to overcome than others, school facilities are generally quite good. Projected 1974-75 school year enrollment in the 17 study communities is 10,545 students with excess capacity for about 3,130 additional students. Appendix B contains detailed information on school facilities in the study area.

e. Health Services. Medical, dental, clinical and associated services are widely dispersed. The study communities are all within 32 road miles of hospital facilities. The average distance of the communities from the nearest hospital is 8.8 road miles. Most of the area hospitals, either because of their location near the borders of adjoining counties or because they provide specialized facilities, serve areas which extend beyond the county in which they are located. Twelve hospitals in the area provide 493 beds with a population service capacity of about 88,000. Overall occupancy during mid-1973 was about 60 percent. Detailed description of existing facilities is in Appendix B. All hospitals except the Wenatchee Ear and Eye Hospital provide general medical and surgical services.

f. Water Supply. Both ground and surface water supplies are abundant. The 17 towns use wells, springs, rivers and lakes as water sources. Alluvial deposits near Brewster, Bridgeport, Okanogan and Omak yield moderate to large quantities of water for municipal use. Those municipalities relying on water obtained from the Columbia and Chelan Rivers' drainages have adequate quantities of good quality surface water.

Treatment of ground water in this area is not extensive, although some of the larger towns do provide purification. Coulee Dam uses zeolite pressure filters for hardness removal. Nearly all municipalities utilizing surface or mixed sources provide purification. The water facilities in the 17 communities have a total maximum supply capability of about 40 MGD of which about 34 MGD is available to homes and small businesses. Excess capability is available for an additional population of about 99,728. Detailed data on water supply is shown in Appendix B.

g. Sewage Disposal Systems. Of the 17 communities, 15 have municipal sewage systems and treatment facilities. The two without municipal systems are Electric City and Twisp. The Electric City sewage system discharges into the Grand Coulee wastewater treatment plant, and Twisp residents use individual septic tanks for waste treatment. The following tabulation indicates the 17-community composite sewage disposal systems capacity, use, and excess capacity. Town summary data describe sewage disposal systems in each community.

	Number of people
Existing capacity	44,678
Existing usage	25,003*
Excess capacity	19,675

*The existing usage is not equal to the total population of the 17 towns because some sewage systems extend beyond the town limits, while others do not provide for the entire town.

h. Police Protection. Four of the 17 towns contract county sheriffs for police protection. Electric City contracts the Grand Coulee Police Department. The remaining 12 have their own organized law enforcement services. The following tabulation summarizes the composite law enforcement capability of the 17 communities.

	In numbers of people served
Existing total capability	51,835
Existing population	26,887
Excess capability	24,948

i. Fire Protection. All 17 communities have organized fire departments. Two of the towns, Okanogan and Omak, employ full-time fire chiefs to direct volunteer fire crews. The remaining communities have all-volunteer personnel. All the communities have adequate equipment to serve foreseeable needs. The following tabulation indicates the composite capabilities for fire protection throughout the 17 communities. In some cases, communities have adequate equipment to support a population increase, but have fewer volunteers than suggested by the standards used

for either the town's present population or a population increase. For purpose of this tabulation, existing capability of the fire department in these communities was assessed as being equal to the town's present population. Additional fire protection information is found in each town summary.

	In numbers of people served
Existing capabilities	65,390
Existing population	26,887
Excess capabilities	38,503

j. Planning and Zoning. Currently, 11 of the 17 communities have planning commissions. Entiat, Mansfield, Bridgeport, Coulee City, Wilbur and Twisp do not have local planning commissions, but generally follow the guidance of county planning agencies. Mansfield is the only town that does not require building permits and does not have building codes. All of the 17 towns but Wilbur have zoning ordinances.

k. Solid Waste Disposal. Currently, nine of the 17 towns provide solid waste collection services. Five of these have contracts with commercial solid waste collection companies. Residents of Twisp and Entiat individually arrange with commercial collectors for solid waste collection. There are no solid waste collection services available for residents of Tonasket, Mansfield, and Coulee City. Eleven of the 17 towns own and operate sanitary landfills; four own municipal dumps. Twisp and Tonasket do not own disposal areas; however, privately owned sanitary landfills are available to town residents.

l. Housing. A preliminary type housing survey was conducted during November 1973 for each of the 17 towns selected for impact analysis. The housing survey is tentative and is not representative of the situation during summer months when most housing is in very short supply. The survey indicated that adequate vacant housing was in short supply in almost all towns within about 60 road miles of the project site. About 12,500 dwellings exist in the 17 communities of which about 2,800 were rental units. Very few dwellings were vacant and for sale, and the vacancy rate on the rental dwellings averaged about 9 percent (250 units). Apartment units in the 17 towns were also in short supply, with a total of 870 units available and a vacancy rate which averaged about 9 percent (80 units). There are about 30 trailer parks with about 1,000 spaces in the impact towns and at the time of the survey the trailer parks had an average vacancy rate of about 35 percent (350 units). Rental rates for dwellings varied from $60 to $225 per month. Usually, tenants of dwellings (single family units) were responsible for paying for the water, sewer, electric, and garbage collection services. The rental rates for apartments (structures containing two or more units) varied between $60 and $200 per month

with the tenant usually paying for the electric service. The rental for trailer spaces ran from $25 to $60 per month with the tenant paying for electric service. The study area generally experiences a critical supply of housing and trailer spaces during summer months when recreationists and agricultural workers are in the area. Motel units were not included in the survey. One-room motel units are available in most towns and may be available for bachelor-type quarters. However, during the summer months when the demand for this type of unit is high, owners and operators would probably desire to have the units available at high rates for overnight occupancy by travelers.

2.11 Civic Organizations. Service, fraternal, and businessmen's associations are representative of those nationwide organizations found in other parts of the country. Organizations are exemplified by the Elks, Moose, and the Chamber of Commerce. Organized youth activities can be found in such groups as the Boy Scouts, Girl Scouts, 4-H clubs, and Future Farmers of America.

2.12 Churches. Churches encompass most religious faiths. As in most rural areas, churches serve more than a religious function in that they often act as centers for social gatherings for town inhabitants and for people in outlying rural areas. Church personnel are also more likely to perform personal counseling functions for parishioners than would be the case in more urban areas.

2.13 The Individual, The Family and Society. Interactions among residents are likely to be informal and face-to-face, as opposed to the formal and impersonal relationships often characteristic of urban society. When compared with urban society, the family assumes more importance to the average individual in a rural environment. Family groups are more likely to engage in social events and recreational activities. Important family members are likely to include uncles, aunts and other relatives outside the conjugal family unit. Rural value systems are likely to stress autonomy, thrift and honesty. A high level of community solidarity often exists with regard to these values, and an individual usually has a clear picture of the type of behavior expected of him in the community. In summary, families are likely to be quite closely knit and people are likely to feel they have much in common with one another.

2.14 The Indian community is characterized by a way of life which is often quite different and distanct from that of other residents. However, the function of all families regarding the rearing of children is basically the same. That function is to aid in teaching the young the cultural traditions and beliefs of the group in which they grow up. The Indians, as well as the other families in the study area, accomplish this goal to one degree or another.

SECTION 3 - PROJECT EMPLOYMENT AND POPULATION PROJECTIONS

3.01 General. Construction work and installation of additional hydroelectric units at Chief Joseph Dam will involve people employed by contractors and Corps of Engineers. Most of the employees will locate near the project during the construction period. Many employees will probably be accompanied by their families. Projection of total population includes consideration of local employment of people who currently reside locally.

3.02 Employment. During late 1974 the activity for construction of the additional units is expected to be in a "phasing-in" process. The following projected employment schedule is only tentative and can be altered by Congressional funding delays or other future funding problems. Approximately 40 government and contractor employees will be on site toward the end of 1974. The construction activities will commence in 1975 with about 56 government employees and 700 contractor employees on site by approximately mid-1975. This peak employment of approximately 756 employees will continue through 1976 and 1977, and start phasing out in the spring of 1978. By mid-1978 approximately 250 contractor and 56 government employees will be on site. This remaining construction force will remain relatively stable until mid-1979. All major construction and installation activities will be completed by approximately the first part of 1980. See figure 1. Due to the type of construction activity and usually moderate winters, employment is considered to remain relatively stable throughout all seasons. It may decrease for short periods during winter months because of adverse weather conditons.

3.03 Population - Induced. Determination of project-induced population increase was based on actual experience during recent construction activities on the third powerhouse and additional hydropower units at Grand Coulee Dam. This project, although larger than the Chief Joseph project, provides background for total projections related to a similar work force. The population projection takes into consideration workers with families, bachelor workers, geographical bachelors (workers without families) and workers hired from the local labor market. To determine the number of persons per family, family size averages for the United States were obtained from the 1970 Census. Total population increase attributable to government construction employees is approximately 170 people. The population increase related to contractor employees is approximately 1,830 of a total project induced peak population of 2,000 people. This peak will continue from mid-1975 through about the first quarter of 1978 when construction activities will start a phase-out process. By mid-1978 the population related to project activities will decrease to about 800 and to about 675 in late 1979. By early 1980 it is expected that all workers and their families related to project construction activities will move out of the area. See figure 1.

3.04 Population - Normal. In addition to population increase induced by the project, the area will also experience population changes attributable to natural increase and migration. The following table shows the estimated increase in population based on historical trends for each of the 17 towns which may be impacted by project construction activities:

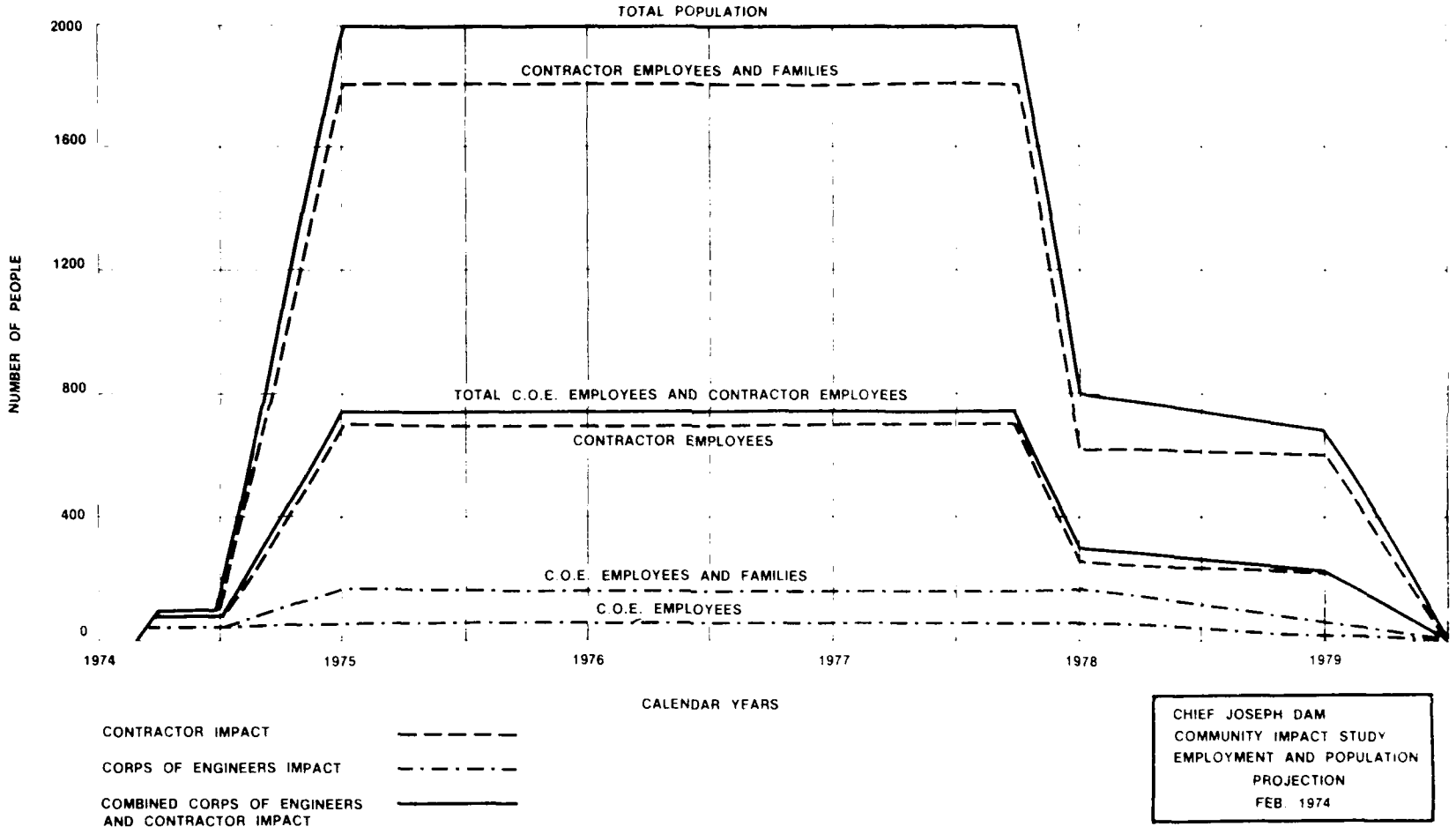

TOTAL POPULATION
CONTRACTOR EMPLOYEES AND FAMILIES
TOTAL C.O.E. EMPLOYEES AND CONTRACTOR EMPLOYEES
CONTRACTOR EMPLOYEES
C.O.E. EMPLOYEES AND FAMILIES
C.O.E. EMPLOYEES
NUMBER OF PEOPLE
2000
1600
1200
800
400
0
1974
1975
1976
1977
1978
1979
CALENDAR YEARS
CONTRACTOR IMPACT
CORPS OF ENGINEERS IMPACT
COMBINED CORPS OF ENGINEERS AND CONTRACTOR IMPACT
CHIEF JOSEPH DAM
COMMUNITY IMPACT STUDY
EMPLOYMENT AND POPULATION
PROJECTION
FEB. 1974

FIG. 1

Table 2

POPULATION PROJECTIONS 1/
17 STUDY TOWNS
1973-1980

Town	1973	1975	1978	1980
Brewster	1140	1200	1300	1370
Bridgeport	1060	1140	1260	1360
Chelan	2920	2980	3070	3130
Coulee City	590	--	--	-- 2/
Coulee Dam	1650	1800	2040	2220
Electric City	860	--	--	-- 2/
Entiat	370	380	400	410
Ephrata	5150	5150	5310	5410
Grand Coulee	1590	--	--	-- 2/
Mansfield	300	330	360	390
Okanogan	2220	2380	2630	2840
Omak	4400	4570	4840	5020
Pateros	530	570	640	690
Soap Lake	1210	1310	1490	1620
Tonasket	970	1000	1020	1040
Twisp	780	790	820	830
Wilbur	1140	1190	1260	1310

1/Normal growth without impact of Chief Joseph construction activity.

2/Not estimated due to phaseout and phase in of Coulee Dam construction activity.

SECTION 4 - COMMUNITY IMPACT

4.01 General. Construction and installation activities at Chief Joseph Dam will cause a local population increase of 2,000 people for about 2.5 years. The community impact analysis determined where these people may be expected to live and the existing capability of these communities to absorb the increased population.

4.02 Construction employees will most likely live within a short commuting distance of the project site. Possible gasoline shortages may require car pools and the use of buses. Other criteria employees are likely to consider in selecting a community are quality and capacity of school systems, adequacy of shopping facilities, quality and capacity of water and sewer systems, other public facilities and general attractiveness of the community. Existing available housing is in short supply in all nearby communities and living quarters will probably consist of house trailers or large campers. Based on experience with other large construction projects, about 25-30 percent of construction workers will bring in their own units. Additional trailer housing will have to be provided by private enterprise, major project contractors, or local or Federal Government or by joint sponsorship. The short project construction period of 2.5 years will not likely attract private investment funds for permanent housing.

4.03 Five towns within 35 miles, over improved highways, of the project were projected to absorb the 2,000 increase of project population. These towns and their estimated project-related population increases were determined by a weight system that included selection criteria such as commuting distance, capacity of public facilities, and other attractive factors. These towns are Brewster, Bridgeport, Coulee Dam, Okanogan and Pateros.

4.04 Brewster, Washington.

	ESTIMATED POPULATION		
	Normal	Impact	Total
1973	1,140	---	1,140
1975	1,200	1,000	2,200
1978	1,300	1,000	2,300
1980	1,370	---	1,370

4.05 Brewster, in Okanogan County, is approximately 14 road miles northwest of Chief Joseph Dam. The city has a planning commission and building codes, and requires building permits. The city zoning ordinances include the use and location of mobile homes.

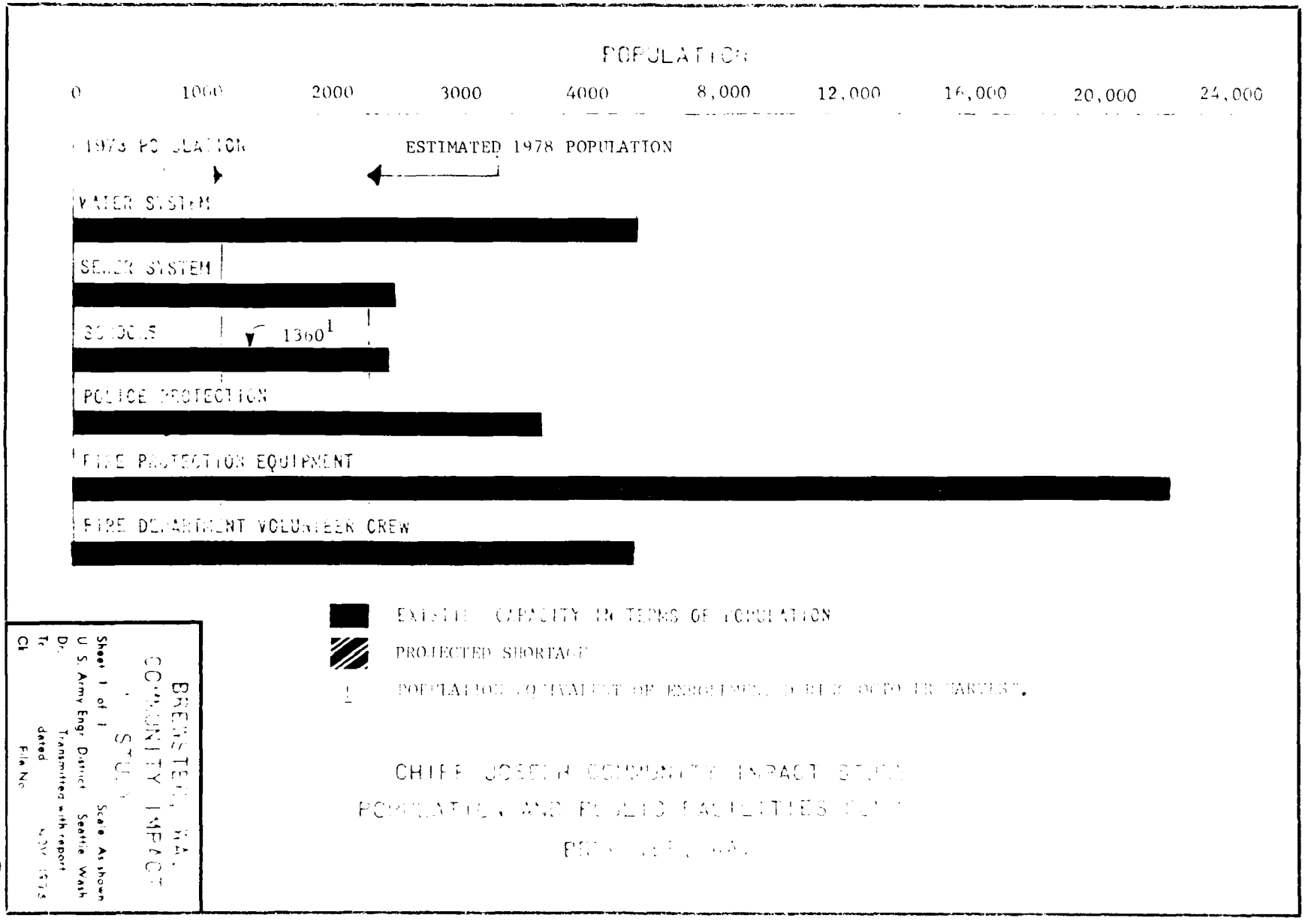
4.06 The school system, which is part of Consolidated District Number 111, has facilities for kindergarten through grade 12, with a present maximum capacity of 762 pupils. The school system is planning to expand its facilities which will create space for 96 to 128 more pupils by September 1974. The estimated 1975 school capacity is 890. Projected 1974-1975 school year enrollment without consideration of Chief Joseph Dam construction is 554. The estimated 260 impact students will increase enrollment to 814 in 1975. The annual impact of harvest labor raises the student enrollment by approximately 56 students during the month of October only. Brewster's high school is rated 1.

4.07 Solid waste is collected by the town and disposed by sanitary landfill measures. Brewster has a sanitary sewage system serving the entire town; the design population equivalent is 2,500. The town's water supply, pumped from two wells and a spring, has a daily supply capacity of 1,800,000 gallons; average daily use is 1,060,000 gallons. An estimated 73 percent of the water supplied daily is used by small businesses and homes within the city limits. The daily average per capita use of this 773,800 gallons is 678.7 gallons. Water usage is metered. The estimated population capacity of Brewster's water system is 5,750.

4.08 The 20-man volunteer firefighting crew operates three pumper trucks and a tanker. The area fire insurance rating is 6 on a scale of 1 to 10, with 1 being ideal. Fire hydrants are spaced throughout the town; water pressure and storage capacity are satisfactory for this purpose. According to the National Board of Fire Underwriters, three pumper trucks, if adequately manned, can provide standard protection for 22,100 residents. By the same standards the volunteer crew is of sufficient size to operate one pumper truck and protect up to 5,400 residents. Brewster employs 4 law enforcement officers. The town's population could increase to 3,636 without exceeding the average police protection-to-population ratio for rural areas in the United States.

4.09 Brewster currently has a modern 35-bed hospital with construction underway to increase the number of beds to 50 with a population service capacity of 8,621. In addition, the town has a five-doctor medical clinic, a dentist and an optometrist.

4.10 A survey indicated that available vacant housing was in short supply. Approximately 80 of the 430 dwellings in Brewster are rental type residences. The survey showed 15 rental vacancies with monthly rates from $80 to $150. The town has about 41 apartment units, of which only 4 were vacant. Apartment rentals ranged from $75 to $150 per month. The town has one trailer court with facilities for 100 trailers. At the time of the survey 50 vacancies existed at rates of $35 to $50 per month. The rental charge includes sewer, water, and solid waste collection. The report Temporary Family Housing, Design Memorandum 41, Chief Joseph Dam, Columbia River, Washington, Seattle District, Corps of Engineers, November 1973 contains a plan to provide mobile home accommodations for government employees during the construction period. The report recommends purchase of up to 38 mobile home units and that these units plus 4 spaces



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES

BREWSTER, WASH.

COMMUNITY IMPACT STUDY

Sheet 1 of 1 Scale As shown

U S Army Engr District Seattle Wash

Transmitted with report

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dated

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File No

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NOV 1975

PLATE 2

CORPS OF ENGINEERS

U S ARMY

for employee-owned mobile homes be located in mobile home parks in the cities of Brewster and Bridgeport.

4.11 Plate 2 graphically presents the capacity of public facilities in Brewster. Information available in mid-1973 indicates that public facilities, except housing, are generally adequate to support the estimated 1,000 increase in population which may be composed of about 230 families. Approximately 60 families are expected to have their own house trailers or campers and will require trailer spaces. Appendix D, Synopsis of Possible Economic Impact Assistance, contains information on financial assistance that may be available to meet housing needs.

4.12 Bridgeport, Washington.

	ESTIMATED POPULATION		
	Normal	Impact	Total
1973	1,060	---	1,060
1975	1,140	300	1,440
1978	1,265	300	1,565
1980	1,360	---	1,360

4.13 Bridgeport, in Douglas County, is 2 road miles from Chief Joseph Dam. The city does not have a local planning commission. Planning assistance is provided by Douglas County. The city requires building permits and has building codes. Although there are zoning ordinances, there are no restrictions on the location or use of mobile home trailers.

4.14 The school system has facilities for grades 1 through 12, with a present maximum capacity of 446 pupils. At the present time, the grade school is operating at full capacity and no plans have been made to expand these facilities. However, the high school, rated 2, is capable of accommodating 60 more students. The present enrollment and the projected 1974-1975 school year additional enrollment, without consideration of Chief Joseph Dam construction, is 386 students. Chief Joseph construction activity is expected to add about 80 students to the enrollment in 1975, making a total enrollment of 466.

4.15 The city provides solid waste collection service and operates a municipal dump. This refuse site is "unsanitary; uncontrolled burning, rodents, insects and inadequate cover operations are principal deficiencies." 1/ The Bridgeport sewage system includes secondary treatment facilities with a population equivalent of 1,350. 1/ Bridgeport obtains water from two wells at a maximum daily pumping capacity of 1,580,000 gallons; average daily use by small businesses and homes within the city limits is 150,000 gallons. Average per capita water use presently is

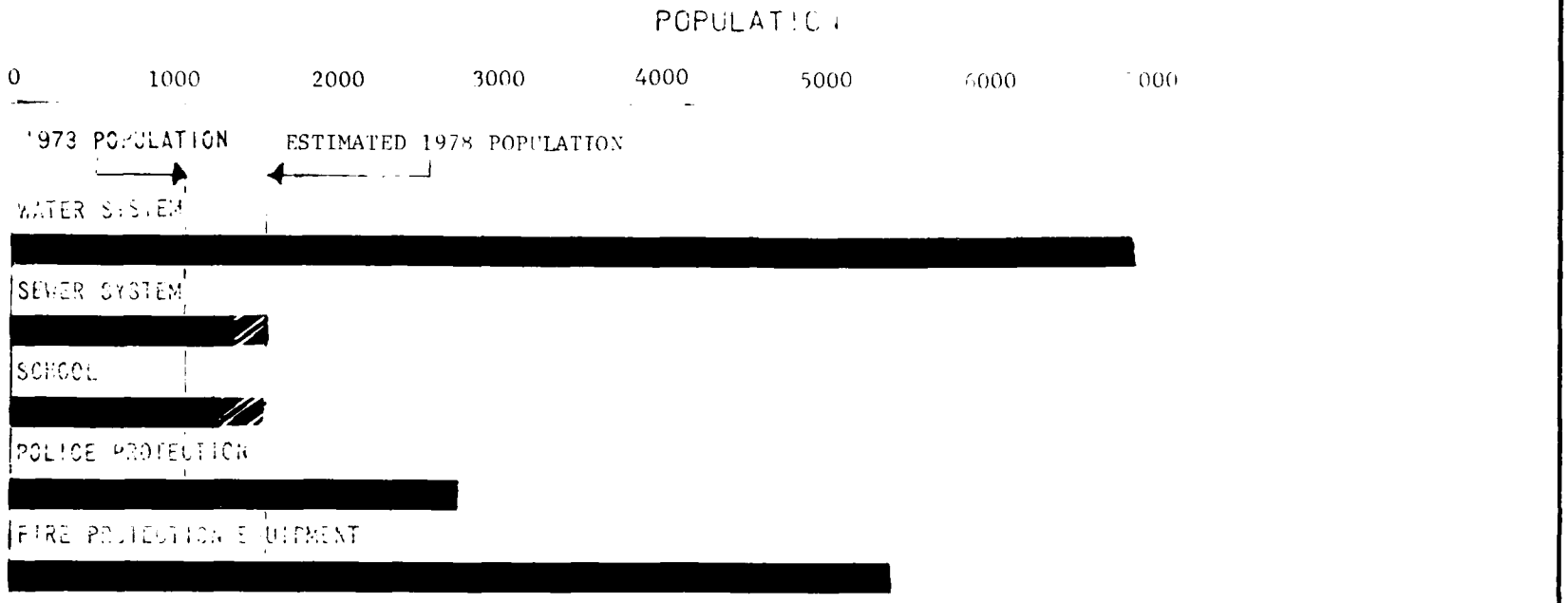
1/Douglas County, Washington Comprehensive Water and Sewer Plan, 1970-1990, prepared by Munson-Nash-Futrell and Associates, submitted 26 August 1969.

141.5 gallons per day. The estimated population capacity of this system is 6,900. Water usage is metered.

4.16 Bridgeport owns one pumper fire truck and has a 15-man volunteer firefighting crew. The area fire insurance rating is 7. According to the standards set by the National Board of Fire Underwriters, the fire protection equipment, if properly manned, is adequate for 5,400 people. By the same standards the volunteer crew is five men below the number required for the present population. The city contracts with Douglas County for the services of three deputy sheriffs, a ratio of one sheriff for every 353 residents. This is 556 fewer residents per sheriff than the average number of residents per police officer for rural areas in the United States.

4.17 Existing vacant housing is in short supply in Bridgeport. A preliminary survey indicated about 400 dwelling units in the city. About 10 houses were rentals and of these only about two were vacant. House rentals when available cost from $70 to $110 per month. Of about 32 apartment-type units, approximately 12 were vacant at monthly rents of $65 to $100. The three trailer parks in Bridgeport provide 45 spaces. About 20 spaces were vacant and monthly space rentals range from $35 to $50.

4.18 Generally, the analysis of the public facilities and projected population indicates a possible shortage of school, sewer system and housing facilities. The shortages measured in terms of people are shown graphically on plate 3. The school system will need space for approximately 20 additional students in 1975. The capacity of the sewage secondary treatment facilities will have to be expanded to service 90 additional people by 1975, 120 by 1985, or a total of 210 by 1985. This assumes all new residents would be on the municipal sewage system. About 70 construction related families will need housing in Bridgeport in the period 1975-1978. About 20 families are expected to have their own house trailers or campers and will require trailer spaces. Some government employees are expected to occupy existing mobile home trailer spaces. Appendix D, Synopsis of Possible Economic Impact Assistance, contains data on financial assistance available to meet school, sewage and housing needs.



EXISTING CAPACITY IN TERMS OF POPULATION

PROJECTED SHORTAGE

CHIEF JOSEPH COMMUNITY IMPACT [illegible]

POPULATION AND PUBLIC FACILITIES [illegible]

BRIDGEPORT, WA.

BRIDGEPORT, WA.
COMMUNITY IMPACT
STUDY

Sheet of Scale As shown
U.S. Army Engr. District Seattle, Wash
Drg. Transmitted with report
Tr. dated
Ck. 196
File No.

PLATE 3

CORPS OF ENGINEERS

U.S. ARMY

4.19 Coulee Dam, Washington.

	ESTIMATED POPULATION		
	Normal	Impact	Total
1973	1,650	---	1,650
1975	1,800	400	2,200
1978	2,035	400	2,435
1980	2,215	---	2,215

4.20 The city of Coulee Dam straddles the Okanogan-Douglas County line and is 30 road miles east of Chief Joseph Dam. Like neighboring communities of Grand Coulee and Electric City, Coulee Dam is a product of construction of Grand Coulee Dam. Combined resources with the other two towns provide community services and facilities. Coulee Dam has a planning commission and building codes, and requires building permits. City zoning ordinances regulate the use and location of mobile home trailers.

4.21 The Grand Coulee Dam schools, School District 301J, include all public schools in Grand Coulee, Electric City, and Coulee Dam. The district has facilities for kindergarten through grade 12 and has a maximum capacity of 1,200 students. The current enrollment is 1,509 students. The projected 1974-1975 school year enrollment, without consideration of the Chief Joseph Dam construction is 1,450 students or a shortage of facilities for 250 students. The inflated enrollment is due to construction on Grand Coulee Dam which may be continued into 1975-1976. Ten relocatable classrooms and a building which the school district declared substandard are presently housing the overflow of students under crowded conditions. In spite of these temporary facilities and somewhat crowded conditions, the Grand Coulee Dam School District has maintained a good quality educational program. The school superintendent states that these temporary facilities will not be adequate if enrollments fail to subside or if they should increase. The high school is rated 1. About 100 students are expected to be added to the enrollment by construction activities at Chief Joseph Dam.

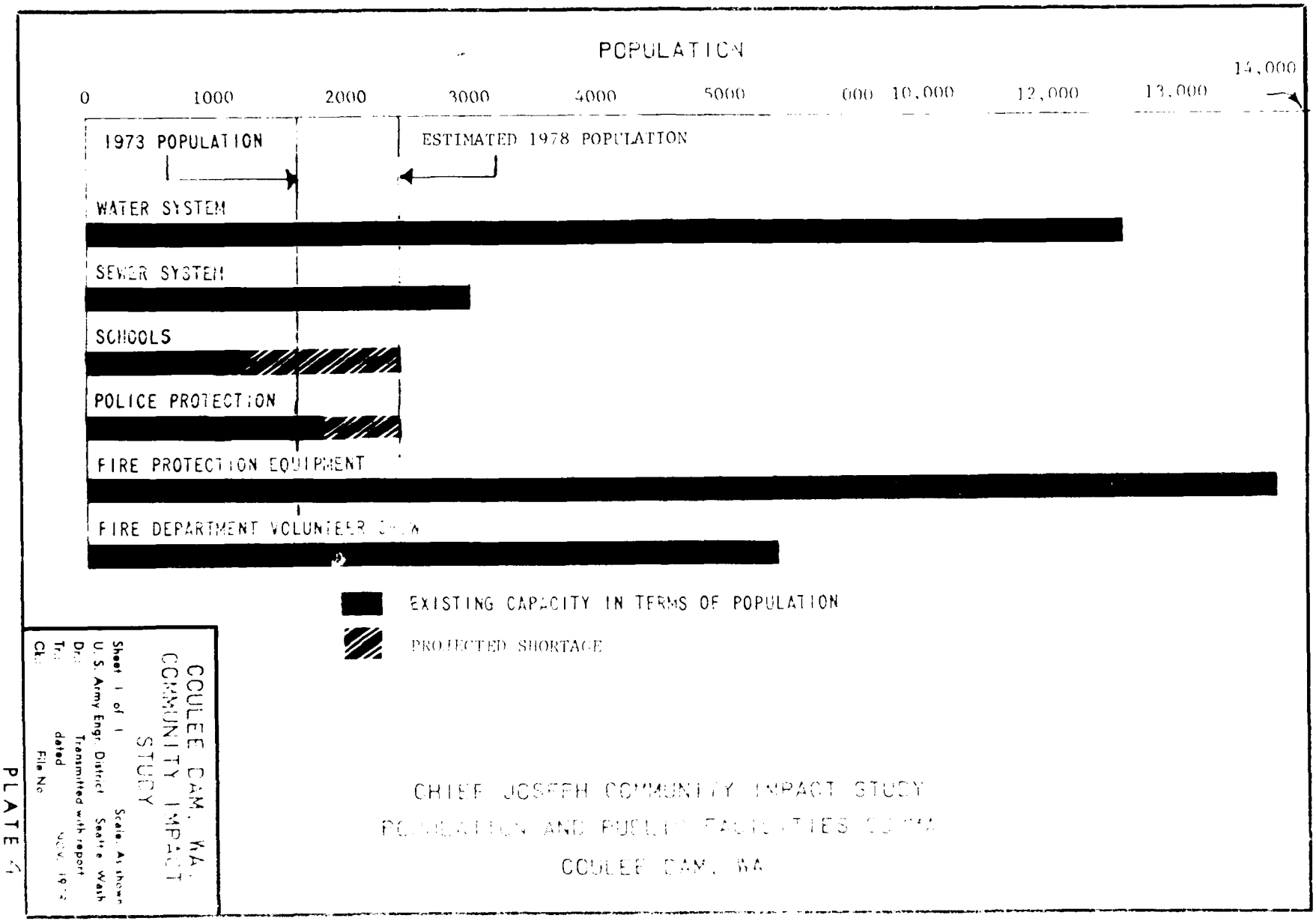
4.22 Grand Coulee, Electric City, Elmer and Coulee Dam contract a commercial solid waste collection company. The four towns also share a sanitary landfill located on land owned by the U.S. Bureau of Reclamation. Coulee Dam sewage facilities, including secondary treatment, have a population equivalent capacity of 3,000. The city's treated water supply comes from the Columbia River, Roosevelt Lake and springs. The total supply capacity is 2,880,000 gallons per day. Total reservoir capacity is 3,400,000 gallons. Average use by small businesses and homes within the city limits is 800,000 gallons daily. The average per capita use is 484.2 gallons daily. This seemingly high consumption rate may be due to

leakage within the system, but because customer services are not metered there is no means of substantiating this. The estimated population capacity of the Coulee Dam water system is 12,600.

4.23 The Coulee Dam Fire Department consists of a 28-man volunteer crew and two pumper trucks. Fire hydrants are spaced throughout the town and there is adequate water storage for this purpose. The fire insurance rating for this area is 5. According to the standards used by the National Board of Fire Underwriters, two pumper truck companies, adequately manned, are sufficient protection for populations up to 13,800. By the same standards, a 28-man crew is more than sufficient for a population of 5,400. The city employs two police officers, a ratio of one officer to every 825 residents. This is 84 fewer residents per police officer than the average for rural areas of the United States.

4.24 As shown graphically on plate 4, public facilities, except schools, are adequate to accommodate the approximate 400 people related to the Chief Joseph Dam construction activities. Available vacant housing is in short supply. A preliminary survey indicated that there were 460 houses in the town of Coulee Dam. Ninety-two of these were rental units, with 12 vacancies. Monthly rentals for dwellings range from $80 to $200. Apartment units number about 44 with 4 vacancies. Apartment rentals are $60 to $180 per month. One trailer park provides 186 spaces of which 71 were vacant. Trailer space rentals range from $35 to $60 per month. Appendix D, Synopsis of Possible Economic Impact Assistance, contains data on financial assistance that may be available to meet school and housing needs.

4.25 Present information indicates that when the new powerhouse at Grand Coulee Dam is completed by January 1975, about 300 construction jobs will be eliminated. The skills involved include ironworkers, carpenters, concrete workers and laborers. These 300 workers represent a total worker and family population of about 1,280 and about 330 students. Since these worker skills would be needed for construction at Chief Joseph Dam during 1975, most of the unemployed workers would be attracted to the Chief Joseph Project. Some workers may continue to reside in Grand Coulee and commute the 14 miles to Chief Joseph Dam, while others will move closer to the project. By about 1977, construction is expected to start on six additional hydroelectric units at Grand Coulee Dam. No information is available at the present time to determine the impact on Grand Coulee of this possible new work force for Grand Coulee Dam.



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES CAPACITY

COULEE DAM, WA

COULEE DAM, WA.
COMMUNITY IMPACT
STUDY

Sheet 1 of 1 Scale: As shown

U. S. Army Engr. District Seattle Wash

Transmitted with report

dated

File No

PLATE 4

CORPS OF ENGINEERS

U.S. ARMY

4.26 Okanogan, Washington.

	ESTIMATED POPULATION		
	Normal	Impact	Total
1973	2,225	---	2,225
1975	2,380	100	2,480
1978	2,630	100	2,730
1980	2,835	---	2,835

4.27 Okanogan, located in Okanogan County, is 31 road miles north of Chief Joseph Dam. The town has a local planning commission and building codes which require building permits for new construction. Zoning ordinances permit use of mobile homes when placed on permanent foundations. Reclassification of zoning is underway to allow mobile home trailers in two specified areas of the community.

4.28 The Okanogan school district has facilities for kindergarten through grade 12, with a present enrollment of 896 students and a maximum capacity of 1,050 students. The projected 1974-1975 school year enrollment is 890 students, without consideration of Chief Joseph Dam construction. Chief Joseph construction activity is expected to add about 25 students to the 1975 enrollment, giving a total enrollment of 915. The difference between the capacity of the existing educational facilities and the projected 1974-1975 enrollment is 160 students. This represents an estimated population equivalent of 618. The Okanogan high school is rated 1.

4.29 Okanogan and Omak jointly own a sanitary landfill. Both towns contract a commercial solid waste collection company. A sanitary sewer system and a disposal plant providing both primary and secondary treatment serve Okanogan residents. Additional capacity is available to handle about 600 new residents. Okanogan relies on springs and three wells for its water supply; the total daily supply capacity is 1,870,000 gallons. Storage capacity is 775,000 gallons. 1/ The average daily consumption rate is 600,000 gallons. Approximately 70 percent of the total water consumed is used by small businesses and homes within the city limits. This is an average of 420,000 gallons per day or 188.8 gallons per capita per day. Water usage is 85 percent metered. The Okanogan water system can supply up to about 1,000 additional people or a total population of about 3,225 given the storage capacity limitations and heavy summer water usage.

4.30 Thirty volunteer firemen, a paid chief, and three trucks, one of which is a pumper, constitute the Okanogan Fire Department. According to

1/Comprehensive Water and Sewer Plan, Okanogan County, Washington, R. W. Beck and Associates, May 1967.

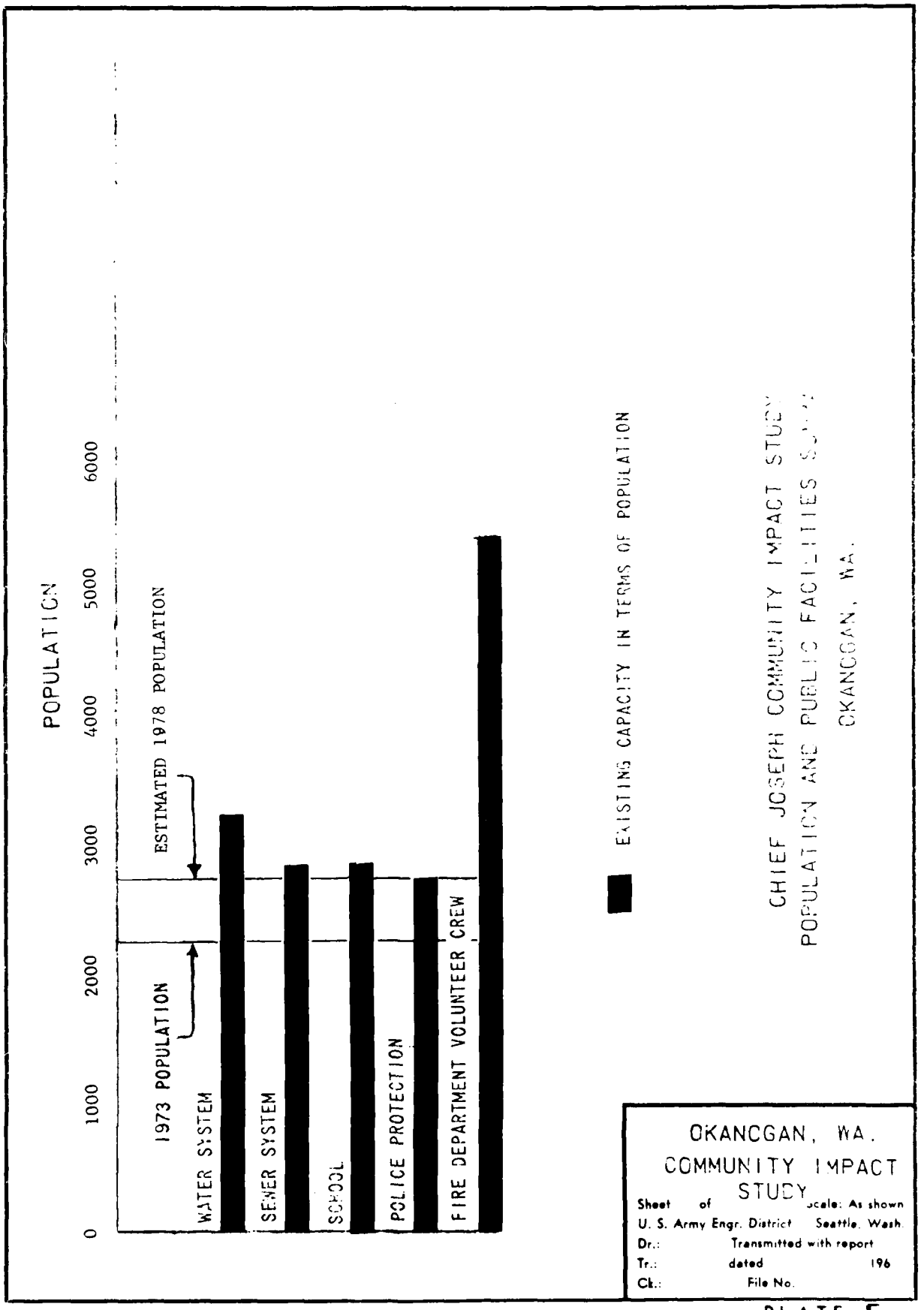
the applied standards, this is sufficient equipment and staffing for protecting up to 5,400 residents. The area fire insurance rating is 6. Okanogan employs three police officers, a ratio of one officer for every 741 residents. This is 168 fewer residents per police officer than the average for rural areas in the United States.

4.31 Available vacant housing is in short supply in Okanogan. The preliminary survey indicated 1,587 houses in the city with about 250 dwellings considered as rental units. Of these about 39 were vacant and available for rent. Rentals for houses usually were in the range of $90 to $250 per month. There were about 45 apartment-type units with five vacancies. Apartment rents ranged from $75 to $200 per month. Two trailer parks provided 45 spaces, seven of which were vacant. Trailer space rentals ranged $35 to $60 per month.

4.32 As shown graphically on plate 5, Okanogan has adequate public facilities to accommodate a total of approximately 100 people associated with Chief Joseph Dam construction, as well as projected resident population increases. About 23 families will require housing in Okanogan during the construction period 1975-1978. Six or seven families are expected to bring their own trailers or campers and will require trailer spaces. Appendix D, Synopsis of Possible Economic Impact Assistance, contains data on financial assistance that may be available to meet school, sewage, and housing needs.

CORPS OF ENGINEERS

U.S. ARMY



CHIEF JOSEPH COMMUNITY IMPACT STUDY
POPULATION AND PUBLIC FACILITIES SURVEY
OKANOGAN, WA.

OKANOGAN, WA.
COMMUNITY IMPACT STUDY

Sheet of Scale: As shown
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PLATE 5

4.33 Pateros, Washington

	ESTIMATED POPULATION		
	Normal	Impact	Total
1973	530	—-	530
1975	570	200	770
1978	640	200	840
1980	690	—-	690

4.34 Pateros, located in Okanogan County, is 21 road miles southwest of Chief Joseph Dam. The town has a local planning commission and building codes and requires building permits. Town zoning ordinances control the location and use of mobile home trailers.

4.35 The Pateros school system includes grades 1 through 12, with a maximum capacity of 400 students. The Pateros High School is rated 3. The present enrollment and the projected 1974-1975 school year enrollment is 245 students, without consideration of Chief Joseph Dam construction. Construction activity at the dam is expected to add about 52 students to the 1975 enrollment giving a total enrollment of 297.

4.36 The town provides a solid waste collection service and owns a sanitary landfill. Pateros has a sanitary sewer system and new secondary treatment facilities that can serve up to 1,150 people. The town obtains water from two wells with a maximum supply capacity of 1,260,000 gallons per day. The average daily use is 120,000 gallons. Small businesses and homes located within the city limits tap about 82 percent of the total water consumed or a daily average of 98,400 gallons or 185.6 gallons per capita per day. The water system is metered and is estimated to be capable of supplying up to 4,520 residents.

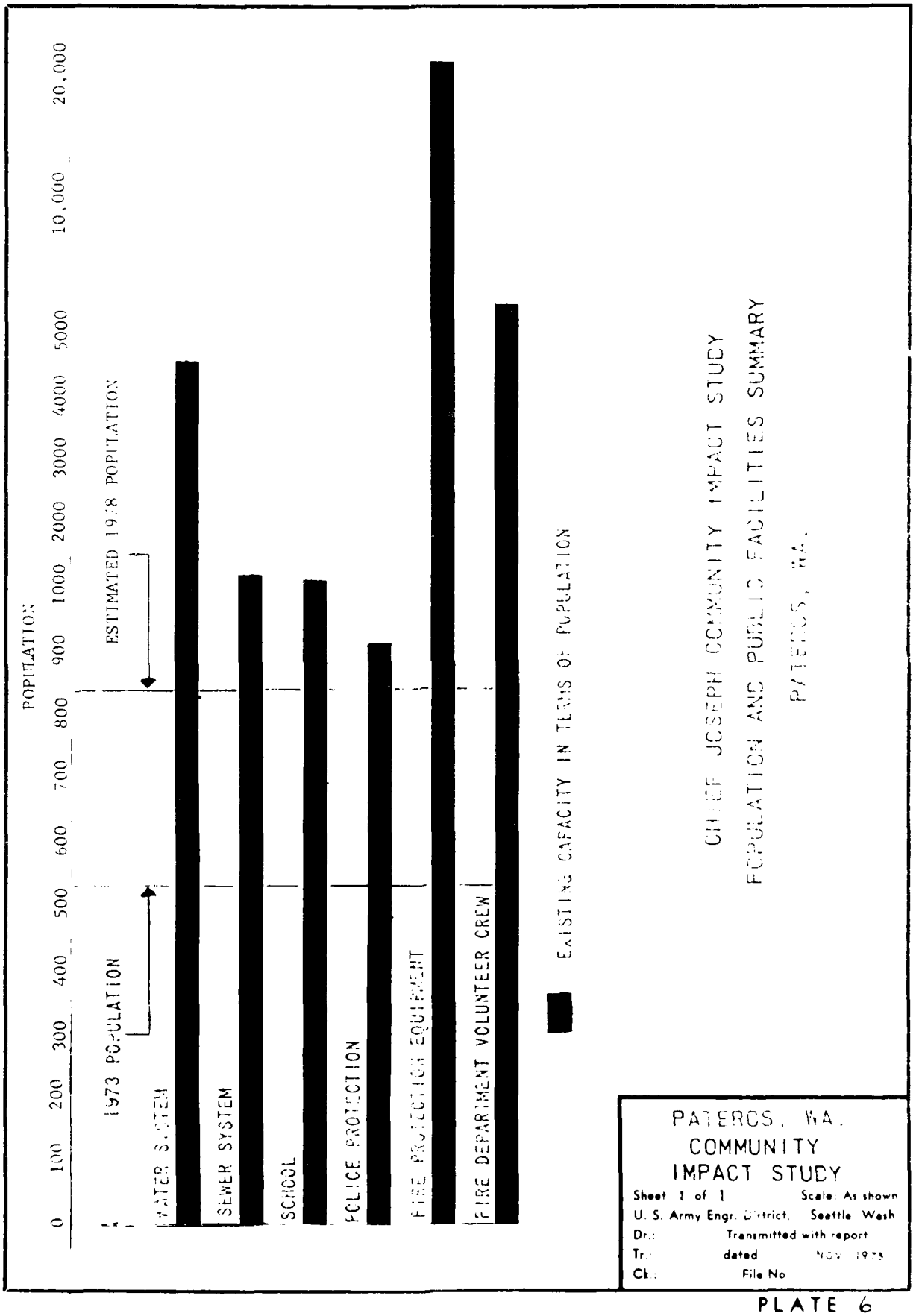
4.37 Pateros employs one full-time police officer to provide protection for the 530 residents. This is 379 fewer residents per officer than the average for rural areas in the United States. Twenty volunteer firemen and three pumper trucks comprise the fire department. According to the standards used, three pumper companies, if sufficiently staffed, are adequate protection for towns with populations up to 22,100. By the same standards, a 20-man volunteer crew is adequate protection for up to 5,400 residents. The fire insurance rating for this area is 6.

4.38 Pateros had about five houses, seven apartment-type units, and about 35 trailer spaces for rent. Rents ranged from $80 to $150 for houses, $60 to $150 for apartments and $35 to $50 for trailer spaces.

4.39 As shown graphically on plate 6, Pateros appears to have sufficient public services to accommodate the approximately 200 people associated with Chief Joseph Dam construction, as well as projected resident population.

4.40 Approximately 45 families will require housing during the peak construction period. About 10 families are expected to have their own house trailers or campers and will require trailer spaces. Although town zoning ordinances control the location and use of mobile home trailers, a comparison with the general trend of housing shortages in the other four towns indicates this problem will be relatively less acute in Pateros mainly because of the availability of trailer speces.

4.41 Appendix D, Synopsis of Possible Economic Impact Assistance, contains data on assistance that may be available to help the projected housing shortage.


POPULATION
0
100
200
300
400
500
600
700
800
900
1000
2000
3000
4000
5000
10,000
20,000
1973 POPULATION
ESTIMATED 1978 POPULATION
WATER SYSTEM
SEWER SYSTEM
SCHOOL
POLICE PROTECTION
FIRE PROTECTION EQUIPMENT
FIRE DEPARTMENT VOLUNTEER CREW
EXISTING CAPACITY IN TERMS OF POPULATION
CHIEF JOSEPH COMMUNITY IMPACT STUDY
POPULATION AND PUBLIC FACILITIES SUMMARY
PATEROS, WA.
PATEROS, WA.
COMMUNITY
IMPACT STUDY
Sheet 1 of 1
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U. S. Army Engr. District, Seattle Wash
Dr.:
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PLATE 6

4.42 Other Impacts. With the influx of new residents, other economic and social effects are expected to occur in the towns of Brewster, Bridgeport, Coulee Dam, Okanogan and Pateros. These impacts include secondary employment or jobs created to serve the increased population, changes in tax revenues and social effects caused by the introduction of new citizens into communities. Auto traffic on the highways between the communities and Chief Joseph Dam will also be increased.

4.43 Projected Indirect Employment. With an increase in population in an area, even on a temporary basis, additional employment is generally created to meet the demands of the additional people. This employment is usually in medical services, retail trade, teaching, clerical assistance, food service, and other professional and personal services. The number of employees in local government is also expected to increase to provide the public services needed by the additional population. Indirect or secondary employment related to population increases attributable to construction at Chief Joseph Dam was determined by ratios of service employment to population based on 1970 Census data. Payroll estimates for the indirect employment were determined by pay rates obtained from the Washington State Department of Employment Security for the Chief Joseph Dam area. Nearly all workers in the indirect employment category can be expected to be hired from the local labor pool. The area has a high rate of unemployment. In mid-1973, the unemployment rate for Chelan-Douglas counties was 10.3 percent and that of Okanogan County was 10.4 percent. Current employment data are not available by communities but are assumed to be similar to the county rate. Estimated jobs and payroll created by this indirect employment are shown on table 4.

4.44 Projected Tax Revenues. State and local tax revenues are expected to rise with an increase in population in an area. However, expenditures by government for servicing the larger population will also rise. For local governments, tax income or revenues would consist of taxes on land and improvements, personal property, and local sales taxes, if any. Personal property taxes would be based on the value of household furnishings, boats, and other mobile type property and equipment. Expenses of local government would include the maintenance and operation of schools, fire and police protection, and cost of town or municipal governmental activities. Usually, water supply and sewage user charges cover maintenance and operation costs. Tax revenues to the state would include sales and other excise taxes, and business and occupation taxes. Expenses to the state would include maintenance and operation of highways, state police protection, and operation of the many agencies of state government. The estimated tax revenues to the state and local governments attributable to the construction of Chief Joseph Dam Additional Units are shown on table 4.

TABLE 3

PROJECTED DIRECT AND INDIRECT EMPLOYMENT
JOBS, PAYROLLS, TAX REVENUES
(1973 Dollars)

Calendar Year	Direct Employment		Indirect Employment		Totals		Total State and Local Tax Revenues 2/
	Jobs	Payroll	Jobs	Payroll	Jobs	Payroll 1/	
1974-1975	38	$595,000	10	$70,000	48	$665,000	$54,000
1975-1976	755	12,285,000	200	1,405,000	955	13,690,000	1,110,000
1976-1977	755	12,285,000	200	1,405,000	955	13,690,000	1,110,000
1977-1978	755	12,285,000	200	1,405,000	955	13,690,000	1,110,000
1978-1979	265	4,283,000	70	491,000	335	4,774,000	388,000
1979-1980	38	595,000	10	70,000	48	665,000	54,000

1/Net expenditures for goods and services will be considerably less than these amounts.

2/Tax revenues include local taxes on personal and real property and state taxes on businesses and inventories, cigarettes, liquor and retail sales. Based on Washington State Department of Revenue data.

4.45 New Citizens and Community Standards. Community social structure is comprised of attitudes, values, and standards of behavior which distinguish one community from another. Introduction of several hundred construction personnel and their families into rural towns near the project site will likely change the social structure of these communities. Usually inhabitants of rural towns have relatively high levels of agreement on what kinds of behavior are expected from members of the community. People generally concur on values and attitudes of what is good or bad and right or wrong. The relatively high degree of general agreement on behavioral standards, attitudes and values within the affected communities would very likely be lessened by the influx of new members. New residents would not likely share all existing values, attitudes and behavioral standards. Way of life and patterns of behavior of new citizens would be somewhat different from traditional community standards. These differences may occur in several ways. For example, new citizens may have different ideas on what their children should learn in school and how they should be taught. Patterns of adult entertainment of new citizens may somewhat differ. If new citizens begin to vote in local elections or participate in community activities, their values, attitudes and standards may eventually be represented to some extent on local school boards, in local politics and in citizen organizations. Church membership or nonmembership may reflect religious attitudes and values of the new citizens.

4.46 Some changes in the social structure of the communities near the project can be expected. Bridgeport, Brewster and Pateros may be the subject to change, Bridgeport because of its proximity to the project site, and Brewster and Pateros because of the large ratio of new temporary residents to permanent residents. Coulee Dam and Okanogan may experience only minor social changes. Overall social changes are likely to be minimal and may last only for the duration of the project construction period. However, these temporary changes may lead to some small long-term social changes. No changes are expected in the social structure of the Colville Indian community except for the social impact related to higher incomes of a few residents. The Colville Indian community is a social and cultural community which is separate and distinct from those into which new residents will be moving. Little additional interaction between the Colville Indian community and these communities will occur as a result of new residents.

4.47 Highway Traffic Safety. The majority of construction workers at Chief Joseph Dam are expected to commute from Brewster, Pateros and Omak along U.S. Highway 97 and State Highways 173 and 17. Workers who reside in Grand Coulee and vicinity will use State Highways 174 and 17. High density traffic will increase the potential for vehicle accidents and traffic law violations. Analysis of traffic violations related to previous construction projects indicate that speeding, drunken driving, and reckless driving will predominate. Probability

for accidents involving property damage, personal injury and death will be increased during the construction period. Traffic law enforcement agencies of the State of Washington, Douglas and Okanogan Counties and local communities could reduce the number and seriousness of accidents by radar, strict law enforcement, saturation patrols and other accident prevention techniques.

4.48 Public Facility Capability of Other Communities. The five communities of Brewster, Bridgeport, City of Coulee Dam, Okanogan and Pateros are considered most likely to be selected as places of residence for most workers and their families. However, workers and their families may also be attracted to other communities within 60 road miles of the project site. The communities which might be impacted by Chief Joseph Dam workers are:

Chelan	Ephrata	Soap Lake
Coulee City	Grand Coulee	Tonasket
Electric City	Mansfield	Twisp
Entiat	Omak	Wilbur

4.49 Detailed information is provided for each community in Appendix C, Analysis of Twelve Other Communities. Population capacity of existing public facilities is shown graphically for each of these twelve communities on the following plates. Seven communities, Chelan, Coulee City, Electric City, Ephrata, Grand Coulee, Omak, and Wilbur have excess capacity during 1975-1978 to accommodate additional Chief Joseph Dam related people without expenditures for additional public facilities.

4.50 Five other communities do not have adequate facilities in 1973 to accommodate additional people during 1975-1978. These communities and the projected inadequate facilities are as follows:

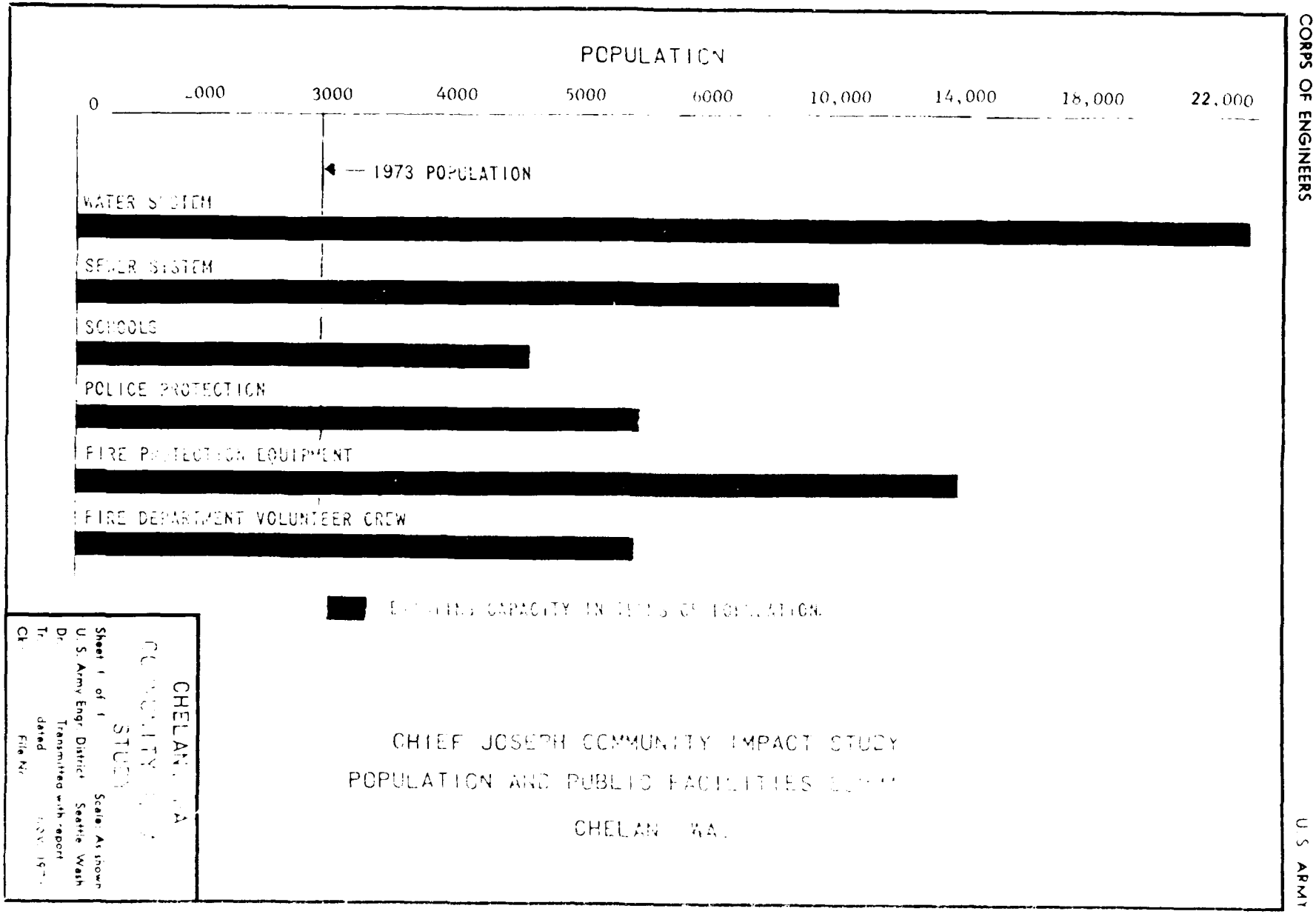
Entiat - water and sewer

Mansfield - sewer

Soap Lake - sewer

Tonasket - sewer

Twisp - water and sewer



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES

CHELAN, WA.

CHELAN, WA
COMMUNITY IMPACT STUDY

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U.S. Army Engr. District Seattle Wash
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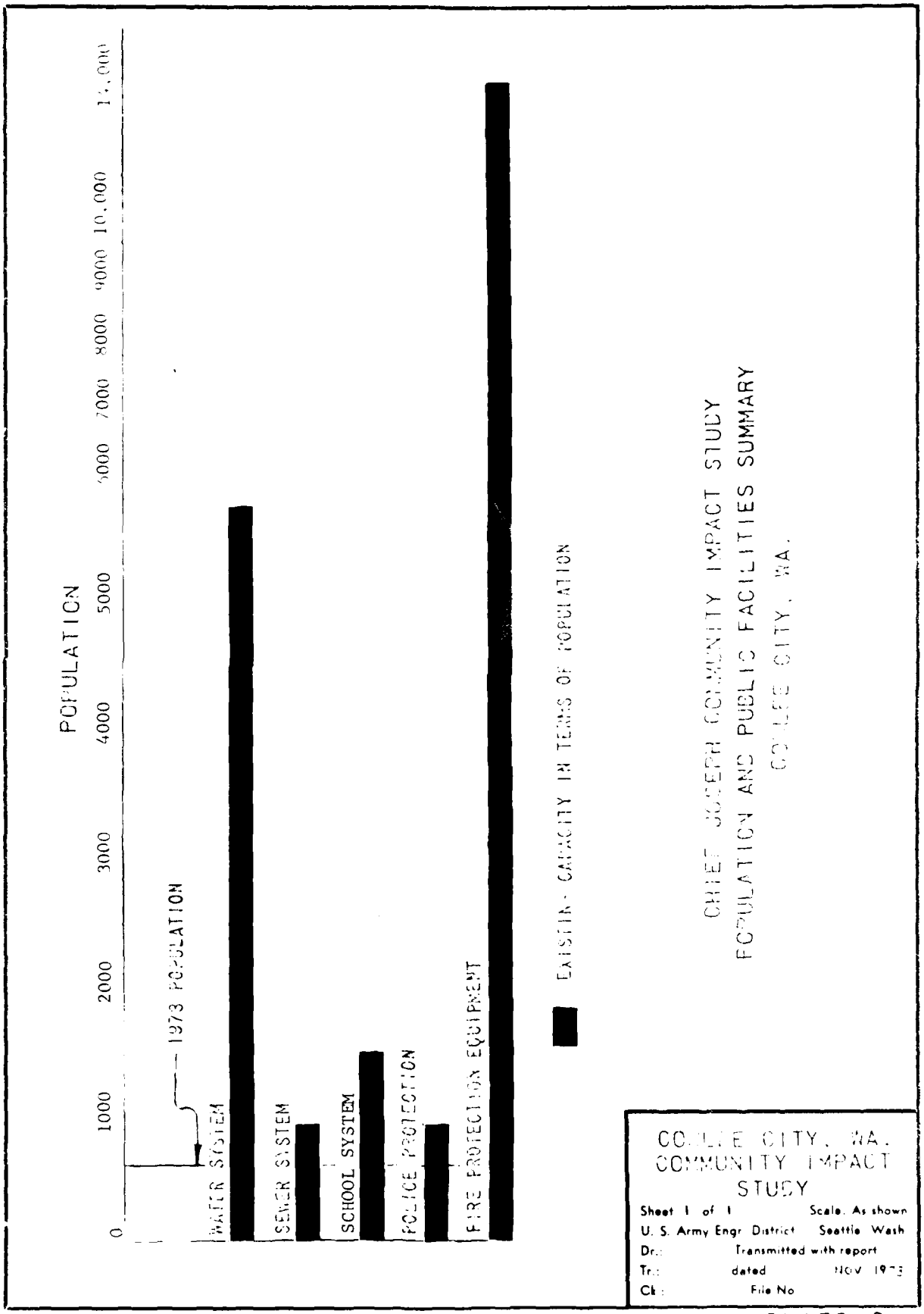
PLATE 7

CORPS OF ENGINEERS

U S ARMY



CHIEF JOSEPH COMMUNITY IMPACT STUDY
POPULATION AND PUBLIC FACILITIES SUMMARY
COULEE CITY, WA.

COULEE CITY, WA.
COMMUNITY IMPACT
STUDY

Sheet 1 of 1 Scale: As shown
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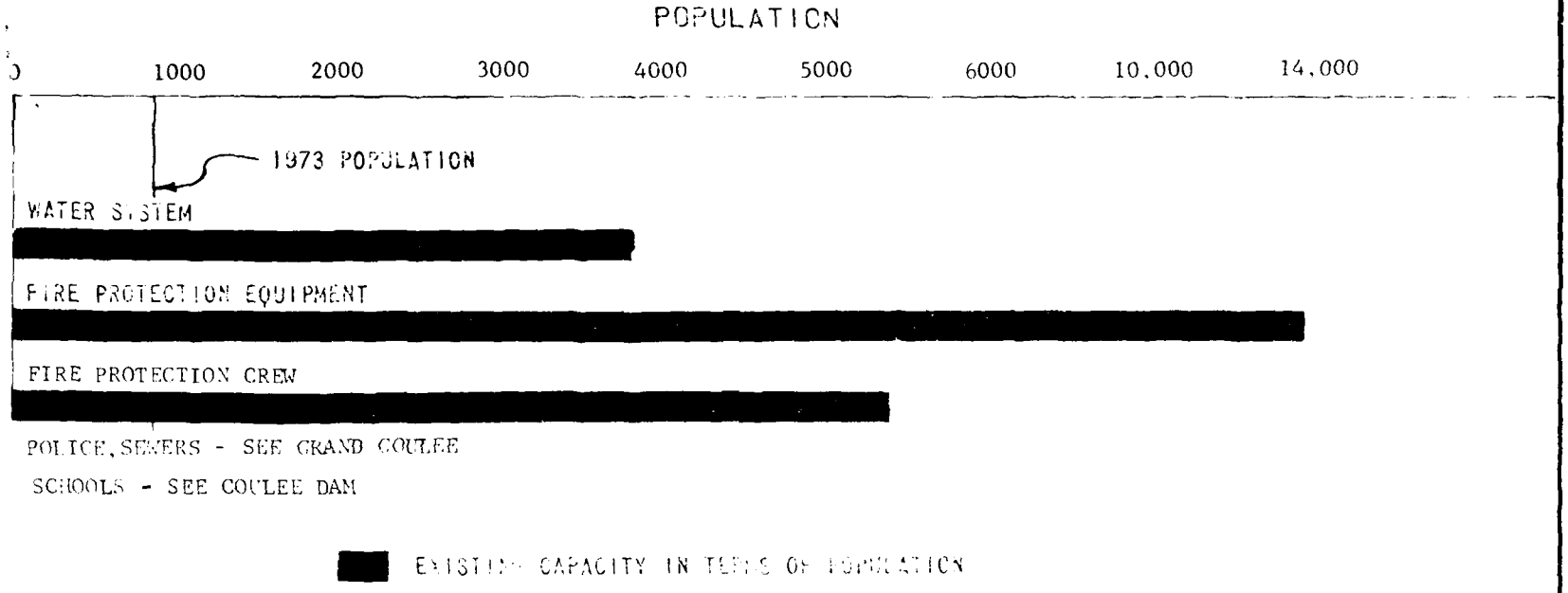
Ck.: File No

PLATE 9



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

ELECTRIC CITY, WA.

ELECTRIC CITY, WA.
COMMUNITY IMPACT
STUDY

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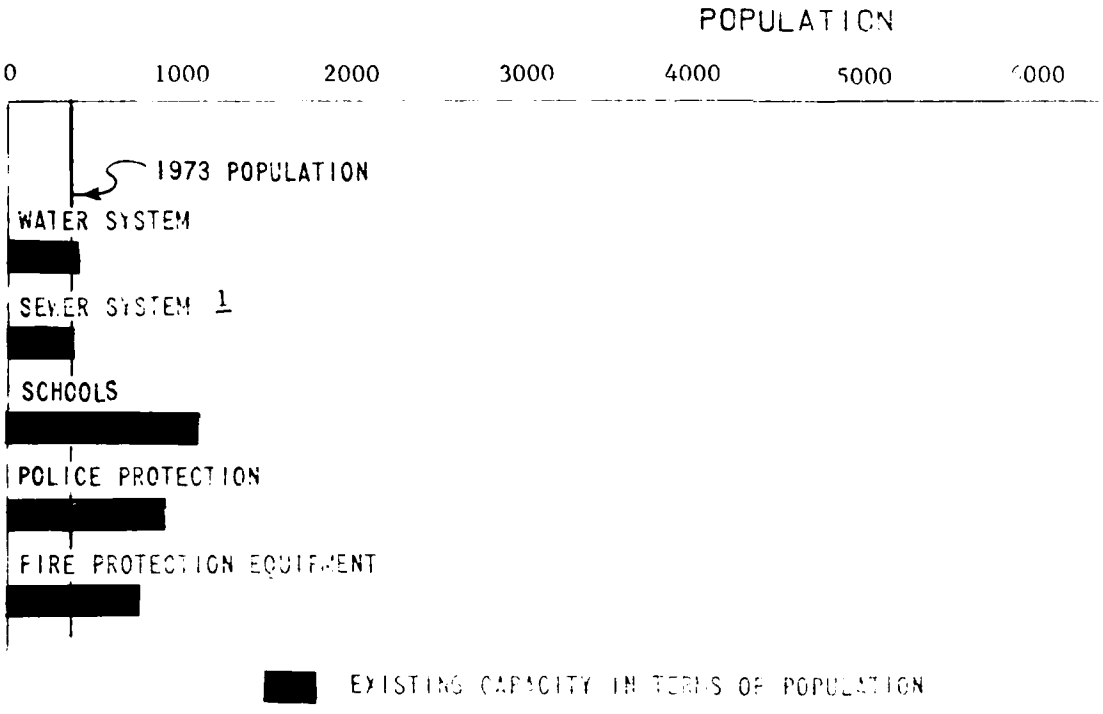
PLATE 9

CORPS OF ENGINEERS

U.S. ARMY



EXISTING CAPACITY IN TERMS OF POPULATION

1 PRESENTLY USED BY 30 PERCENT OF TOWN INHABITANTS

POPULATION AND PUBLIC FACILITIES

CHIEF JOSEPH COMMUNITY IMPACT STUDY

ENTIAT, WA.

ENTIAT, WA.
COMMUNITY IMPACT STUDY

Sheet 1 of 1 Scale As shown

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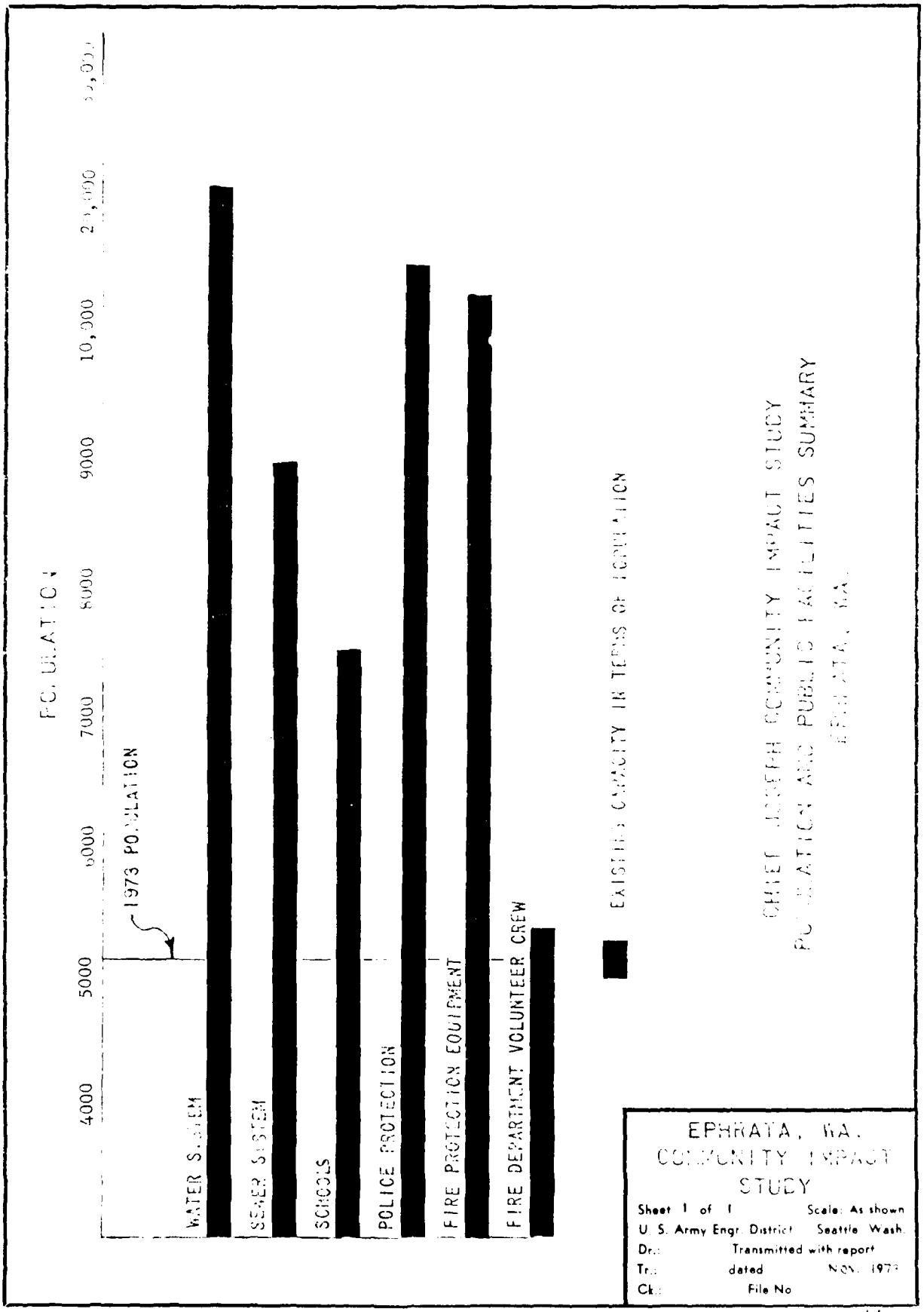
PLATE 10

CORPS OF ENGINEERS

U.S. ARMY

CORPS OF ENGINEERS

U S ARMY



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

EPHRATA, WA.

EPHRATA, WA.
COMMUNITY IMPACT
STUDY

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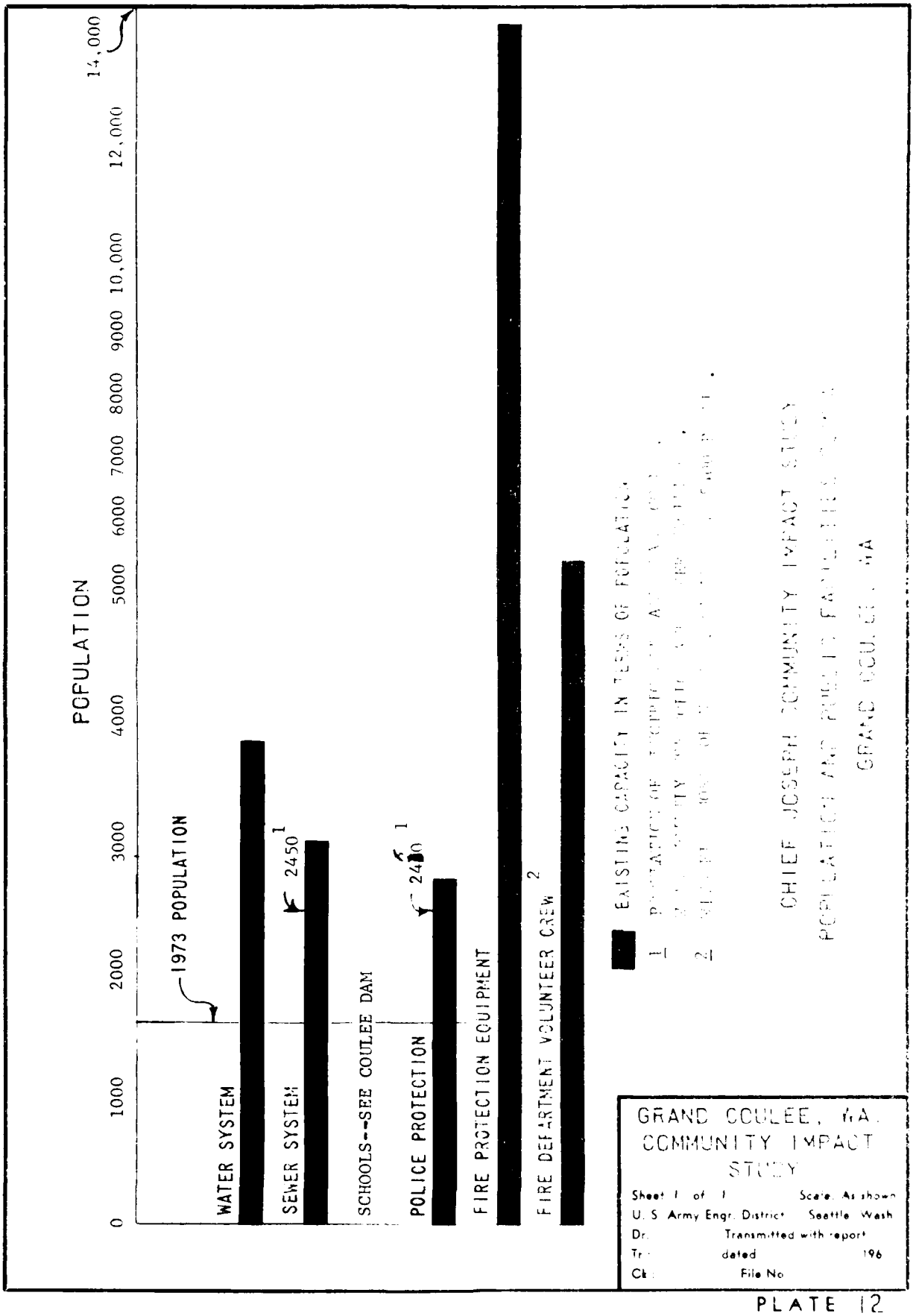
PLATE II


POPULATION
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
12,000
14,000
1973 POPULATION
WATER SYSTEM
SEWER SYSTEM
2450 1
SCHOOLS--SEE COULEE DAM
POLICE PROTECTION
2450 1
FIRE PROTECTION EQUIPMENT
FIRE DEPARTMENT VOLUNTEER CREW 2
EXISTING CAPACITY IN TERMS OF POPULATION
1/
2/
CHIEF JOSEPH COMMUNITY IMPACT STUDY
GRAND COULEE, WA
GRAND COULEE, WA.
COMMUNITY IMPACT
STUDY
Sheet 1 of 1
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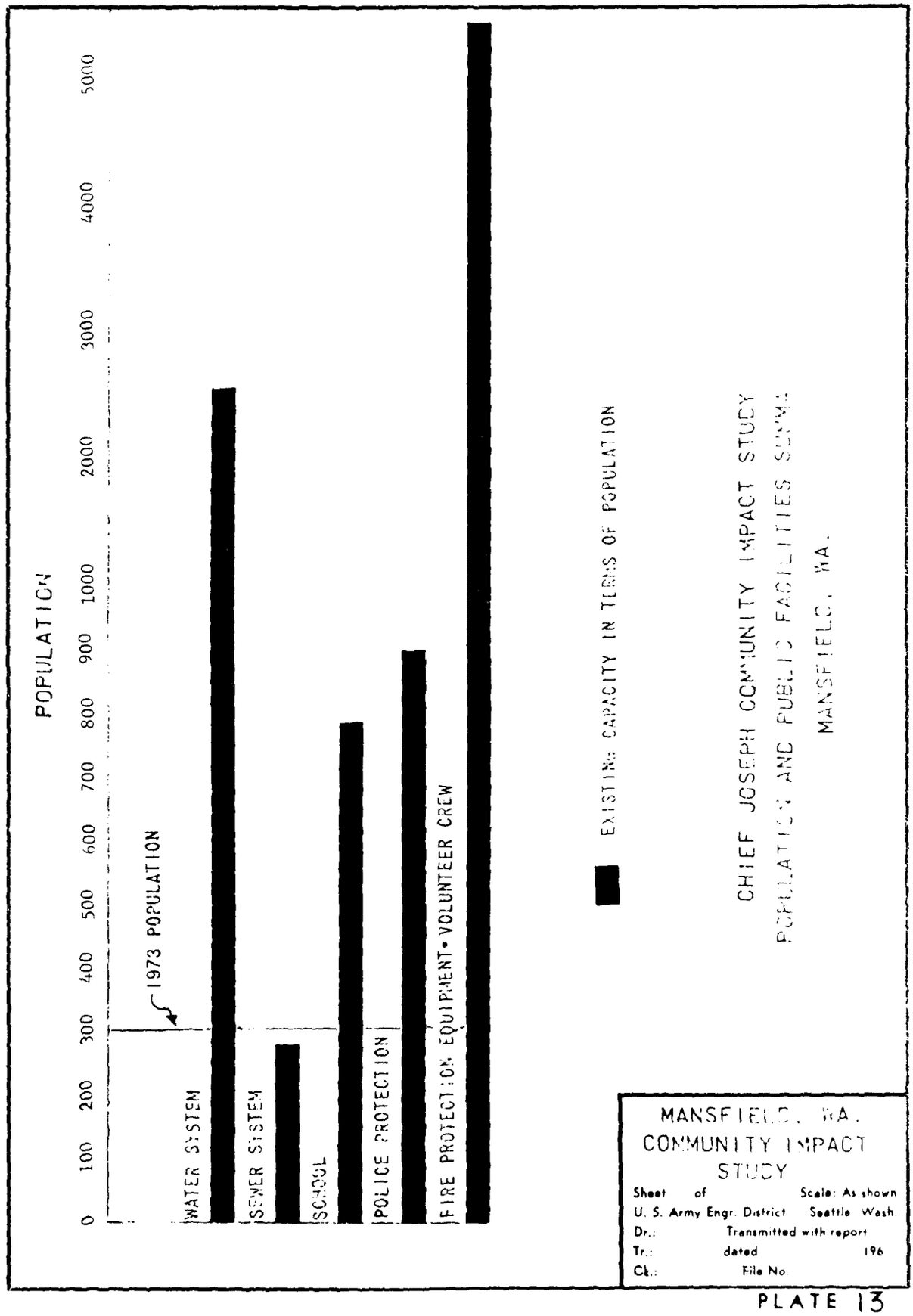
File No.

PLATE 12

CORPS OF ENGINEERS U.S. ARMY



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POPULATION AND PUBLIC FACILITIES SUMMARY

MANSFIELD, WA.

MANSFIELD, WA.
COMMUNITY IMPACT
STUDY

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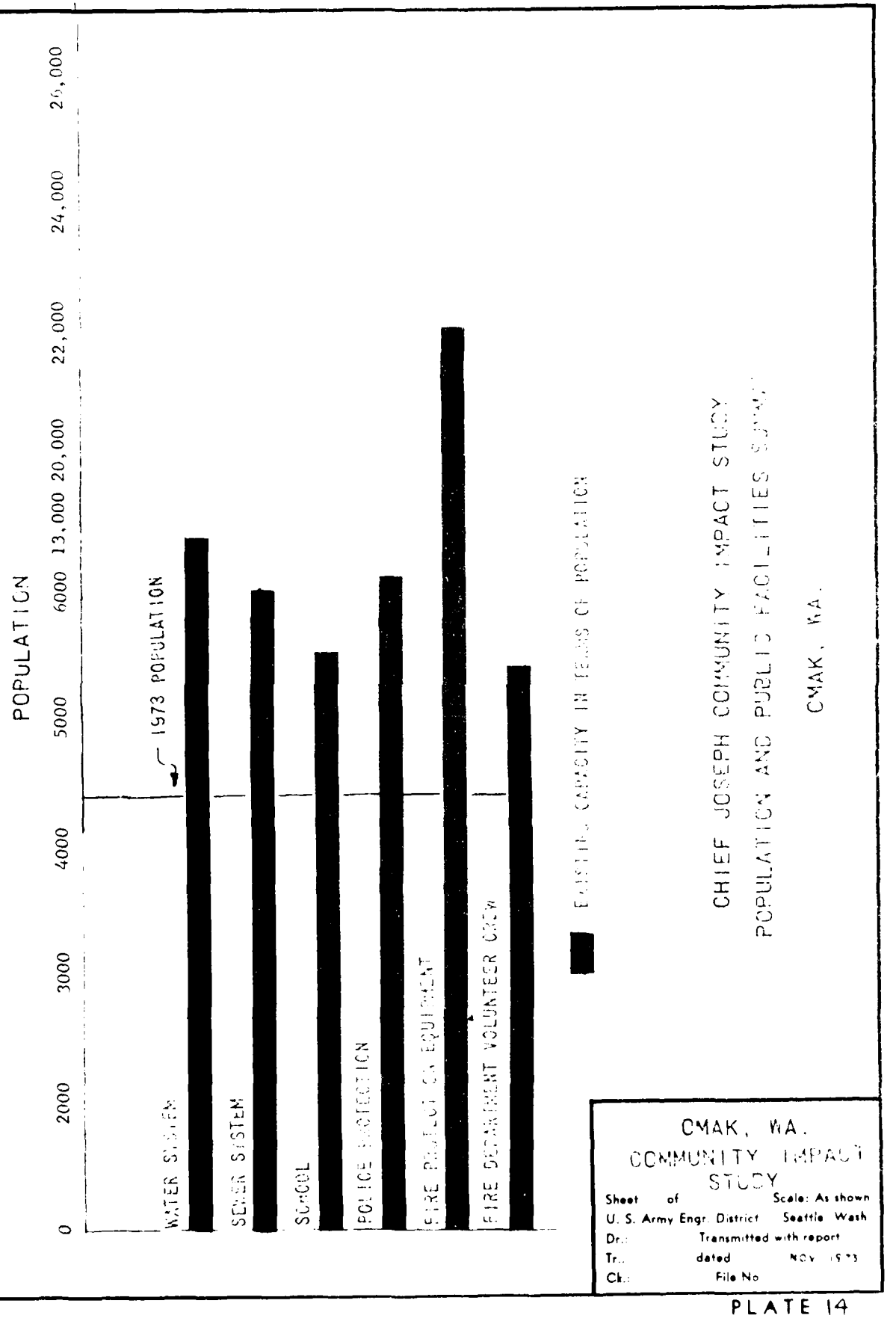
PLATE 13

CORPS OF ENGINEERS

U.S. ARMY



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SURVEY

CMAK, WA.

CMAK, WA.
COMMUNITY IMPACT STUDY

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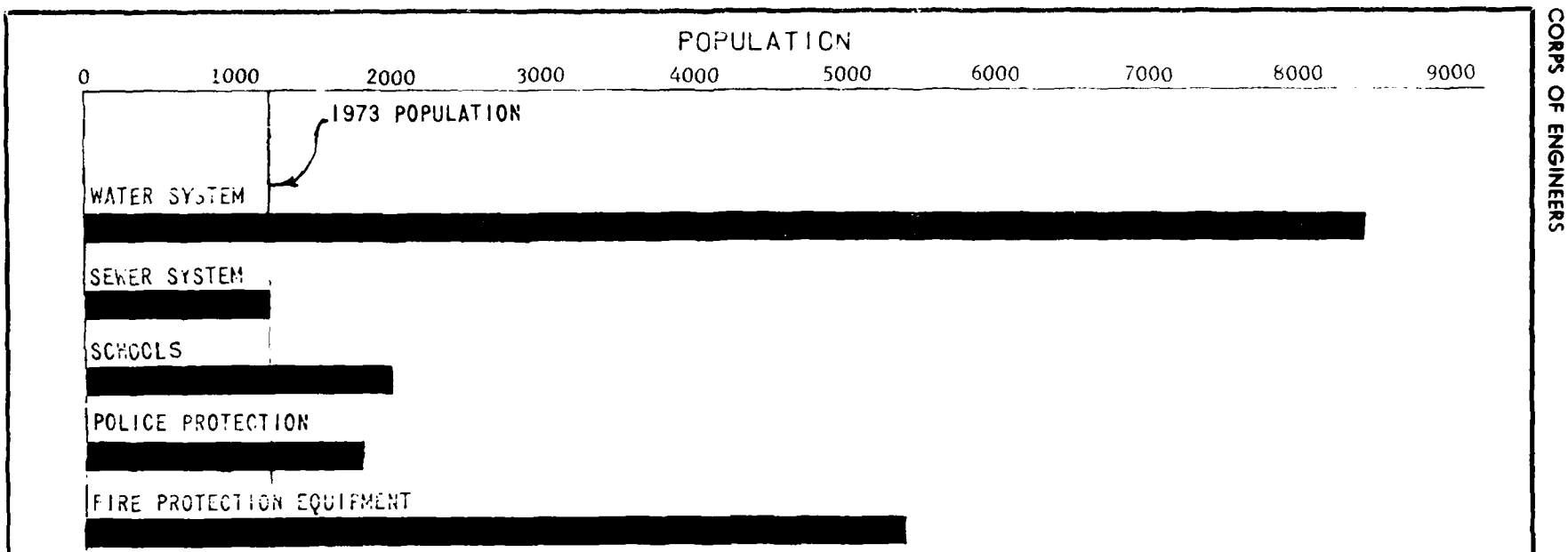
PLATE 14



CHIEF JOSEPH COMMUNITY IMPACT STUDY
POPULATION AND PUBLIC FACILITIES SUMMARY
SOAP LAKE, WA.

SOAP LAKE, WA.
COMMUNITY IMPACT STUDY

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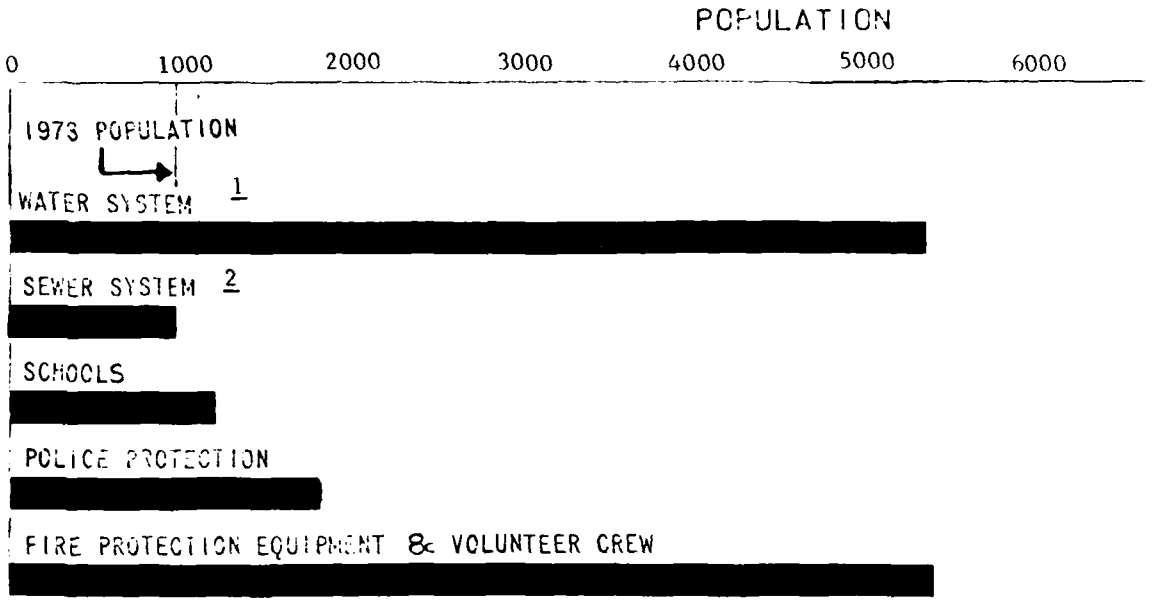
PLATE 15

CORPS OF ENGINEERS
U.S. ARMY

CORPS OF ENGINEERS



EXISTING CAPACITY IN TERMS OF POPULATION

1 RESTRICTED SIZE OF WATER MAINS MAY REDUCE THIS CAPACITY.

2 PRESENTLY OVERLOADED

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

TONASKET, WA.

TONASKET, WA.
COMMUNITY IMPACT STUDY

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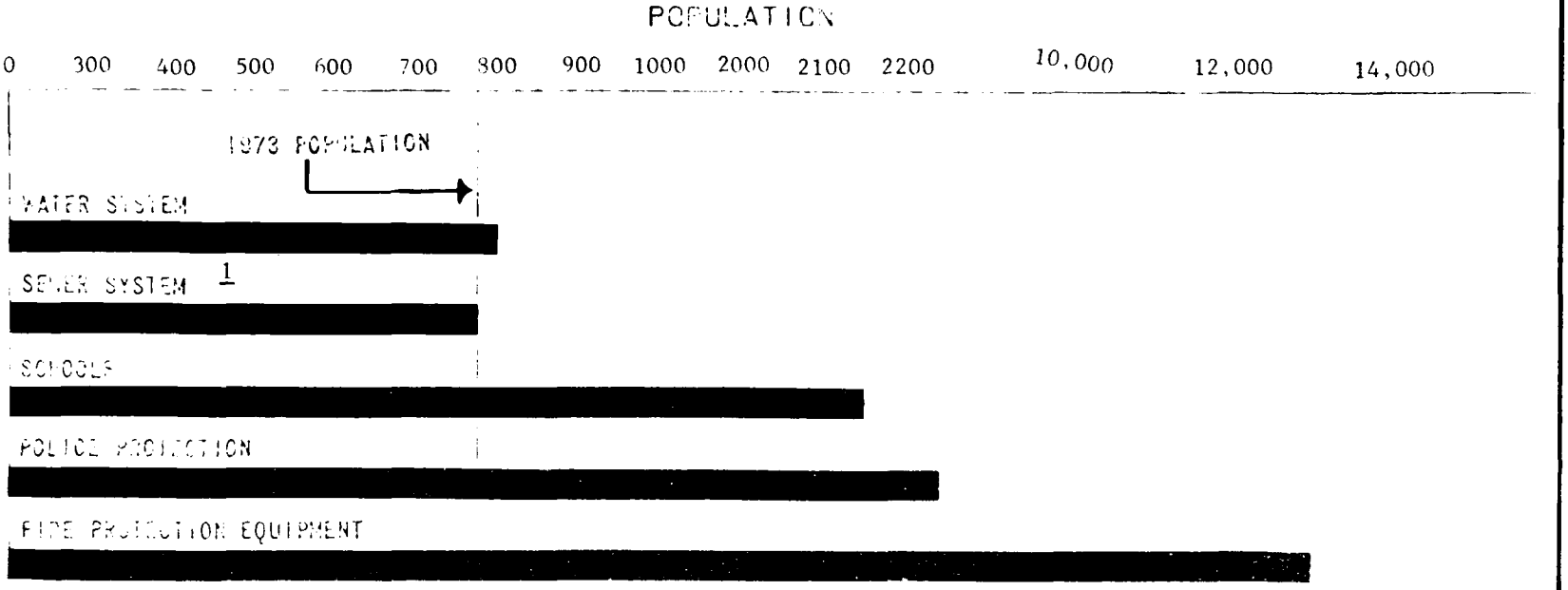
PLATE 16

U.S. ARMY



CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

TR SP, WA.

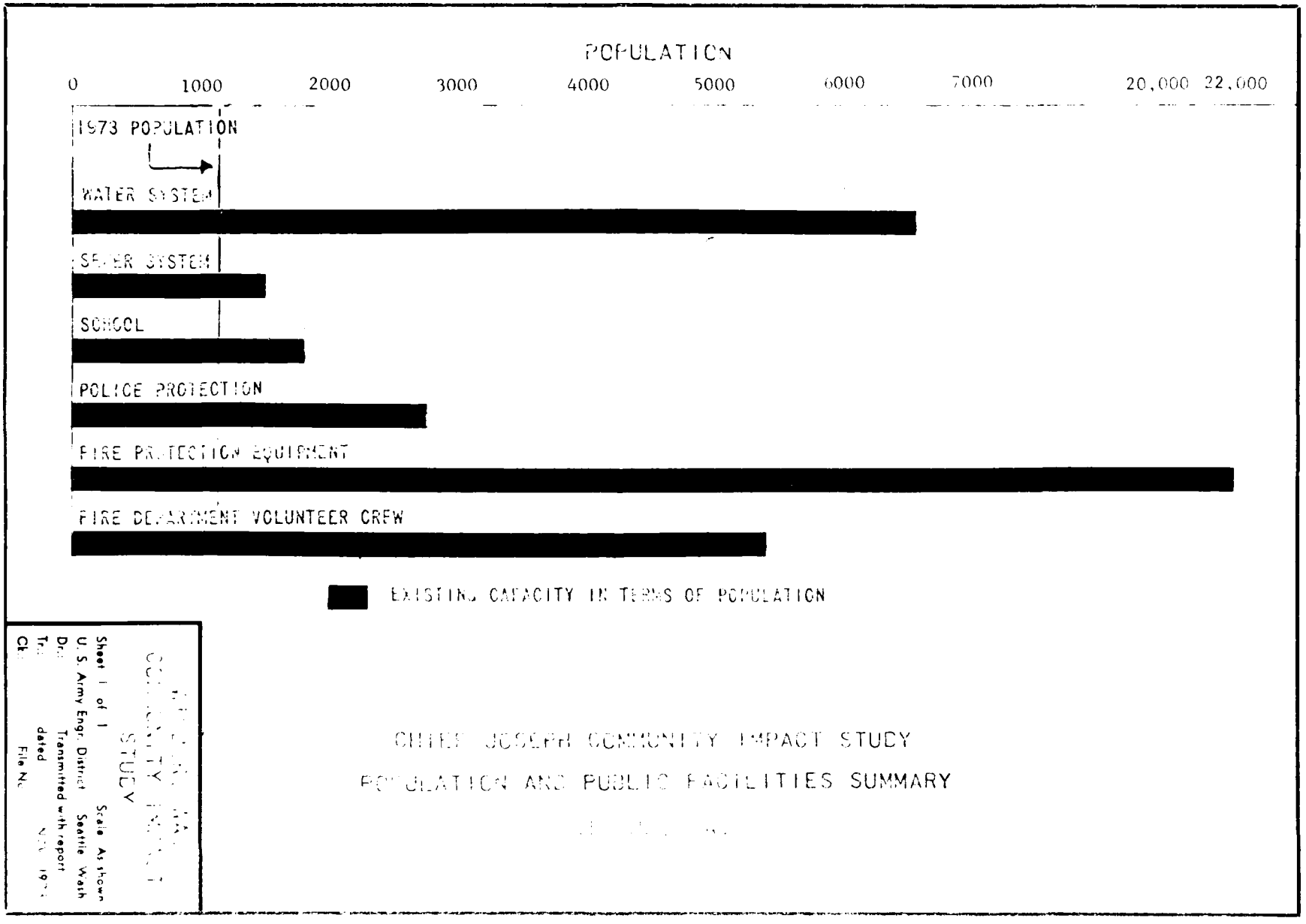
TR SP, WA.
COMMUNITY IMPACT STUDY

Sheet 1 of 1 Scale: As shown
U S. Army Engr District Seattle Wash
Dr
Transmitted with report
Tr dated
Ch NOV. 1973
File No

PLATE 17

CORPS OF ENGINEERS

U.S. ARMY



CORPS OF ENGINEERS

U.S. ARMY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

STUDY

Sheet 1 of 1 Scale As shown

U.S. Army Engr. District Seattle Wash

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Ch... File No.

PLATE 18

SECTION 5 - CONCLUSION

5.01 Construction of Chief Joseph Dam and installation of the first 16 hydroelectric generators occurred during 1949-1958. Peak employment during construction was 1,742 in November 1952. This peak included 1,677 contractor employees and 65 Government employees. In comparison, peak employment during 1974-1980 construction is estimated at 756 employees (700 contractor and 56 Government) which is about 43 percent of the 1949-1958 work force.

5.02 In the earlier construction period, workers lived in temporary housing units, such as trailers or small houses moved in within a fairly wide radius of the dam. Considerable surplus housing was available in Electric City-Grand Coulee-Coulee Dam-Elmer City areas from previous construction programs at Grand Coulee Dam. Today, many construction workers move to a project site and bring their own mobile homes which are considerably more modern than those of 20 years ago. During 1975-1978 peak construction activity, about 120 (26 percent) of the nearly 460 families are expected to move to the area with their own trailers. The balance of about 340 families will require housing in rented trailers or in rented dwellings or apartments. Adequate spaces are available within 60 road miles of the project to accommodate mobile home housing for all of the construction workers and their families. However, due to gasoline shortages and a desire of most employees to live as close as possible to the project site, nearby communities are expected to be selected as the place of residence by about 2,000 people.

5.03 The most probable expectation is that 2,000 workers and their families will reside within 35 road miles of the project in the towns of Brewster, Bridgeport, Coulee Dam, Okanogan and Pateros. Potential public facilities or service problems for local governmental officials and planners to consider are summarized in the following table:

TABLE 4
FACILITY IMPACT SUMMARY

Community	Estimated Impact Population	Estimated Shortage By 1975	Possible Remedy
Brewster	1,000	Housing 170 rental units 60 trailer spaces	New mobile home park. Expand existing parks. Leased mobile homes.
Bridgeport	300	Schools 20 students	One relocatable classroom or rearrangement of present space.
		Sewer Facilities 90 people	Expand present facilities.
		Housing 50 rental units 20 trailer spaces	New mobile home park. Expand existing parks. Leased mobile homes.
Coulee Dam	400	Schools 100 students	No problem if powerhouse construction at Grand Coulee Dam starts to phaseout. Otherwise, relocatable classrooms.
		Housing 65 rental units 25 trailer spaces	Expand existing parks. Leased mobile homes.
Okanogan	100	Housing 20 rental units 5 trailer spaces	New mobile home park. Expand existing parks. Leased mobile homes.
Pateros	200	Housing 35 rental units 10 trailer spaces	Leased mobile homes.

5.04 The overall social and economic impact for a peak of 756 construction workers at Chief Joseph Dam is expected to be minor. Excess capacities of public facilities and services to accommodate additional increases in population are available in nearby communities. However, adequate vacant housing is in short supply. This need can generally be satisfied by mobile home trailers.

ACKNOWLEDGMENT

This report was prepared by the Economic and Social Evaluation Section, Planning Branch, Engineering Division, Seattle District. Valuable and courteous assistance was provided by community leaders and residents, and local, county and state employees. Corps of Engineers personnel participating in the study were:

Arthur A. Harnisch, Chief Economic and Social Evaluation Section	Regional Economist
George E. Marshall	Regional Economist
Paul C. Cloud	Economist
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Morris D. Davis	Sociologist
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APPENDIX A

STUDY PROCEDURE

1. GENERAL

Steps in the study process involved (1) identification of communities which could possibly be impacted by construction activities, (2) collection of data for the area and communities, (3) analysis and evaluation, and (4) conclusions. Field surveys were made of selected communities in the study area to collect data pertaining to existing facilities and services. Other information was obtained from official publications of government agencies. Information collected was then analyzed to determine how existing conditions in communities related to anticipated conditions influenced by construction activities. As a result of the evaluation and analysis, potential problem areas and nonproblem areas were identified.

2. IDENTIFICATION OF COMMUNITIES

Seventy-six identifiable communities lie within a 50-mile radius of the Chief Joseph Dam. With the assistance of county planning personnel, 17 communities were selected which would be most likely to attract new people moving into the area. The selection was based on existing schools, retail and service establishments, public facilities, convenient commuting distance to the project site, and other amenities. The assumption was made that about a 60-road-mile distance would be the most likely maximum commuting distance for all but a few employees. The 17 selected communities with distances in road miles from Chief Joseph Dam are tabulated below:

Bridgeport (2)	Grand Coulee (38)	Wilbur (57)
Brewster (14)	Electric City (39)	Soap Lake (57)
Mansfield (18)	Coulee Dam (30)	Tonasket (59)
Pateros (21)	Chelan (41)	Entiat (60)
Okanogan (31)	Coulee City (41)	Ephrata (62)
Omak (36)	Twisp (50)	

3. COLLECTION OF DATA

Data were obtained by personal interviews in the field, telephone calls, letters, and published sources. A survey was conducted for each of the 17 communities to develop an inventory of available public facilities and services. Special emphasis was placed on schools, domestic water supply, sewage collection and treatment, police and fire protection, and housing. Information was obtained from community officials,

school administrators, utility companies, and local businessmen. Data were also obtained from state and county agencies. Federal and State of Washington publications of statistical information were used as primary sources of existing and anticipated economic conditions in the study area. The information covered trends in population, school enrollments, employment, population service capacity of the public facilities, and other social and economic data.

4. METHODOLOGY

The following guidelines were used to determine the adequacy of the existing facilities and services to meet population expansion needs:

a. Water Supply System. The Supervisor of the Health Services Division of the Washington State Department of Social and Health Services determined and furnished the maximum supply capacities and the average daily water use, both in million gallons per day (MGD), for each of the 17 water supply systems. The city supervisor or an equally knowledgeable person in each community estimated what percentage of average daily water use was consumed only by small businesses and homes within the city limits. This accounted for water used for irrigation or industrial purposes. The average daily per capita water use (gpcd) was determined by dividing this portion of total water consumption by the town's population. To determine the amount of water available for supporting a population increase, this same percentage was applied to the maximum water supply capacity. The result was then divided by the daily per capita water use factor, 228.6 to estimate the maximum population that could be supported by the projected water supply. This use factor is based on the daily minimum supply requirements established by the Washington State Department of Social and Health Services, as stated in "Design Standards for Public Water Supplies," May, 1973. The approach was modified by known local conditions such as limited-size water mains and leaking water systems.

b. Sewage Disposal Systems. The District Engineer of the Washington State Department of Ecology furnished the design flow capacity and its population equivalent for each sewage disposal system and treatment facility. The 1973 population for each town was subtracted from the design population equivalent to determine if any excess capacity was available.

c. Schools. Local school superintendents provided current enrollments, projected 1974-1975 school year enrollments and school capacities of each school system without consideration of Chief Joseph Dam construction impact. For each community, the projected 1974-1975 school year enrollment was subtracted from the total school capacity to obtain the unused student capacity. To obtain the unused population equivalent capacity, this figure was multiplied by the population factor 3.86, which is the ratio of the total state population to school age state residents (ages 6-18 years) as reported in the 1970 Census.

d. The "Supplementary Report of Secondary Schools Recommended for Accreditation, 1972-1973" provided the accreditation ratings for the high schools of the 17 towns. Accreditation ratings indicate the schools' ability to meet all Washington State statutory regulations for secondary educational institutions and requirements of the State Board of Education concerning curriculum, personnel, buildings, equipment, instructional material, and facilities. Accredited high schools are rated from 1 to 3. Class 1 schools approach a comprehensive program. Class 2 schools meet more than the minimum standards in some categories. Class 3 schools are on a 1-year probationary status and must either improve their program or lose their accreditation.

e. Police Protection. Estimated population capacity of the existing police protection services was based on the ratio of full-time sworn police officers or contracted county sheriffs to town residents. This was compared with a weighted average police protection ratio of 1.1 sworn officers per 1,000 persons for rural and outside urbanized areas in the United States (hereafter called "rural areas"). This ratio can be expressed as 909 residents per officer. The ratio was calculated using 1970 data reported in "Uniform Crime Reports in the United States." Due to the lack of published or recognized standards of ratio of police officers to population, this approach was assumed to be a reasonable proxy measure.

f. Fire Protection. The ability of the established fire departments to provide protection for additional residents was determined by first applying the formula

$$P = \frac{C - .85}{.12}$$

where "C" is the number of existing engine companies and "P" is the population capacity. Personnel required was based on a standard of 20 volunteers for each engine company. These guidelines were inferred from the National Board of Fire Underwriters' "Standard Schedule for Grading Cities and Towns of the United States - With Reference to Their Fire Defenses and Physical Conditions," as published and expounded upon in the International City Managers Association's publication "Municipal Fire Administration," 1967.

g. The standard requirements, by population served, for personnel and equipment are presented in the following tabulation:

FIRE ENGINE COMPANY REQUIREMENTS

Population served	Number of companies	Volunteer firemen
0 - 5,400	1	20
5,400 - 13,800	2	40
13,800 - 22,100	3	60
22,100 - 30,400	3	80

Where the fire equipment had less capacity, such as a jeep tank truck, the figure for population served was adjusted downward.

h. The Chief Engineer of the Washington State Survey and Rating Bureau provided the fire insurance ratings for each of the 17 towns. These ratings indicate the combined adequacies of the town water supply, fire department, fire alarm system, fire prevention measures, and building laws. The ratings range from 1 to 10, where a rating of 1 indicates ideal conditions.

i. Medical Facilities and Services. The adequacy of medical facilities and services is based on the hospital capacity, the physician-to-population ratio, and the dentist-to-population ratio. The existing facilities and services are compared with the following statistics for Washington State contained in State of Washington Pocket Data Book 1972, published by the Office of Program Planning and Fiscal Management, January, 1973.

1. 5.8 hospital beds per 1,000 population.

2. 157 physicians per 100,000 population.

3. 60 dentists per 100,000 population.

5. ANALYSIS AND EVALUATION

The inventory of public facilities produced information on the capacity of facilities and the present number of people served. Guidelines or proxy data were obtained from published information and that supplied by State and Federal agencies concerning the ratio or standards per unit of public facilities such as water supply, sewage, and police and fire protection to number of people serviced. School officials provided information concerning the capacity of school facilities and expected 1975 enrollment without construction activity at Chief Joseph Dam. Enrollment capacity was translated into ability to serve present and additional future population. For each public facility surveyed in each community, shortages or surpluses for handling additional people were identified. From this base of 17 potential communities those communities were identified which would be most likely to be given primary consideration for residence by personnel employed at Chief Joseph Dam.

6. CONCLUSIONS

From the analysis and evaluation of collected data, conclusions were drawn as to which communities would be most likely to attract the Chief Joseph construction work force. The selection was on the basis of driving distance from the construction site and available excess capacity of existing facilities and services. Deficiencies in public facilities are identified.

7. COURSES OF ACTION

Various means to financially assist affected communities were inventoried. This included authorized Federal and State economic assistance and development programs. Courses of action which the impacted community can pursue to minimize problem areas are listed in Appendix D.

APPENDIX B

STUDY AREA HEALTH, SCHOOL, AND
WATER SUPPLY FACILITIES

1. GENERAL

This appendix presents detailed data on hospital, medical and dental facilities, public schools and municipal water supply facilities available to each of the 17 communities in the study area.

2. MEDICAL AND DENTAL FACILITIES

Each of the 17 towns is within 32 road miles of hospital facilities and services. The average distance of the communities from the nearest hospital is 8.82 road miles. Most of the area hospitals, either because of their location near the border of adjoining counties or because they provide specialized facilities, are serving areas which extend beyond the counties in which they are located. The number, capacity, and percent occupancy of those hospitals most readily available to the 17 study communities are summarized in table 1. All hospitals except the Ear and Eye Hospital of Wenatchee provide general medical and surgical services. Available medical services by county 1/, along with the number of physicians and dentists with practices located within close traveling distance of the 17 study communities 2/, are as follows:

a. Douglas County.

Douglas County Memorial Hospital, at Waterville, provides general medical and surgical services with an extended dare unit and emergency facilities, including one emergency ambulance. The Coulee Dam Fire Department operates two public ambulances, and the Bridgeport Fire Department operates one.

Location of practice	Number of physicians	Number of dentists
Coulee Dam	1	1
East Wenatchee	2	4

b. Chelan County.

The Chelan Community Hospital, in the city of Chelan, has facilities for intensive coronary care, emergency care and in-patient abortions. Chelan also has a medical clinic. The local funeral home provides ambulance service for the Chelan area. Wenatchee, 82 road miles southwest of

1/Reported in American Hospital Association List of Health Care Institutions 1972.

2/Reported in Medical Directory, American Medical Assn., 1969

TABLE B-1

EXISTING HOSPITALS

CAPACITY AND OCCUPANCY

County and city	Number of 1/ hospitals	Number 1/ of beds	Population 2/ service capacity of hospital	Percent occupancy
Chelan				
Chelan	1	37	6,379	24.3
Wenatchee	3	186	32,069	64.5
Douglas				
Waterville	1	13	2,241	46.2
Grant				
Ephrata	1	58	10,000	55.2
Grand Coulee	1	45	7,758	66.7
Moses Lake	1	26	4,483	57.7
Soap Lake	1	38	6,552	76.3
Okanogan				
Brewster	1	50	8,621	70.0
Omak	1	27	4,655	70.4
Tonasket	1	30	5,173	50.0
Totals	12	510	87,931	

1/Reported in American Hospital Association List of Health Care Institutions, 1972.

2/5.8 beds per 1,000 people, based on statistics for hospital facilities in Washington. State of Washington Pocket Data Book, published by the Office of Program Planning and Fiscal Management, January 1973.

Chief Joseph Dam, has three hospitals, one of which specializes in eye, ear, nose and throat care. The two general hospitals have intensive care facilities. 1/ A commercial ambulance service, available to all three hospitals, operates four ambulances, including one intensive-care car.

Location of practice	Number of physicians	Number of dentists
Chelan	4	3
Manson	1	0
Brief	1	2
Cashmere	4	4
Wenatchee	59	23

c. Grant County

Coulee General Hospital in Grand Coulee has a postoperative recovery room, an intensive-care unit, an intensive-cardiac-care unit, a pharmacy, a blood bank, an inhalation therapy department, and an emergency department. McKay Memorial Hospital in Soap Lake has a postoperative recovery room, an intensive-care unit, a pharmacy, an extended-care unit, and a physical therapy department. Columbia Basin Hospital at Ephrata has facilities for postoperative recovery, intensive-cardiac care, selfcare, extended care, and a pharmacy. The Ephrata Police Department provides ambulance service for the area. Also, both the Soap Lake and Grand Coulee Fire Departments operate ambulances. Samaritan Hospital in Moses Lake has intensive-care facilities, including two ambulances.

Location of practice	Number of physicians	Number of dentists
Grand Coulee	2	1
Soap Lake	1	0
Ephrata	6	0
Moses Lake	12	8

d. Okanogan County

Okanogan-Douglas County Hospital, at Brewster, has an intensive-care unit, an inhalation therapy department, a physical therapy department, an emergency department and an in-patient abortion service. The affiliated nursing home provides ambulance service. The Mid-Valley Hospital, at Omak, has an intensive-cardiac-care unit, a premature nursery, and an emergency department. The community owns and maintains an ambulance. The Okanogan Fire Department also operates an emergency ambulance.

1/Intensive care facilities consist of 10 or more of the 42 possible hospital facilities listed in the 1972 American Hospital Association Guide to Health Care Institutions.

Location of practice	Number of physicians	Number of dentists
Brewster	5	1
Pateros	1	0
Okanogan	1	3
Omak	9	5
Twisp	2	0
Tonasket	3	0

e. Lincoln County.

Location of practice	Number of physicians	Number of dentists
Wilbur	1 (Lincoln County Health Officer)	1

3. MEDICAL AND DENTAL SUMMARY.

The study area is served by 12 hospitals capable of accommodating an estimated 88,000 residents. No attempt was made to determine the exact location of people these facilities are presently accommodating, since the 12 hospitals serve both county and regional population. However, an average of 310 hospital beds or about 61 percent of those available are occupied. The remaining 200 vacant beds have an estimated population capacity of 34,480. These facilities are adequate to serve any foreseeable demands. A total of 115 physicians are practicing in the area. The estimated total population of the study area is 66,000. This is a ratio of about 1 physician to every 570 residents, or 67 fewer residents per physician than the state average. 1/ A total of 60 dentists have practices in the study area. The Washington state average ratio is 60 dentists to 100,000 residents. 1/

4. SCHOOLS.

a. The projected 1974-1975 school-year enrollment of the 17 communities totals 10,545 students. Total school capacity in the 17 communities is 13,676 students, or about 3,131 above the projected 1974-1975 school-year enrollment. The estimated population equivalent of this difference is 12,000.

b. The exception to the general undercapacity in the area is the Grand Coulee Dam School District, which encompasses the towns of Coulee Dam, Electric City and Grand Coulee. This school district is operating over capacity by 250 students. The unused school capacity in the other 14 towns would accommodate 3,325 additional students. The average student-to-teacher ratio in the study area of 18.6 to 1.0 is more favorable than the statewide average of 22.0 to 1.0.

1/State of Washington Pocket Data Book 1972, published by the Office of Program Planning and Fiscal Management, January 1973.

c. Washington secondary schools are provided with three levels of accreditation and a nonaccredited classification. All of the secondary schools serving the 17 communities are accredited. Two are classified as 3, seven are classified as 2, and six are classified as 1.

d. Table B-2 shows school facilities serving each town, high school accreditation classification, present student-to-teacher ratio, student capacity and projected 1974-1975 student enrollment without consideration of the Chief Joseph Dam construction impact.

5. WATER SUPPLY

a. Both ground and surface water supplies are abundant. The 17 towns use wells, springs, rivers and lakes as water sources. The Columbia Basin Irrigation Project has greatly increased the amount of ground water in the Soap Lake and Ephrata area to the extent that there are now several places where the water table is within 30 feet of the surface. Alluvial deposits near Brewster, Bridgeport, Okanogan and Omak yield moderate to large quantities of water for municipal use. Those municipalities relying on water obtained from the Columbia River and Chelan River drainages have adequate quantities of good quality surface water. 1/

b. Treatment of ground water in this area is not extensive, although some of the larger towns do provide purification. Coulee Dam does use zeolite pressure filters for hardness removal. Nearly all municipalities utilizing surface or mixed sources provide purification. 1/

c. Table B-3 presents water supply and associated data and estimates the current and excess population capacity of each system.

1/Municipal and Industrial Water Supply, Appendix XI, Columbia-North Pacific Region Comprehensive Framework Study, submitted by Pacific Northwest River Basins Commission, Vancouver, Washington, pp. 51-65.

TABLE B-2
PUBLIC SCHOOL FACILITIES

Town	High school accreditation rating	1973-74 Student-to-teacher ratio	1974-75 Student-to-teacher ratio	1974-75 Student capacity	Projected 1974-75 student enrollment	Difference
Bridgeport	2	16.8	16.8	446	386	60
Brewster	1	19.1	19.1	890	554	336
Chelan	2	20.7	20.4	1,200	775	425
Coulee City	2	14.6	13.0	400	176	224
Grand Coulee Dam Schools	1	22.0	22.0	1,200	1,450	-250
Entiat	1	23.0	23.0	500	306	194
Ephrata	1	16.3	16.4	2,200	1,580	620
Mansfield	2	10.0	10.0	250	127	123
Okanogan	1	22.0	22.0	1,050	890	160
Omak	3	24.0	25.0	1,900	1,613	287
Pateros	3	15.3	15.3	400	245	155
Soap Lake	1	20.0	20.0	640	430	210
Tonasket	2	16.7	18.4	1,000	938	62
Twisp	2	22.8	18.4	1,000	645	355
Wilbur	1	15.0	15.0	600	430	170
		18.6*	18.2*	13,676	10,545	3,131

*Average student-to-teacher ratio for study area.

TABLE B-3
WATER SUPPLY AND CONSUMPTION
JULY 1973

Town	Source	Average Daily Use MGD	Maximum supply capacity MGD	*% Used by small businesses and homes	*Maximum Supply available to small businesses and homes MGD	*Population capacity	Excess Population capacity
Bridgeport	2 wells	0.15	1.58	100	1.580	6,900	5,840
Brewster	2 wells spring	1.06	1.80	73	1.314	5,750	4,607
Chelan	Lake Chelan	1.00	5.00	100	5.000	22,970	20,050
Coulee City	2 wells spring	0.04	1.44	90	1.296	5,670	5,082
Coulee Dam	Columbia River Roosevelt Lake springs	0.80	2.88	100	2.880	12,580	10,928
Electric City	3 wells	0.20	1.90	46	0.874	3,820	2,956
Entiat	2 wells	0.099	0.11	92	0.101	410	37
Ephrata	7 wells	1.90	6.50	75	4.875	21,320	16,170
Grand Coulee	Franklin D. Roosevelt Reservoir	0.45	1.44	60	0.864	3,780	2,194
Mansfield	2 wells	0.04	0.58	100	0.580	2,540	2,237
Okanogan	springs 3 wells	0.60	1.87	70	1.309	3,225	1,000
Omak	4 wells	2.60	6.67	90	6.003	12,000	7,600
Pateros	2 wells	0.12	1.26	82	1.033	4,520	3,990
Soap Lake	2 wells	0.25	2.14	90	1.926	8,420	7,214
Tonasket	3 wells	0.40	1.44	85	1.224	5,350	4,380
Twisp	2 wells	0.38	1.60	95	1.520	800	23
Wilbur	3 wells	0.20	1.50	100	1.500	6,560	5,420
TOTALS			39.71		33.879	126,615	99,728

* Estimated

APPENDIX C

ANALYSIS OF TWELVE OTHER COMMUNITIES

The five communities of Brewster, Bridgeport, City of Coulee Dam, Okanogan and Pateros are expected to accommodate all of the workers and families related to construction at Chief Joseph Dam. However, 12 other communities within 60 road miles of the project may possibly be selected as the place of residence for project workers. These communities are:

Chelan	Ephrata	Soap Lake
Coulee City	Grand Coulee	Tonasket
Electric City	Mansfield	Twisp
Entiat	Omak	Wilbur

This appendix describes the public facilities available and estimates the population capacity of each community.

1. WASHINGTON - 1973 population: 2,920

[illegible] in Douglas County, 41 road miles southwest of Chief Joseph [illegible] has a planning commission and building codes, and requires [illegible] permits. The city zoning ordinances allow for the location and [illegible] homes meeting the uniform building code standards.

[illegible] Chelan school system, part of Intermediate School District [illegible] facilities for kindergarten through grade 12. The present [illegible] city is 1,200 students. The 1973-1974 school year enrollment, [illegible] half-day kindergarten classes, is 786 students. The 1974-1975 [illegible] enrollment, without consideration of Chief Joseph Dam construc- [illegible] is 775 students. The difference between the capacity of [illegible] educational facilities and the projected 1974-1975 school year [illegible] is 425 students. This gives an estimated population equivalent [illegible] total population capacity of the school system is 4,560 people. [illegible] school is rated 2.

[illegible] ty of Chelan is responsible for collecting solid waste and [illegible] a dump landfill. Chelan County Regional Planning Council [illegible] this site as a pollution hazard due to leaking and surface [illegible] problems. 1/ Chelan has a secondary type sewage treatment [illegible] with a population equivalent design capacity of 10,000. The [illegible] supply is pumped from Lake Chelan at a daily supply capacity [illegible] gallons. The average daily water consumption by small busi- [illegible] homes within the city limits is 1,000,000 gallons or 342.4 [illegible] per capita. This high consumption average is partially due to [illegible] system. The water system, which is unmetered, is capable of [illegible] an estimated 22,970 people.

[illegible] 5-man volunteer fire department operates two pumper trucks, [illegible] vehicle, and a bush buggy. The fire insurance rating for this [illegible] area. According to standards set by the National Board of Fire [illegible] , Chelan is equipped to protect up to 13,800 residents if [illegible] staffed. By the same standards, the firefighting crew is suf- [illegible] manning one pumper truck company - adequate protection for [illegible] residents. Six sworn-in officers, in addition to two state [illegible] and two county deputy sheriffs stationed in Chelan provide [illegible] police protection. The police protection provided by the [illegible] officers represents a ratio to population of about 1 to 486, [illegible] with the United States rural area average of approximately 1 [illegible]

[illegible] ing community facilities can support an estimated 1,640 [illegible] residents at which point the existing school facilities will [illegible] utilized. The water supply system can serve approximately [illegible] people. The sewage disposal system is capable of serving [illegible] people. The Chelan Fire Department is equipped to protect [illegible] additional residents and is adequately manned for 2,480 [illegible].

[illegible] and Drainage Basin Study, Chelan County, Washington, R. W. [illegible] Associates, August 1973.

1.06 The city of Chelan is on the shore of Lake Chelan, which is a popular recreation area. Housing vacancies are in short supply. Only 7 houses and apartments were available in late 1973. The three trailer parks have a heavy demand for spaces during summer months. One of the three trailer parks is considered suitable for summer use only.

2. COULEE CITY, WASHINGTON - 1973 population: 588

2.01 Coulee City, located in Grant County, is 41 road miles southeast of Chief Joseph Dam. Coulee City does not have a planning council, but Grant County does. The city requires building permits and the City Council establishes building codes. City zoning ordinances restrict the use and location of mobile home trailers.

2.02 Coulee City School District, No. 150-204J, has facilities for grades 1 through 12, with a maximum capacity of 400 students. The high school is rated 2. The present enrollment is 212 students. The projected 1974-1975 school year enrollment is 176 students. This does not take into consideration the possible impact of Chief Joseph Dam construction. The difference between the 1974-1975 school year enrollment and the maximum capacity of the school facilities is 224 students, which gives an estimated population equivalent of 865.

2.03 Solid waste disposal is the responsibility of the individual residents. However, Coulee City does maintain a sanitary landfill. According to the Grant County solid waste disposal plan to be implemented in 1974, the county will collect Coulee City solid waste and dispose of it by sanitary landfill measures near Soap Lake, Washington. The Coulee City sewage system consists of three aerobic lagoons from which the effluent flows to a small lake. The Environmental Protection Agency reports that the lagoons do not provide adequate secondary treatment. The equivalent population capacity of this system is 900. Sources of the city water supply are two wells and a spring; total daily supply capacity is 1,440,000 gallons. Storage capacity is 80,000 gallons. The average water consumption is 40,000 gallons per day. Small businesses and homes within the city limits consume 90 percent of the water supply or a daily average of 36,000 gallons. The average daily per capita consumption of this portion of the water supply is 61.2 gallons. The system is completely metered, but meters are no longer read. The Coulee City water supply system has an estimated population capacity of 5,670.

2.04 The 10-man volunteer fire crew has access to the city-owned pumper trucks. The area fire rating is 8. According to the National Board of Fire Underwriters two pumper companies, if adequately manned, are standard protection for 13,800 residents. By the same standards the volunteer crew is ten men short of meeting the fire protection needs of Coulee City's present population. Coulee City employs one police officer. Also, a Grant County deputy sheriff resides in the city. The police protection-to-population ratio is 1 to 588 compared with the average for rural areas of the United States of 1 to 909.

2.05 The existing community facilities could support a population increase of about 300 at which point the sewage system would be operating at full capacity. The school system could accommodate approximately 865 more residents. The water supply system is capable of serving 5,080 additional residents. The fire department equipment, if manned according to standards, is adequate protection for a population increase of 13,200. Coulee City is a retirement community with only about five vacant houses for rent, no apartment units, and about 20 trailer spaces vacant and available.

3. ELECTRIC CITY, WASHINGTON - 1973 population: 864

3.01 Electric City is located 39 road miles east of Chief Joseph Dam in Grant County. The school and solid waste disposal facilities are discussed in the Coulee Dam summary. Electric City has a local planning commission and building codes and requires building permits. The city zoning ordinances restrict the location and use of mobile home trailers.

3.02 Three wells supply water for Electric City residents; total supply capacity is 1,900,000 gallons daily. Storage capacity is 300,000 gallons. The average daily water use is 200,000 gallons. An estimated 46 percent of the water consumed is used by small businesses and homes within the city limits, a daily average of 92,000 gallons. The daily average per capita use of this portion of water consumed is 106.5 gallons. The estimated population capacity of Electric City's water supply is 3,820. The Electric City sewage system discharges into the Grand Coulee waste-water plant. The equivalent population capacity of this system is 3,000. The combined population of these two towns is 2,450.

3.03 Electric City also contracts with Grand Coulee for the police protection provided by three officers who cover both communities. This is a ratio of one officer for every 816 residents or 93 fewer residents per police officer than the average for rural areas. The city owns two pumper fire trucks manned by 25 volunteer firemen. The fire insurance rating for this area is 7. According to standards used, two pumper trucks are acceptable protection for towns with populations totaling 13,800. A 25-man crew is more than adequate for up to 5,400 residents.

3.04 The school system serving Electric City is the Grand Coulee Dam School which is discussed under Coulee Dam, Washington. The Coulee Dam sewage disposal system can accommodate 550 more residents between the two communities. The water system is capable of providing for approximately 2,960 more residents. Fire protection equipment can provide for up to 12,900 additional residents. The 25-man volunteer crew is of adequate size for an increase of 4,500 residents. Police protection is adequate for about 280 additional Electric City and/or Coulee Dam residents.

3.05 Rental houses and apartment units are scarce in Electric City with only about seven houses and three apartments available. Three trailer parks had 109 spaces with 25 vacancies. House rentals were $60 to $225, apartment rentals $40 to $185, and trailer spaces averaged about $40.

4. ENTIAT, WASHINGTON - 1973 population: 373

4.01 Entiat is located 60 road miles southwest of Chief Joseph Dam in Chelan County. Entiat has a local planning commission. Building permits are required and the city council has adopted the 1958 Uniform Building Codes. The city does have zoning ordinances, but there are no restrictions on the use or location of mobile home trailers. Regulation of mobile home sites is expected in the near future.

4.02 The Entiat School System includes grades 1 through 12. The maximum student capacity is approximately 500. The present enrollment and the projected 1974-1975 school year enrollment is 306 students. The latter is without consideration of Chief Joseph Dam contruction impact. The high school is rated 1.

4.03 The individual residents are responsible for arranging solid waste collection services through a commercial contractor. However, Entiat does own a municipal dump. Two sewage systems serve Entiat. The town sewer system serves one church, one laundromat, one store, offices for the U.S. Forest Service and three organizations, Library, City Hall, a gas station, and eight residences, all located in a certain area. This is a nonoverflowing lagoon type system, which meets Environmental Protection Agency and Department of Ecology standards. The school operates an extended aeration treatment facility to serve the school and 18 area homes. The existing systems are used by about 30 percent of the town's population or about 113 residents. The combined capacity is approximately 226. Two wells furnish the city's water supply. The total pumping capacity would be 2,300,000 if both pumps are used, but this figure is deceiving because it includes an emergency pump. The average amount of water pumped daily from the wells is 110,000 gallons. The average daily use is 45,000 gallons residential and 54,000 gallons business. The difference between the use and the amount pumped is due to a leak within the system which is difficult to find, because the main lines are not metered. There is a meter at the pump and a meter for each customer. The City Superintendent feels that at this time the city could serve, waterwise, ten more families or 38 additional people.

4.04 The city owns two pumper fire trucks, maintained and operated by 20 volunteer firemen. The area fire insurance rating is 6. The National Board of Fire Underwriters indicates that two pumper companies, manned according to standards, is sufficient protection for towns with populations ranging up to 13,800. A 20-man crew by the same standard is adequate for manning one pumper truck and providing protection for up to 5,400 residents. Entiat contracts one deputy sheriff, a ratio of one sheriff per 373 residents. This is 536 fewer residents per sheriff than the average for rural areas in the United States.

4.05 The existing community facilities will support an estimated 38 more residents, at which point the water system will be operating at full capacity. The sewage system is sufficient for a population increase of approximately 110 persons. Entiat could accommodate 536 more residents without exceeding the average population-to-police protection ratio for

rural areas. The Entiat School could accommodate about 750 more residents. Due to the small size and capacity of firefighting equipment, the volunteer fire department is equipped to handle a population increase of only about 400. Vacant housing in Entiat is in short supply.

5. EPHRATA, WASHINGTON - 1973 population: 5,150

5.01 Ephrata, Washington, located in Grant County, is 62 road miles northeast of Chief Joseph Dam. Ephrata has a local planning commission and building codes, and requires building permits. The city zoning ordinances restrict the location of mobile home trailers.

5.02 Ephrata schools include grades 1 through 12 with a maximum capacity of 2,200 students. The present enrollment is 1,590 students. The projected 1974-1975 school year enrollment without consideration of the Chief Joseph Dam contruction impact is 1,580 students. The total school capacity exceeds the 1974-1975 projected enrollment by 620 students, giving an estimated population equivalent of 2,390. Ephrata's high school is rated 1.

5.03 The city provides solid waste collection and owns a sanitary landfill. The Ephrata water system consists of seven wells; the daily supply capacity is 6,500,000 gallons. Average daily consumption is 1,900,999 gallons. Small business and homes within the city limits account for approximately 75 percent of the total water consumption or an average of 1,425,000 gallons daily. The average daily per capita use of this portion is 276.7 gallons. The system, which is capable of supplying water for approximately 21,320 residents, is metered. The Ephrata waste treatment plant is a lagoon system proving secondary treatment. The population equivalent design capacity is 9,000.

5.04 Ephrata owns four pumper trucks and one mobile disaster truck. Thirty volunteers comprise the firefighting crew. The fire insurance rating for this area is 5. According to standards outlined by the National Board of Fire Underwriters, four pumper companies are adequate protection for towns with populations up to 30,400. A 30-man crew is more than adequate protection for 5,400 residents. Ephrata employs 14 police officers. This is a ratio of approximately one officer for every 367 residents, or 542 fewer residents per officer than the average for rural areas in the United States.

5.05 The existing community facilities can support up to approximately 2,390 more residents, at which point the school system will be operating at full capacity. The sewage disposal system is capable of servicing 3,850 more people. The water system can supply 16,150 more residents. An increase of 7,590 residents would bring the Ephrata police protection-to-population ratio up to the average for rural areas. The fire department is equipped to handle up to 25,250 more residents, but the present crew size limits the department's population capability to 250 more residents. However, if 10 more volunteers were to join the present crew, the department could provide protection for up to 8,650 more residents.

5.06 Ephrata has very few housing vacancies available for any increase in population. During November 1973 there were about 10 houses, 20 apartment units, and five trailer spaces for rent.

6. GRAND COULEE, WASHINGTON - 1973 population: 1,586

6.01 The city of Grand Coulee is 38 road miles east of Chief Joseph Dam. Discussions of the school district and solid waste disposal pertaining to Grand Coulee are included in the summary for the city of Coulee Dam. Grand Coulee has a local planning commission, and the city council has established building codes. The city requires building permits. The city zoning ordinances allow the use of mobile home trailers when they are properly located.

6.02 Water for Grand Coulee residents is pumped from Franklin D. Roosevelt Reservoir. The maximum daily supply capacity is 1,440,000 gallons. Average daily water use is 450,000 gallons. Small businesses and homes within the city limits consume about 60 percent of the total water used or an average of 270,000 gallons per day. The average daily per capita use is 177 gallons. The system is metered and its estimated population capacity is 3,780. The sewage disposal plant serving both Grand Coulee and Electric City includes secondary treatment facilities; the equivalent population capacity is 3,000. The combined population of these two towns is 2,450.

6.03 The Grand Coulee Police Department employs three officers to provide protection for both Grand Coulee and Electric City. This is a ratio of one officer for every 816 residents, or 93 fewer residents per police officer than the 909 average for rural areas. Population capacity is 3,333. Fifteen volunteer firemen man two city-owned pumper trucks. Two pumper companies with adequate staffing are up to standards for protection of towns with populations totaling 13,800. The firefighting crew lacks five men in meeting the same standards for Grand Coulee's present population. The fire insurance rating for this area is 6.

6.04 The school system serving Grand Coulee is the Grand Coulee Dam School which is discussed under Coulee Dam, Washington. The water system can supply approximately 2,190 more residents. The sewage disposal system can service 550 more Electric City and/or Coulee Dam residents. The fire department is equipped to provide protection for up to 12,200 more people if properly staffed. If five more volunteers joined the department, it would meet staffing standards for one pumper company and could provide protection for 3,814 more residents. Police protection is adequate for about 280 more Electric City and/or Coulee Dam residents.

6.05 House rentals in Coulee Dam ranged from $80 to $200 per month and the survey indicated about 12 vacancies. Apartment rentals were $60 to $180 with four vacancies. One trailer park of 186 spaces has 71 vacant. Trailer space rentals were about $35 to $60 per month.

7. MANSFIELD, WASHINGTON - 1973 population: 303

7.01 Mansfield, located in Douglas County, is 18 road miles south of Chief Joseph Dam via a rural road and 36 road miles over State highways. Mansfield has no local planning commission or building codes, nor does the city require building permits. The city zoning ordinances apply to only two square blocks of the downtown area.

7.02 Mansfield schools, covering grades 1 through 12, have a maximum capacity of 250 students. The present enrollment is 120 students and the projected 1974-1975 school year enrollment is 127. The latter is without consideration of Chief Joseph Dam construction impact. The difference between the present capacity of the school facilities and the projected 1974-1975 school year enrollment is 123 students. The estimated population equivalent of this unused student capacity is 475. The Mansfield High School is rated 2.

7.03 Mansfield presently owns a municipal dump which is unsanitary due to uncontrolled burning, rodents, insects, and inadequate cover operations. 1/ By 1974 the County Solid Waste System will transfer solid waste from Mansfield to a sanitary landfill near Waterville. The existing sewage treatment facility consists of a septic tank followed by an aerobic rock filter and a subsurface drain field. This treatment system does not presently meet the current State Wastewater Discharge requirements. 1/ The city of Mansfield is presently applying for a grant through the State Department of Ecology for State and Federal monies to upgrade the existing treatment facilities. The original population equivalent design capacity of the present system is 400. It is now serving an equivalent population of about 274. The source of the Mansfield water supply system is two wells. The daily supply capacity is 580,000 gallons. The average daily use by Mansfield small businesses and homes is 40,000 gallons or 132 gallons per capita. The water system is not metered. Its estimated population capacity is 2,450.

7.04 Mansfield has one appointed part-time police officer and one part-time special deputy. Douglas County Fire District No. 5 owns five trucks, one of which is a pumper truck. Fifty volunteers comprise the volunteer firefighting crew. The fire insurance rating for this area is 8. According to the National Board of Fire Underwriters, one pumper company comprised of a 20-man crew is adequate protection for up to 5,400 residents. By the same standards, a 50-man crew is 10 over the required staffing for two pumper companies, adequate protection for up to 13,800 residents.

7.05 The sewage disposal system must be improved before it can support a population increase. The water supply system, however, is adequate for a population increase of about 2,230. Assuming that the service of two part-time police officials is equal to that of one full-time officer, Mansfield's population can increase by 606 before exceeding the average

1/Douglas County Washington Comprehensive Water and Sewer Plan,1970-1990 prepared by Munson-Nash-Futrell and Associates. Submitted 26 August 1969.

population-to-police-protection ratio of rural areas in the United States. Both the existing fire protection equipment and crew are up to standards protection for 5,100 more people. The school system can accommodate approximately 475 more residents. Vacant housing is practically non-existent in Mansfield.

8. OMAK, WASHINGTON - 1973 population: 4,400

8.01 Omak is located 36 road miles north of Chief Joseph Dam in Okanogan County. The town has a local planning commission and building codes and requires building permits. Town zoning ordinances allow for the use and location of mobile home trailers.

8.02 Omak Public School District No. 19 includes kindergarten through grade 12; maximum capacity is 1,900 students. The present enrollment is 1,589 and the projected 1974-1975 school year enrollment is 1,613. The latter figure does not consider the possible impact of Chief Joseph Dam construction. The difference between the projected 1974-1975 enrollment and the present school capacity is 287. The estimated population equivalent of this unused school capacity is 1,108. The Omak High School is rated 3.

8.03 Omak and Okanogan jointly own a sanitary landfill and both contract a commercial solid waste collection company. A sanitary sewer system and a primary and secondary treatment plant serve virtually all homes and establishments within Omak; maximum population capacity is 6,000. Omak obtains water from four wells; total supply capacity is 6,670,000 gallons per day. Storage capacity is 1,865,000 gallons. 1/ Average daily consumption is 2,600,000 gallons. Small businesses and homes within the town limits use an estimated 90 percent of the total water consumed or an average of 2,340,000 gallons or 531.8 gallons per capita per day. Water customers are not metered. This high per capita use is likely to be due to water being wasted or leakage in the piping system. 1/ The Omak water system is capable of supplying up to an estimated 12,000 people.

8.04 Omak employs eight full-time police officers or one officer for every 550 residents. This is 359 fewer residents per police officer than the average police-protection-to-population ratio for rural areas. The town owns three pumper fire trucks and employs a full-time fire department chief. Thirty volunteers constitute the firefighting crew. According to standards used by the National Board of Fire Underwriters, three pumper companies adequately manned are sufficient protection for towns with populations up to 22,100. By the same standards, a crew of 30 volunteers is more than adequate for up to 5,400 residents. The fire insurance rating for this area is 6.

8.05 The existing community facilities can support an estimated population increase of about 1,100 at which point the school system will be operating at full capacity. The sewage system can support 1,600 more residents, and the water system can supply up to 7,600 more. The Fire Department presently is equipped to handle up to 17,700 more people and staffed to provide protection for 1,000 more residents. Police protection is adequate for about 2,870 additional people. Few housing vacancies were found in Omak. High demand by recreationists usually creates an extremely short supply during the summer months.

1/Comprehensive Water and Sewer Plan, Okanogan County, Washington, R. W. Beck and Associates, 1967.

9. SOAP LAKE, WASHINGTON - 1973 population: 1,206

9.01 Soap Lake is located 57 road miles southeast of Chief Joseph Dam. The town has a local planning commission with building codes and requires building permits. Town zoning ordinances allow the use and location of mobile home trailers.

9.02 The Soap Lake School System includes kindergarten through grade 12. It can accommodate up to 640 students. The present enrollment is 440 students, but is expected to decrease to 430 tudents by the 1974-1975 school year. The difference between the capacity of the school system and the projected 1974-1975 school year enrollment is 210 students. The estimated population equivalent is 810. Although a new elementary school building will be constructed in 1974, it will have the same student capacity as the building presently in use. The Soap Lake High School is rated 1.

9.03 Soap Lake obtains domestic water from two wells. Total supply capacity is 2,140,000 gallons per day. Storage capacity for the water system is 300,000 gallons. The average daily use is 250,000 gallons. Small businesses and homes within the town limits tap about 90 percent of the water consumed or a daily average of 225,000 gallons. The average per capita use of this portion of the average water consumption is 186.5 gallons per day. Soap Lake's water supply system is metered with both individual meters and a master flowmeter at each well. The system is capable of supporting about 8,420 residents. The Soap Lake sewer collection system, which serves almost the entire town, is in a good state of repair. The District Engineer of the Washington State Department of Ecology, however, maintains that the sewage treatment facility, built in 1948, should be replaced. The town provides a solid waste collection service and owns a sanitary landfill. Soap Lake owns one pumper fire truck and a tanker. Fifteen volunteers comprise the fire-fighting crew. According to standards used, one pumper company supported by 20 men is adequate protection for up to 5,400 residents. The area fire insurance rating is 7. The town employs two policemen. This is a ratio of one officer for every 603 residents or 306 fewer residents per police officer than the average for rural areas.

9.04 The water system is capable of supplying up to 7,220 more people. Soap Lake schools could support a population increase of about 310. The volunteer firefighting crew is lacking 5 men for meeting the requirements for the present Soap Lake population. However, the fire department is equipped to support up to 4,200 additional residents. Police protection is adequate for about 610 more people.

9.05 Soap Lake is a popular retirement and vacation community. Housing is in critical short supply during the summer months. The brief survey indicated there were about 130 houses, 20 apartment units and two trailer spaces for rent.

10. TONASKET, WASHINGTON - 1973 population: 970

10.01 Tonasket, located in Okanogan County, is 59 road miles north of Chief Joseph Dam. The town has a local planning commission and established building codes which require building permits. Town zoning ordinances restrict the location of mobile home trailers to specific areas.

10.02 The Tonasket School System includes grades 1 through 12 with a maximum capacity of 1,000 students. Presently, 920 students are enrolled. The projected enrollment for the 1974-1975 school year is 938. The difference between the total student capacity and the projected 1974-1975 school year enrollment is 62 students, or an estimated population equivalent of 240. The Tonasket High School is rated 2.

10.03 Tonasket does not assume responsibility for solid waste disposal. However, a privately owned sanitary landfill is available to the town residents. Although the Tonasket sewage treatment facility was designed to provide secondary treatment for a population of 1,250 it is presently operating at twice the design capacity under normal flow conditions. The ity should be expanded. 1/ Additional sewage capacity is currently in the planning process and is expected to be in operation by the end of 1974. Three wells supply water for Tonasket residents. However, the water from two of the wells has high iron content and is not entirely satisfactory for drinking purposes. These two wells are used strictly for standby purposes. The total supply capacity is 2,520,000 gallons per day. 1/ However, the total firm supply though is 1,440,000 gallons per day. The total reserve capacity is 310,000 gallons. Average use is 400,000 gallons per day. Small businesses and homes within the city limits tap about 85 percent of the total water consumption or an average of 340,000 gallons or 350.5 gallons per capita per day. The water system is not metered. It is estimated to be capable of supplying up to 5,350 residents. However, restricted size of water mains will reduce this population equivalant.

10.04 Tonasket owns one pumper fire truck maintained by 25 volunteer firemen. According to the standards used, one pumper company with a 20-man volunteer crew is adequate protection for up to 5,400 residents. The water system is equipped with fire hydrants and the static pressure in the system appears to be satisfactory for this purpose. 1/ The fire insurance rating for this area is 6. Tonasket employs two police officers. This is a ratio of one officer per 485 residents or 424 fewer residents per police officer than the average of rural areas.

10.05 The sewage treatment plant is currently unable to support a population increase. The water system may supply up to 4,380 more people with the assumption of adequate size water mains. Tonasket schools have adequate facilities to support a population increase of 240. The fire department could provide protection for up to about 4,430 more residents. Police protection is adequate for about 850 additional people. Tonasket had a limited number of housing vacancies available in the fall of 1973. During summer months, vacancies are practically nonexistent.

1/Okanogan County Comprehensive Water and Sewer Plan, R. W. Beck and Associates, 1967, page 6, Tonasket.

11. TWISP, WASHINGTON - 1973 population: 777

11.01 Twisp is located 50 road miles northwest of Chief Joseph Dam in Okanogan County. Twisp does not have a local planning commission, but the county does. The town has building codes and requires building permits. There are no zoning ordinances.

11.02 Twisp schools presently include kindergarden and grades 1 through 12. A 1974-1975 addition will bring the total student capacity up to 1,000. Presently, 615 students are enrolled in Twisp schools. The projected 1974-1975 school year enrollment is 645. The difference between the capacity of the educational facilities and the projected 1974-1975 school year enrollment is 355 students, or a population equivalent of an additional 1,370 people. The Twisp High School is rated 2.

11.03 A privately owned sanitary landfill is available to Twisp residents along with a commercial solid waste collection service. Twisp obtains its water supply from two wells; the maximum daily pumping capacity is 1,600,000 gallons. An additional well is planned to be in operation by October 1974. At the present time, the supply capacity does not meet the maximum instantaneous flow demands. Total storage capacity is 410,000 gallons. An average of 380,000 gallons of water is consumed daily. Small businesses and homes tap about 95 percent of the total water supply, or an average of 361,000 gallons a day; consumption of 465 gallons per capita per day gives a population capacity of 800. The pumps at the well are equipped with master meters, but only the commercial accounts are metered.

11.04 Presently, Twisp does not have a community sewer system, but relies on individual septic tanks. The town has formulated plans to install a lagoon treatment facility and is soliciting Federal assistance to partially finance the project. 1/

11.05 Twisp owns two pumper fire trucks now and is planning to purchase another this year. Fifteen volunteers comprise the firefighting crew. Twisp, according to the standards used, has sufficient equipment to provide fire protection for up to 13,800 people. By the same standards, however, the firefighting crew is five men below the requirement for Twisp's present population. Twisp contracts the protection services of three deputy sheriffs. This is a ratio of one sheriff to 259 residents, or 650 fewer residents per sheriff than the average population-to-police-protection ratio for rural areas.

11.06 The lack of a community sewer system restricts Twisp to only minimal population increase capabilities. However, the school system could accommodate up to about 1,370 more residents and fire protection equipment is adequate for a population increase of approximately 13,000. Police protection is adequate for about 1,950 additional residents. Vacant housing in Twisp is in short supply. Very few houses, apartments or trailer spaces are available.

Problems with the septic tanks, such as river pollution and general health danger, will increase with additional use.

1/Okanogan County Comprehensive Water and Sewer Plan, R. W. Beck, and Associates, 1967, page 4, Twisp.

12. WILBUR, WASHINGTON - 1973 population: 1,140

12.01 Wilbur, located in Lincoln County, is 57 road miles southeast of Chief Joseph Dam. The town does not have a local planning commission, although the county does. The city council has established building codes and requires building permits. There are no zoning ordinances.

12.02 Wilbur Public Schools, District No. 200, include kindergarten through grade 12. The maximum student capacity is 600. The present enrollment is 432 students and the projected 1974-1975 school year enrollment is 430 students. The difference between the capacity of Wilbur's educational facilities and the projected 1974-1975 school year enrollment is 170 students; the estimated population equivalent is 656. Wilbur High School is rated 1.

12.03 The town provides a solid waste collection service and owns a sanitary landfill. The present sewage treatment facility is a lagoon system designed for a population of 1,500. Three wells are the source of Wilbur's water system; maximum supply capacity is 1,500,000 gallons per day. Small businesses and homes within the town limits use an average of 200,000 gallons daily, or 175.4 gallons per capita per day. Water usage is not metered. This system is capable of supporting up to an estimated 6,560 residents.

12.04 Wilbur owns two ladder fire trucks and maintains a pumper truck owned by Fire District No. 7. Twenty-five volunteers comprise the firefighting crew. The fire insurance rating for this area is 7. According to the standards used, 3 engine companies, adequately manned, are sufficient protection for towns with populations up to 22,100. By the same standards, 25 volunteers are more than required staffing to provide protection for up to 5,400 residents. Wilbur contracts the policing services of the Lincoln County Sheriff who assigns three deputy sheriffs on rotating shifts to the Wilbur area, providing one officer for every 380 residents.

12.05 The existing community facilities can support a population increase of 360, at which point the sewage system will be operating at design capacity. The school system can support approximately 660 more residents and the water system can supply 5,420 more. The fire department is equipped to handle up to 20,960 more residents and staffed to provide protection for up to 4,260 more. The Wilbur population could increase by 1,587 residents before exceeding the average population-to-police protection ratio for rural areas.

12.06 No vacant houses or apartments were found in Wilbur in the fall of 1973. Two trailer parks with 38 spaces had about 18 vacancies. Trailer spaces rented from about $35 to about $50.

APPENDIX D

SYNOPSIS OF POSSIBLE ECONOMIC IMPACT ASSISTANCE

1. GENERAL

This section provides information on various Federal domestic and State assistance programs for communities such as those which are impacted by construction activity at Chief Joseph Dam. Funds usually allocated for assistance are appropriated by the United States Congress each fiscal year and by the Washington State Legislature each biennium. As a consequence, it is not practical to assume in advance that adequate funds will be appropriated in any given year to satisfy all requests. Such actions as nonappropriation, executive impoundment of funds, or the gradual phasing out of some domestic assistance programs by general revenue-sharing render the chances of receiving aid through some of these programs uncertain. Information on assistance programs was obtained from various State and Federal agencies and from data contained in 1972 Catalog of Federal Domestic Assistance, Executive Office of the President, Office of Management and Budget. This catalog, which is updated each year, is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

2. MEDICAL AND DENTAL FACILITIES

There are presently few ongoing funds available which would serve to insure continued support for construction planning or staffing of community medical and dental facilities. However, some of the following programs may be applicable to the needs of the Chief Joseph study area:

a. Hill-Burton Act (Public Law 91-296). This program provides grants, loans, and guaranteed mortgage loans for the construction, improvement or expansion of community health facilities. Congress has authorized funding of the program for one additional year, although continuance of the program is questionable. Write to Department of Social and Health Services, Health Services Division, Hill-Burton Unit. P.O. Box 1788, Olympia, Washington 98504, Attention 301. Phone (206) 753-5818. Ask for application form HEW 537 and Supplemental Form HSM 524-1.

b. National Housing Act (Public Law 90-448). This program provides that the Federal Housing Administration, Department of Housing and Urban Development, may insure lenders against loss on mortgages used to finance the construction or rehabilitation of private nonprofit and proprietary hospitals, including major movable equipment. Contact HUD, Spokane Insuring Office, 920 Riverside Ave. West, Spokane, Wa., 99201. Phone (509)456-2510.

c. Small Business Administration (Public Law 85-536). This program provides assistance to medical or dental practitioners on an individual basis or as a group to obtain direct low-interest loans or insured loans.

AD-A094 932 INSTITUTE FOR WATER RESOURCES (ARMY) FORT BELVOIR VA F/G 5/4
CHIEF JOSEPH DAM, COLUMBIA RIVER, WASHINGTON, COMMUNITY IMPACT --ETC(U)
MAY 80 A A HARNISCH, W R BURTON, K G CARSSOW
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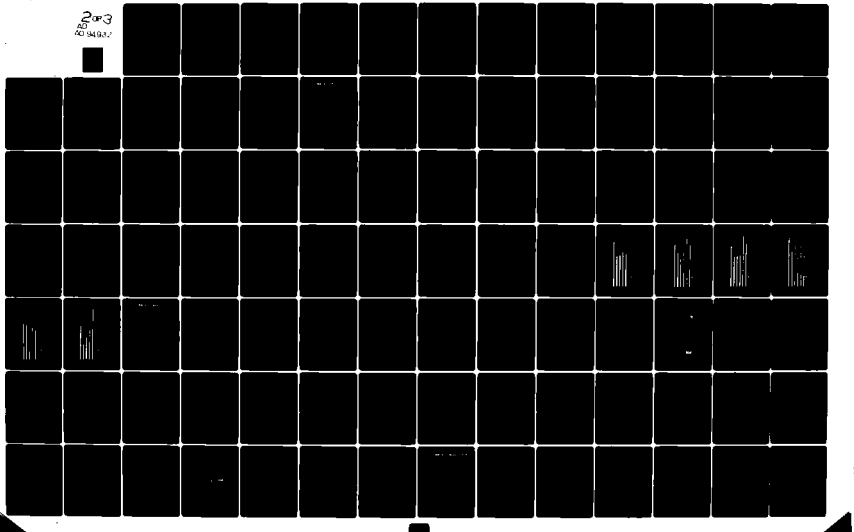

Funds are provided for the conversion or expansion of facilities such as private health clinics or offices, the purchase of equipment or materials, and for working capital. Contact Small Business Administration, Court House Bldg., Room 651, Spokane, Washington 99210. Phone (509)456-3781.

d. Small Business Administration (Public Law 85-699). Under this program, individuals or groups of health practitioners may secure lease guarantees in order to insure the payment of rents. Initial contact for 11 SBA programs should be made with Small Business Administration, Courthouse Bldg., Room 651, Spokane, Washington 99210. Phone (509)456-3781.

3. HOUSING

Several programs are administered by the Federal Housing Administration, Department of Housing and Urban Development, which insure mortgages and protect the lender against loss on loans. This results in lower interest rates for the buyer. This form of assistance is available to potential borrowers in the Chief Joseph Dam study area. Contact Department of HUD, Spokane Insuring Office, 920 Riverside Ave. West, Spokane, Washington 99201. Phone (509)456-2510. To apply for any Farmers Home Administration funds, contact the nearest of the following offices:

County	Address	Phone
Douglas, Chelan	113 Second Street Room 103-A Wenatchee, Wa. 98801	(509)662-5146
Okanogan	211 Queen Street P.O. Box 832 Okanogan, Wa. 98840	(509)422-2761
Lincoln	P.O. Box 3508 Terminal Annex 4305 East Trent Spokane, Wa. 99220	(509)456-3724
Grant	U.S. Bureau of Rec. Bldg. Room 207 P.O. Box 1156 Ephrata, Wa. 98823	(509)754-4611

a. Home Mortgage Insurance (Public Law 73-479). This program insures mortgages for the construction, purchase, repair or rehabilitation of one-family to four-family homes. Any person meeting the downpayment requirements and having a satisfactory credit rating is eligible.

b. Mortgage Insurance for Multi-Family Rental Housing (Public Law 73-479). This program provides mortgage insurance for long-term mortgage financing of the construction or rehabilitation of rental housing. Investors, builders, developers, and others who meet FHA requirements for mortgages are eligible for insured financing under this program.

c. Mortgage Insurance for Moderate Income Homes (Public Law 83-560). This program provides for the construction, purchase, or rehabilitation of single-family homes and one-unit to four-unit rental projects, at market interest rates, for low and moderate income families. Advantageous financing terms for home purchase are available to families displaced by urban renewal or other governmental action. All families are eligible, subject to income and credit qualifications.

d. Mobile Home Loan Insurance - Financing Purchase of Mobile Homes as Principal Residence (National Housing Act, Title 1). This Federal Housing Administration program insures lenders against losses on loans made to individuals purchasing mobile homes for principal places of residence. The borrower must give assurance that his unit will be placed on a site which complies with FHA standards and with local zoning requirements.

e. Mortgage Insurance for Development of Mobile Home Courts (Public Law 84-345). This is a program which provides mortgage insurance for the development of mobile home courts.

f. Farmers Home Administration (Public Law 80-117 and Public Law 89-754). This program assists, through direct loans and guaranteed insured loans, public or private nonprofit organizations interested in providing sites for housing. Provision is made for the acquisition and development of land in rural areas for subdivision into adequate building sites. Sites are sold on a nonprofit basis to eligible low and moderate income families, cooperatives, and nonprofit organizations.

g. Farmers Home Administration (Public Law 89-117 and Public Law 91-606). This is a program of direct loans and guaranteed insured loans whereby, in communities of less than 10,000 population, individuals can apply for low-interest loans for the purchase or construction of houses. Such individuals must, however, have adjusted yearly incomes of less than $10,100. Individuals with adjusted yearly incomes of less than $7,000 can qualify for an even larger subsidy.

h. Farmers Home Administration (Housing Act of 1949 as amended). This program can provide direct loans and guaranteed insured loans for the purchase, improvement, or repair of rental or cooperative housing in communities of less than 10,000 population. Funds may also be used to provide recreational and service facilities appropriate for use of the dwellings and to buy and improve the land on which buildings are to be located.

4. POLICE PROTECTION

a. The Law Enforcement Assistance Administration, Department of Justice (Public Law 93-83). This program provides matching 85 percent grants to assist states and local governments in implementing programs and projects to strengthen and improve law enforcement. If need is so

great as to not be readily met by the state comprehensive plan, so-called "discretionary grants" can be made for the additional 15 percent not funded in the matching grant formula. All monies are in short supply, but chances of receiving such funds are enhanced if application is made well in advance of need. Contact Law Enforcement Assistance Administration, Room 5103, Arcade Bldg., 1319 Second Ave., Seattle, Washington 98101. Phone (206)442-1170.

b. Farmers Home Administration (Public Law 92-419). This program can supply matching funds and loans which are administered by the State of Washington for police protection, including the purchase of equipment and the construction of facilities. This is restricted to communities with populations under 5,500. Fixed guidelines have not yet been established for this program.

c. The Economic Development Administration (Public Law 89-136, as amended). This provides for grants and loans up to 80 percent of the amount needed for the financing of police facilities. Economically underdeveloped areas such as Chelan, Douglas, Okanogan and Grant Counties may qualify for these funds if utilizing them in this way would enhance economic development and help to overcome economic obstacles. In other words, it must help create an environment which is conducive to the creation of jobs. Contact for all EDA programs should be made with Economic Development Administration, 415 First Ave. North, Seattle, Washington 98109. Phone (206)442-0596.

5. FIRE PROTECTION

a. Farmers Home Administration (Public Law 92-419). Communities with populations less than 5,500 may apply for matching funds and low-interest loans for the construction of municipal fire protection facilities and for the purchase of equipment.

b. Economic Development Administration (Public Law 89-136). This program provides for the acquisition of fire protection facilities in the same way and with the same provisions as noted earlier in the section on police protection.

6. TRANSPORTATION

a. Federal Highway Administration (Public Law 91-605). This is a program of 70-30 Federal-State matching funds for eligible counties and municipalities. In addition, Chelan and Douglas Counties may qualify for special economic growth funds under this law for highway construction and improvement. Apply well in advance of need to the Washington State Department of Highways. Contact George Andrews, Director, Washington State Department of Highways, Highway Administration Bldg., Room 3D-33, Olympia, Washington 98504. Phone (206)753-6054.

b. Federal Highway Act (Public Law 93-87). This 1973 legislation makes funds available to rural communities by Fiscal Year 1975 for the

development of rural mass transit systems. Specific guidelines have not been established, although applications for funds will be made through the Washington State Department of Highways at the above address.

c. Farmers Home Administration (Public Law 92-419). This program may provide matching funds and loans for municipal street improvements, such as widening streets in rural towns with populations less than 5,500.

7. SCHOOLS

The United States Office of Education, Department of Health, Education and Welfare, administers assistance programs to schools in Federally impacted areas (Public Law 81-815 and Public Law 81-874). Such schools will receive Federal monies. Make initial contact for both of these programs with James J. Oechsner, Federal Budget Administrator, Office of Superintendent of Public Instruction, Box 527, Olympia, Washington 98501. Phone (206)753-7345.

a. School-Affected Federal Impacted Areas (Public Law 81-874) School-affected Federal impacted area funds are administered on a per student basis, the rate per student based on whether or not his parents live on or off Federal land or are employed on Federal property.

b. Office of Education School Construction Grants (Public Law 81-815). Federally impacted areas would be entitled to these funds for construction. However, educational agencies would be in severe competition with other impacted areas. Few of these construction grant funds have been available in the last six years.

8. POWER FACILITIES

a. Small Business Administration (Public Law 85-699). Funds in the form of direct and insured loans could be made available to communities wishing to expand electrical facilities or other utilities. If a county or municipality forms a local development company which can secure loans, the company could in turn loan to public or private utilities seeking to expand energy facilities. Loans to local development companies are for the purchase of land, buildings, machinery, and equipment or for constructing or modernizing buildings.

b. Economic Development Administration (Public Law 89-136). For counties deemed to be economically underdeveloped, 80 percent loans and grants could be made for the expansion and improvement of power facilities. The law includes the provision that EDA funds used in this way must help to enhance the economic development of the area.

9. WATER SUPPLY

a. Washington Futures (Referendum 27). Under this new program 40 percent grants may be made to local governments for the construction,

improvement, or expansion of water sources, storage and treatment facilities. Facilities must meet State standards and awarding of funds must be made by the Washington State Department of Health. Send applications to Ms. Rebecca McGee, Office of Community Development, 100 Insurance Bldg., Olympia, Washington 98504. Phone (206)753-4022.

b. Economic Development Administration (Public Law 89-136). Under this program 80 percent grants and loans can be made for the construction, improvement, or expansion of water systems in economically underdeveloped areas. Such facilities must, however, help enhance economic development and help overcome economic obstacles in an area or EDA funds cannot be used.

c. Farmers Home Administration (Public Law 87-128). This program provides for project grants and loans for the improvement and expansion of water systems for rural towns with populations less than 5,500. Contact nearest County Farmers Home Administration Office.

10. SEWER SYSTEMS

a. Economic Development Administration (Public Law 89-136). This program provides up to 80 percent grants and loans for the development of sewage systems in designated economically underdeveloped areas. This use of funds must enhance economic growth and development of the areas in question.

b. Farmers Home Administration (Public Law 87-128). This program provides for project grants and loans for improvement and expansion of sewer systems in rural communities with populations less than 5,500.

c. Environmental Protection Administration (Public Law 92-500). This program provides construction grants in amounts up to 75 percent of the cost of sewage treatment systems. State of Washington Department of Ecology provides 15 percent "seed money" for approved projects. Apply to the regional EPA Office at 1200 6th Ave., Seattle, Washington 98101, or call (206)442-1200. In addition, apply to Mr. Rhys Sterling, Washington State Department of Ecology, Olympia, Washington 98504. Phone (206)753-3886.

11. SOLID WASTE

a. Farmers Home Administration (Public Law 92-419). This program provides grants and loans for the improvement and expansion of rural solid waste collection and treatment facilities.

b. Economic Development Administration (Public Law 89-136). This program can provide grants and loans totaling up to 80 percent of the cost of construction, improvement, or expansion of solid waste facilities. Such facilities would have to help enhance economic development in economically underdeveloped areas.

c. Washington State Department of Ecology has a program providing grants for 50 percent funding of new construction, as well as for improvement of solid waste disposal sites. Funds may also be used for the acquisition of necessary equipment. Counties must determine the costs of new construction or improvement of sites and submit an alternate plan for funding without the use of State funds. All planning must be financed and carried out by the county in question. County governmental authorities should make application through the Washington State Department of Ecology. Initial contact should be made with Mr. Avery Wells, Washington Department of Ecology, Olympia, Washington 98504. Phone (206) 753-6883. In order to qualify for the solid waste project grant, the plan submitted by a county must meet the following criteria:

(1) It must include an approved management plan.

(2) It must provide for a permit system covering the annual licensing of solid waste disposal sites.

(3) It must provide for solid waste management standards which meet or exceed Washington State standards.

(4) It must provide for an organization to operate the system.

(5) It must provide for the establishing of a financial system to pay for operation and maintenance of the solid waste disposal system.

12. RECREATIONAL FACILITIES

a. Bureau of Outdoor Recreation, Department of Interior (Public Law 88-578 as amended by Public Laws 90-401, 91-485, 91-308 and 92-347). Funds are available under this program for the acquisition and development of recreational projects such as parks, playgrounds, swimming pools, and for support facilities such as roads and water supplies. Funding is not available for the operation and maintenance of facilities. For additional information and application for funds, contact Stanley E. Francis, Administrator, Washington State Inter-Agency Committee for Outdoor Recreation, 4800 Capitol Building, Olympia, Washington 98504. Phone (206) 753-7140.

b. Economic Development Administration (Public Law 89-136). Economically underdeveloped counties may qualify for grants and loans to 80 percent for the development and improvement for recreational facilities. However, these facilities must contribute to the economic development of an area for these EDA funds to be available.

c. Small Business Administration (Public Law 85-536). This program can supply direct or insured loans for the private development of recreational facilities such as bowling alleys, golf courses, etc.

d. Farmers Home Administration (Public Law 92-419). For rural communities of less than 5,500 population, matching grants and loans are available for the development of recreational facilities such as parks, swimming pools, campgrounds, etc.

APPENDIX E

STATISTICAL APPENDIX

TABLE E-1

Population by age, sex and race
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	BRIDGEPORT		BREWSTER & PATEROS		CHELAN		COULEE CITY		COULEE DAM		ENTIAT	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Under 5 years	62	56	53	56	121	114	24	39	14	12	58	51
5	11	18	11	16	26	33	11	8	4	-	6	7
6	18	13	19	11	36	34	9	7	4	4	16	10
7 - 9	38	56	56	53	107	111	29	36	13	7	46	38
10-13	77	75	79	76	129	139	68	57	23	14	58	47
14	23	15	22	20	51	41	17	9	4	5	10	18
15	22	9	30	18	42	38	9	9	7	6	12	13
16	19	20	28	11	55	39	11	5	5	6	15	12
17	16	15	27	21	52	36	9	8	5	5	20	12
18	17	12	14	12	27	26	12	6	7	2	14	13
19	7	6	7	13	15	13	6	4	3	3	14	9
20	5	7	4	13	9	17	3	2	-	1	9	10
21	8	12	3	7	12	16	-	2	2	2	6	8
22-24	23	22	17	22	50	53	13	18	7	3	27	21
25-34	95	93	80	82	211	215	49	54	13	16	70	66
35-44	91	89	119	123	196	247	46	51	20	30	72	79
45-54	124	128	130	122	279	262	85	73	47	52	97	92
55-59	60	42	73	62	135	164	37	38	20	19	48	32
60-61	16	11	27	30	61	40	11	13	8	5	12	16
62-64	31	27	34	33	74	80	17	16	11	2	24	22
65-74	65	60	70	89	172	172	40	40	16	12	46	40
75 & over	28	31	52	82	100	137	22	32	8	10	28	25

	BRIDGEPORT	BREWSTER & PATEROS	CHELAN	COULEE CITY	COULEE DAM	ENTIAT
Persons By Race:						
White	1,637	1,889	3,934	1,047	449	1,333
Negro	6	1	5	-	3	1
Indian	26	37	34	3	5	9
Other Specified Race	1	-	7	5	-	1
Reported Other Race	3	-	7	-	-	5

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-1 (Cont'd)

Population by age, sex and race
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	EPHRATA		GRAND COULEE AND ELECTRIC CITY		MANSFIELD		OKANOGAN		OMAK	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Under 5 years	189	172	84	90	16	12	99	107	164	178
5	44	40	18	11	3	2	31	27	44	42
6	44	39	30	19	-	1	27	23	41	32
7 - 9	153	161	54	58	8	15	62	63	123	100
10-13	251	247	97	91	22	16	117	89	191	173
14	66	59	22	28	7	3	32	28	61	44
15	66	68	22	26	2	6	31	27	60	43
16	71	60	22	15	8	9	36	31	41	45
17	67	65	21	24	4	9	37	27	48	32
18	54	40	16	18	2	3	20	29	35	51
19	32	30	11	14	2	3	16	18	22	32
20	25	31	13	10	1	-	7	15	19	24
21	14	30	13	13	2	-	5	14	16	26
22-24	68	97	42	47	2	7	49	43	68	81
25-34	255	276	135	126	29	24	134	143	198	224
35-44	271	318	139	128	20	26	142	173	236	248
45-54	339	376	183	174	35	44	149	140	239	243
55-59	161	176	89	73	25	23	93	88	113	123
60-61	60	59	23	29	12	7	37	38	53	45
62-64	62	80	38	28	10	8	55	42	59	62
65-74	166	189	82	85	22	16	110	128	140	169
75 & over	82	102	43	54	20	19	80	103	80	96

	EPHRATA	GRAND COULEE AND ELECTRIC CITY	MANSFIELD	OKANOGAN	OMAK
Persons by Race:					
White	5,217	2,223	504	2,681	3,736
Negro	3	39	-	8	-
Indian	21	79	1	71	420
Other Specified Race	10	12	-	1	4
Reported Other Race	4	5	-	11	4

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-1 (Cont'd)
Population by age, sex and race
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	SOAP LAKE		TONASKET		TWISP		WILBUR	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 5 years	101	78	129	97	92	88	78	47
5	15	24	24	16	11	28	11	16
6	29	28	33	24	24	26	15	19
7 - 9	100	78	102	78	85	72	55	62
10-13	124	144	128	133	126	105	60	52
14	35	29	42	36	27	27	15	16
15	32	41	30	29	37	30	15	20
16	30	43	34	25	39	30	21	13
17	39	37	25	29	36	24	17	11
18	20	24	24	18	26	20	14	5
19	11	16	16	15	20	10	6	4
20	13	9	10	14	9	11	4	4
21	4	9	14	8	2	21	3	4
22-24	30	42	43	43	44	41	28	25
25-34	114	128	134	157	126	140	83	111
35-44	162	168	166	157	147	144	96	70
45-54	189	203	152	153	159	166	91	112
55-59	103	86	86	81	95	94	51	52
60-61	37	34	28	31	28	38	22	17
62-64	46	45	53	51	55	27	27	24
65-74	154	142	92	99	104	101	64	66
75 & over	93	58	68	82	57	37	31	39

	SOAP LAKE	TONASKET	TWISP	WILBUR
Persons By Race:				
White	2,906	2,748	2,605	1,581
Negro	9	1	-	-
Indian	8	49	20	12
Other Specified Race	22	2	4	-
Reported Other Race	2	9	-	3

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-2

Families by family income
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	Bridgeport	Brewster Pateros	Chelan	Coulee City	Coulee Dam	Entiat	Ephrata
$1-$999, NONE, LOSS	25	11	45	10	-	15	30
$1,000-$1,999	15	13	48	21	-	11	46
$2,000-$2,999	50	26	33	15	12	23	87
$3,000-$3,999	46	52	56	-	5	11	60
$4,000-$4,999	38	35	90	12	-	35	81
$5,000-$5,999	36	35	64	6	14	27	68
$6,000-$6,999	24*	22	99	45	-	31	112
$7,000-$7,999	14	27	67	31*	10	22	121
$8,000-$8,999	37	50	75*	15	5	34*	91
$9,000-$9,999	29	30*	93	20	12	44	83*
$10,000-$11,999	63	83	83	19	24*	52	249
$12,000-$14,999	40	68	132	20	13	50	174
$15,000-$24,999	43	76	150	4	33	24	227
$25,000-$49,999	5	21	12	-	-	-	31
$50,000-AND OVER	-	-	-	-	-	-	-

*Median income level for town.
1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-2 (Cont'd)

Families by family income
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	GRAND COULEE ELECTRIC CITY	MANSFIELD	OKANOGAN	O[illegible]	S[illegible]	TONASKET	TWISP	WILBUR
$1-$999, NONE, LOSS	23	-	22	28	4[illegible]	26	26	15
$1,000-$1,999	8	-	27	29	2[illegible]	47	46	-
$2,000-$2,999	16	10	49	114	[illegible]	50	32	18
$3,000-$3,999	33	14	11	72	[illegible]	71	52	22
$4,000-$4,999	50	3	70	45	[illegible]	40	49	20
$5,000-$5,999	42	3	34	111	7[illegible]	44	71	36
$6,000-$6,999	34	23	84	85	[illegible]	58	58	10
$7,000-$7,999	32	10	85	112*	4[illegible]*	97*	81*	34
$8,000-$8,999	65	16	77*	86	[illegible]	57	35	65
$9,000-$9,999	48*	11*	57	113	[illegible]	34	70	15*
$10,000-$11,999	55	21	88	101	[illegible]	73	84	48
$12,000-$14,999	92	32	104	126	[illegible]	81	51	81
$15,000-$24,000	151	15	79	100	[illegible]	72	85	68
$25,000-$49,999	-	4	17	24	[illegible]	14	5	10
$50,000-AND OVER	7	-	-	-	-	-	-	-

*Median income level for town.
1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-3

Employed Persons 16 and Over by Sex, Industry, and Class of Worker
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	Bridgeport		Brewster and Pateros		Chelan		Coulee City		Coulee Dam		Ephrata		Grand Coulee and Electric City		Moses Lake	
	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)
MALE:																
AG./OTHER:																
Employed Private Co	1..	109	142	21.	203	457	18	49	-	5	23	139	5.	496	-	5.7
Employed Own Corp	5	-	-	-	4	33	5	-	11	-	-	5	-	30	-	-
Fed Gov't Worker	-	36	-	21	-	45	-	6	-	30	-	29	-	172	1.	1..
State Gov't Worker	-	5	-	14	-	38	-	15	-	-	-	14	3	7.	-	7
Local Gov't Worker	-	47	-	75	-	68	-	17	-	10	-	17	-	1.3	-	52
Self-Employed Worker	56	24	22	46	57	119	48	3	58	5	33	-	16	133	-	47
Unpaid Family Worker	-	5	-	-	-	-	-	-	-	-	10	-	-	-	-	-
FEMALE:																
AG./OTHER:																
Employed Private Co	29	63	4	295	18	347	-	6	-	33	21	71	3	534	-	1..
Employed Own Corp	-	-	-	-	-	11	-	-	-	-	-	6	-	6	-	6
Fed Gov't Worker	-	8	-	-	-	12	-	5	-	9	-	6	11	60	-	16
State Gov't Worker	-	-	-	4	-	5	-	10	-	-	-	16	-	23	-	5
Local Gov't Worker	-	33	-	78	-	54	-	16	-	4	-	17	-	155	-	64
Self-Employed Worker	5	8	-	15	5	17	-	-	-	-	-	6	-	22	-	17
Unpaid Family Worker	-	5	-	-	-	12	-	4	-	-	-	-	-	49	-	16

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-3 (Cont'd)

Employed Persons 16 and Over by Sex, Industry, and Class of Worker
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	Mansfield		Okanogan		Omak		Soap Lake		Tonasket		Twisp		Wilbur	
	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)	(Agricultural)	(Other Industries)
MALE:														
AG./OTHER:														
Employed Private Co	11	19	54	345	39	586	65	253	83	247	121	236	73	146
Employed Own Corp	-	-	-	6	-	4	11	10	-	9	-	6	-	-
Fed Gov't Worker	-	-	-	67	-	10	-	50	-	38	-	94	-	15
State Gov't Worker	-	10	-	76	-	41	-	32	-	19	5	12	-	24
Local Gov't Worker	-	5	-	79	-	88	-	79	-	77	-	54	-	10
Self-Employed Worker	93	17	22	51	5	91	136	80	57	89	58	39	76	46
Unpaid Family Worker	-	10	5	-	-	-	-	-	-	-	-	-	-	-
FEMALE:														
AG./OTHER:														
Employed Private Co	-	19	5	254	4	374	4	253	12	240	5	100	-	154
Employed Own Corp	-	-	-	-	-	-	-	-	-	-	-	5	-	-
Fed Gov't Worker	-	5	-	32	-	19	-	24	-	9	-	20	-	-
State Gov't Worker	-	-	-	30	-	35	-	-	-	9	-	18	-	6
Local Gov't Worker	-	20	-	50	-	88	-	53	-	17	-	38	-	21
Self-Employed Worker	-	-	-	6	-	34	-	28	-	4	-	27	5	5
Unpaid Family Worker	-	-	-	6	6	12	5	4	5	7	-	-	-	-

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-4

Employed Persons 16 and Over by Occupation
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	Brid[illegible] port	Brewster and Pateros	Chelan	Coulee City	Coulee Dam	Entiat	Ephrata
PROF, TECH, KDRD WKRS:							
Nurse	-	18	4	-	-	-	16
Med. Hlth Wkr Exc Nrs	5	-	-	-	-	-	6
Teachers--Elem/Sec	5	31	13	16	-	6	52
Other Profess. Wkrs	-	10	7	-	6	6	57
Mgr/Admin Exc. Farm	22	20	18	-	12	12	73
SALES WORKERS:							
Retail Trade	4	35	29	-	5	4	49
Other Than Ret Trade	-	-	4	-	-	-	11
CLERICAL, KDRD WKRS:							
Bookkeepers	15	14	20	6	-	10	75
Secr, Steno, Typists	11	21	40	-	-	-	72
Other Clerical Wkrs	15	22	66	5	16	19	149
Crafts, Foremen, Kdrd	3	-	14	-	-	-	13
OPERATIVES EXC TRANS:							
Durable Goods, Mfg.	-	-	19	-	-	5	-
Nondurable Goods, Mfg.	-	-	62	-	-	-	69
Nonmanufacturing Ind.	6	50	-	4	-	34	10
Trans Equip Operative	-	-	6	-	-	-	-
Laborers, Exc Trans	-	-	5	-	-	-	6
Farmers & Farm Mgrs	5	-	-	-	-	-	-
FARM LABOR & FOREMEN:							
Farm Lab, Unpd Family	-	-	-	-	-	-	-
Farm Lab, Exc Unpd, And Farm Foremen	29	4	12	-	-	21	-
SERVICE WKR EXC PRVT:							
Cleaning Service Wkr	-	5	28	-	-	-	36
Food Service Wkr	17	45	71	10	-	16	97
Health Service Wkr	8	16	27	-	-	4	22
Personal Service Wkr	-	10	-	-	-	-	25
Protective Serv Wkr	-	-	-	-	-	-	5
Serv Wkr Exc Prvt	-	-	5	-	-	6	5
Private Hsehld Wkr	6	5	31	-	7	-	15

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-4 (Cont'd)

Employed Persons 16 and Over by Occupation
Selected Central Washington Areas
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	Grand Coulee and Electric City	Mansfield	Okanogan	Omak	Soap Lake	Tonasket	Twisp	Wilbur
PROF, TECH, KDRD WKRS:								
Nurse	6	-	21	24	10	22	-	5
Med. Hlth Wkr Exc Nrs	5	-	-	7	-	7	-	-
Teachers—Elem/Sec	47	10	15	22	13	18	31	39
Other Profess. Wkrs	4	-	10	8	22	-	5	5
Mgr/Admin Exc. Farm	17	10	10	20	12	8	10	5
SALES WORKERS:								
Retail Trade	52	-	5	74	31	18	22	10
Other Than Ret Trade	-	9	-	6	7	5	-	-
CLERICAL, KDRD WKRS:								
Bookkeepers	25	-	45	17	16	8	16	11
Secr, Steno, Typists	22	-	35	92	17	8	-	27
Other Clerical Wkrs	33	15	55	56	46	33	31	24
Crafts, Foremen, Kdrd	5	-	-	6	-	-	-	-
OPERATIVES EXC TRANS:								
Durable Goods, Mfg.	-	-	11	4	-	-	-	-
Nondurable Goods, Mfg.	-	-	5	16	69	-	-	5
Nonmanufacturing Ind.	-	-	45	56	21	90	5	5
Trans Equip Operative	5	-	-	5	-	13	-	-
Laborers, Exc Trans	-	-	-	21	-	-	-	-
Farmers & Farm Mgrs	-	-	-	-	-	-	-	5
FARM LABOR & FOREMEN:								
Farm Lab, Unpd Family	-	-	-	-	5	-	-	-
Farm Lab, Exc Unpd, And Farm Foremen	-	-	5	-	4	13	-	-
SERVICE WKR EXC PRVT:								
Cleaning Service Wkr	13	-	21	26	17	5	6	15
Food Service Wkr	35	-	55	48	52	13	58	30
Health Service Wkr	-	-	10	14	14	11	7	-
Personal Service Wkr	5	-	-	11	5	12	12	-
Protective Serv Wkr	-	-	6	-	-	-	-	-
Serv Wkr Exc Prvt	-	-	-	5	-	-	-	-
Private Hsehld Wkr	-	-	29	34	10	19	10	5

1/Geographical area covered by CCD is usually larger than city/town area.

TABLE E-5

Housing Data For Selected Central Washington
1970 POPULATION DATA 1/
COUNTY CENSUS DIVISION (CCD)

	All persons	All housing units	Person/ rural	Person/ annexed territory	Rural house units	Rural/ 1,000-2,499	Rural/ less than 1,000
CHELAN COUNTY:							
Chelan	3,987	2,361	3,987	-	2,361	2,430	-
Entiat	1,349	761	1,349	-	761	-	355
DOUGLAS COUNTY:							
Bridgeport	1,673	829	1,673	-	829	-	952
Coulee Dam	457	194	457	-	194	241	-
Mansfield	505	226	505	-	226	-	273
GRANT COUNTY:							
Grand Coulee & Electric City	2,358	1,009	2,358	-	1,009	1,309	651
Coulee City	1,055	433	1,055	-	443	-	747
Soap Lake	2,947	1,259	2,947	-	1,259	1,064	74-
Ephrata	5,255	1,925	-	-	-	-	-
LINCOLN COUNTY:							
Wilbur	1,596	634	1,596	-	634	1,074	-
OKANOGAN COUNTY:							
Twisp	2,629	1,120	2,629	-	1,120	-	1,127
Brewster-Pateros	1,927	816	1,927	-	816	1,059	472
Tonasket	2,809	1,433	2,809	-	1,433	-	1,179
Okanogan	2,778	1,155	2,778	6	1,155	2,015	1 -
Omak	4,164	1,483	-	53	-	-	-

1/Geographical area covered by CCD is usually larger than city/town area.

COMMUNITY IMPACT REPORT

Chief Joseph Dam

COLUMBIA RIVER, WASHINGTON

UPDATE I

RE-ANALYSIS AT INITIATION OF CONSTRUCTION

OCTOBER 1974

REPRINT MARCH 1980

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PLATES AND TABLES

SUMMARY OF FINDINGS AND CONCLUSIONS

.01 According to the Army Corps of Engineer projections:

A. Chief Joseph Dam construction workers will begin arriving in the area in mid-1974 and the last workers will leave in late 1979.

B. The peak work period (with 825 workers) will be from early 1976 to early 1978.

C. Peak population (workers and families) will amount to approximately 2200 "impact" people.

.02 The six communities which can be expected to accommodate most of the new population are: Bridgeport, Brewster, Pateros, Coulee Dam, Okanogan, and Mansfield. Unincorporated Bridgeport Bar will also grow.

.03 If it were not for the Chief Joseph Dam construction, population expansion of the aforementioned communities would be expected to be modest.

.04 On the basis of analyses of such factors as "time-distance" travel, housing and community facilities availability, and other community characteristics, the following projected allocation (Alternative III) of the 2200 impact population has been prepared and is recommended for planning purposes:

Bridgeport	600
Brewster	500
Bridgeport Bar	220
Pateros	220
Coulee Dam	330
Okanogan	110
Mansfield	50
Other "outside" Areas	170
Total	2200

.05 Capacities of most community facilities appear adequate to provide for the needs of the projected future populations; however existing housing will be inadequate in all of the "impact" communities except for Okanogan.

.06 Since Bridgeport is expected to house the greatest number of "impact" people, its public facilities will experience the greatest pressure. It appears that both school and sewer facilities will need to be expanded to meet adequately Bridgeport's total population needs during the next five years.

INTRODUCTION

i.01 The purpose of this report is to update the Army Corps of Engineers February 1974 Chief Joseph Dam Community Impact Report and identify the probable places of residence of the 2,200 new population projected for the "impact" area. Six communities, Bridgeport, Brewster, Pateros, Coulee Dam, Okanogan and Mansfield have been listed as the localities which will be expected to accommodate most of the new arrivals.

i.02 Section I of this report presents the current status of community facilities (water systems, sewer and solid waste disposal systems, schools, police and fire protection, medical-dental and hospital facilities, and housing) and the updated population service capacity for the different facilities. Update information in Section I was obtained by interviewing knowledgeable people in each community in reference to changes in condition and extent of public facilities since the original research in the summer of 1973.

i.03 In Section II, historical population trends and projections to 1975, 1978, and 1980 are shown, based on the assumption of no construction activity at Chief Joseph Dam. Different analysis techniques were used because of different characteristics of the six communities.

i.04 In Section III, population has been projected for the target communities under three alternative futures, all of which consider such factors as population increases during the Chief Joseph Dam construction period, time-distance relationships, housing availability, capacity of public facilities, and the availability of amenities such as recreation and commercial outlets.

i.05 Section IV presents a comparison of the population support capacities of public facilities with projected population levels for the respective communities. Section V contains the report conclusions.

i.06 Portions of this report are reproduced from the Army Corps of Engineers' February 1974 report; other portions are based upon new information and interpretations.

i.07 Since future conditions involving, for example, interest rate levels, zoning regulations, building code requirements, cost of fuel, or environmental controls may alter population settlement patterns, it is impossible to be certain that any set of population allocations will actually materialize as projected. However, by evaluating key development indicators, it is possible to identify the most likely population allocations to the subject communities.

i.08 Thus the recommended set of planning projections for the six communities represents our best judgement of probable development trends within the six-community impact area.

SECTION I - COMMUNITY IMPACT

1.01 Construction and installation activities at Chief Joseph Dam will cause an estimated maximum local population increase of approximately 2,200 people for about 2.5 years.[1] This portion of the community impact analysis evaluates the existing capability of these communities to absorb the increased population.

1.02 Construction employees will most likely live within a short commuting distance of the project site if suitable housing facilities are available. High cost and possible shortages of gasoline may require car pools and the use of buses for those workers who commute longer distances. Other criteria employees are likely to consider in selecting a community are quality and capacity of school systems, adequacy of shopping facilities, quality and capacity of water and sewer systems, other public facilities, and general attractiveness of the community. Existing available housing is in short supply in all nearby communities and living quarters will probably consist of house trailers or large campers. Based on experience with other large construction projects, about 25-30 percent of construction workers will bring in their own units. Additional trailer housing will have to be provided by private enterprise, major project contractors, or local or Federal Government or by joint sponsorship. The short peak project construction period of 2.5 years will not likely attract private investment funds for permanent housing. Total construction period is expected to be at least $5\frac{1}{2}$ years.

1.03 Six towns within 39 miles, over improved highways, of the project were projected to absorb the 2,200 increase of project population. These towns and their estimated project-related population increases were determined by a weight system that included selection criteria such as commuting distance, capacity of public facilities, and other attractive factors. These towns are Bridgeport, Brewster, Pateros, Coulee Dam, Okanogan and Mansfield.

Bridgeport, Washington

1.04 Bridgeport, in Douglas County, is two road miles from Chief Joseph Dam. The city does not have a local planning commission. Planning assistance is provided by Douglas County. The city requires building permits and has building codes. Although there are zoning ordinances, there are no restrictions on the location or use of mobile home trailers.

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[1] Based on anticipated contract award schedule, Army Engineers, estimate--August 1974.

1.05 The Superintendent of Bridgeport Schools stated that the schools, grades K-12, are presently operating at capacity.[1] Average enrollment for the 1973-74 school year was 367. Thus, this enrollment level is deemed to be capacity. There are no plans to expand school facilities; in fact, there will be a budgetary cut-back during the current year as a result of recent bond failures. September 1974 enrollment was: 175 students in grades K-6 and 169 in grades 7-12, a total of 344.[2] The high school is rated 2 for accreditation purposes.[3]

1.06 The city provides solid waste collection service and operates a municipal dump. This refuse site is "unsanitary; uncontrolled burning, rodents, insects and inadequate cover operations are principal deficiencies."[4] The Bridgeport sewage system includes secondary treatment facilities with a population equivalent of 1,350.[4] Bridgeport obtains water from two wells at a maximum daily pumping capacity of 1,580,000 gallons; average daily use by small businesses and homes within the city limits is 150,000 gallons. Average per capita water use is 141.5 gallons per day. The estimated population capacity of this system is 6,900. However, local officials state that peak usage (on hot days) is about equal to the maximum pumping capacity of the two wells while simultaneously drawing down the 500,000 gallon storage tank. Water usage is metered.

1.07 There are two pumper fire trucks in Bridgeport and a 15-man volunteer firefighting crew. The area fire insurance rating is 7. According to the standards set by the National Board of Fire Underwriters, the fire protection equipment, if properly manned, is adequate for 5,400 people. By the same standards the volunteer crew is five men below the number required for the present population. The city contracts with Douglas County for the services of three deputy sheriffs, a ratio of one sheriff for every 353 residents (protection capacity for a population up to 2,727). This represents 55% fewer residents per sheriff than the average number of residents per police officer for rural areas in the United States.

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[1] Interview, August 20, 1974, with Harry Rhodes, Superintendent of Schools, Bridgeport.

[2] Telephone interview, Harry Rhodes, September 10, 1974.

[3] Division of Curriculum and Instruction--Program Operation, Olympia, September 19,1974

[4] Douglas County, Washington Comprehensive Water and Sewer Plan, 1970-1990, prepared by Munson-Nash-Futrell and Associates, submitted August 26, 1969.

1.08 Existing vacant housing is in short supply in Bridgeport. A preliminary survey indicated there are about 400 total dwelling units in the city. About 14 houses were rentals and of these only about five were vacant. House rentals range from $70 to $135 per month. Of the approximately 40 apartment units in Bridgeport, about 10 are vacant; apartment rental rates range generally from $65 to $100 per month.[1] There are five trailer parks in Bridgeport with about 43 vacant spaces.[1] The Army Corps of Engineers has leased 42 spaces at rents of $60 to $100 per month as housing for its employees.[2]

Bridgeport Bar, Washington

1.09 Bridgeport Bar is an unincorporated area in Douglas County between Bridgeport and Brewster. It is served by State Highway 173 and a number of county roads. The Bridgeport Bar area extends from about four to eleven miles northwest of Chief Joseph Dam. The area is zoned for agriculture with 7,500 square feet as the minimum lot size for a single family dwelling unit. Mobile home parks are permitted under rezoning procedures.

1.10 Bridgeport Bar is bisected by the boundary between the Bridgeport and Brewster School Districts.

1.11 Residents of the Bridgeport Bar can dispose of solid waste either at a dump on the Bar or at Bridgeport's dump. Sewage disposal and water supply systems are privately owned.

1.12 Fire protection for the Bridgeport Bar is provided by the two pumper trucks and the 15 man volunteer crew located in Bridgeport. Police protection is provided by the three deputy sheriffs which Bridgeport contracts with Douglas County.

1.13 According to the Douglas County Planning Department, the estimated 1974 population of the Bridgeport Bar area is about 340. Bridgeport Bar is an agricultural area in transition to mixed uses including residential, commercial and recreational. The area housed workers during the original construction period of Chief Joseph Dam, and, as indicated in the Army Corps of Engineers Draft Supplement to Environmental Statement, June 1974, the new project will result in an expected temporary increase in residential use of the Bridgeport Bar.

[1] Survey of housing in Bridgeport, August 1974.
[2] Army Corps of Engineers, August 16, 1974.

Brewster, Washington

1.14 Brewster, in Okanogan County, is approximately 14 road miles northwest of Chief Joseph Dam. The city has a planning commission and building codes, and requires building permits. The city zoning ordinances include the use and location of mobile homes.

1.15 The school system, which is part of Consolidated District Number 111, has facilities for kindergarten through grade 12, with a present maximum capacity of 625 pupils.[1] Official school enrollment during September 1974 was 590.[2] The annual impact of harvest labor raises the student enrollment by approximately 56 students during the month of October only. Brewster's high school is rated 1 (highest accreditation rating).

1.16 Solid waste is collected by a private firm[3] and disposed by sanitary landfill measures. Brewster has a sanitary sewage system serving the entire town; the design population equivalent is 2,500. The town's water supply, pumped from two wells and a spring, has a daily supply capacity of 1,800,000 gallons; average daily use is 1,060,000 gallons. An estimated 73 percent of the water supplied daily is used by small businesses and homes within the city limits. The daily average per capita use of the 773,800 gallons is 678.7 gallons. Water usage is metered. The estimated population capacity of Brewster's water system is 5,750.

1.17 The 20-man volunteer firefighting crew operates three pumper trucks and two tankers.[4] The area fire insurance rating is 6 on a scale of 1 to 10, with 1 being ideal. Fire hydrants are spaced throughout the town; water pressure and storage capacity are satisfactory for this purpose. According to the National Board of Fire Underwriters, three pumper trucks, if adequately manned, can provide standard protection of 22,100 residents. By the same standards the volunteer crew is of sufficient size to operate one pumper truck and protect up to 5,400 residents. Brewster employs four law enforcement officers. The town's population could increase to 3,636 without exceeding the average police protection-to-population ratio for rural areas in the United States.

1.18 Brewster currently has a modern 50-bed[3] hospital with a population service capacity of 8,621. In addition, the town has a five-doctor medical clinic, a dentist and an optometrist.

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[1] Interview with Clyde Brown, Superintendent of Schools, Brewster, August 20, 1974

[2] Telephone interview, Clyde Brown, September 10, 1974

[3] Interview with Joan Bender, City Clerk, and George Beaudoin, city employee, August 20, 1974

[4] Telephone interview with Mayor Gamble, September 11, 1974.

1.19 A survey indicated that available vacant housing was in short supply. Approximately 80 of the 430 dwellings in Brewster are rental type residences. The survey showed 15 rental vacancies with monthly rates from $80 to $150. The town has about 41 apartment units, of which only four were vacant. Apartment rentals ranged from $75 to $150 per month. The town has one trailer court with facilities for 70 trailers.[1] At the time of the survey 48 vacancies[1] existed at rates of $35 to $50 per month. The rental charge includes sewer, water, and solid waste collection.

Pateros, Washington

1.20 Pateros, located in Okanogan County, is 21 road miles southwest of Chief Joseph Dam. The town has a local planning commission and building codes and requires building permits. Town zoning ordinances control the location and use of mobile home trailers.

1.21 The Pateros school system includes grades 1, through 12, with a maximum capacity of 350 students.[2] The Pateros High School is rated 2.[3] The September 1974 enrollment was 239 students.

1.22 The town provides a solid waste collection service and owns a sanitary landfill. Pateros has a sanitary sewer system and new secondary treatment facilities that can serve up to 1,150 people. The town obtains water from two wells with a maximum supply capacity of 1,260,000 gallons per day. The average daily use is 120,000 gallons. Small businesses and homes located within the city limits tap about 82 percent of the total water consumed or a daily average of 98,400 gallons or 185.6 gallons per capita per day. The water system is metered and is estimated to be capable of supplying up to 4,520 residents.

1.23 Pateros employs two[4] full-time police officers to provide protection for the 530 residents. This is 640 fewer residents per officer than the average for rural areas in the United States. Twenty-five volunteer firemen and three pumper trucks comprise the fire department. According to the standards used, three pumper companies, if sufficiently staffed, are adequate protection for towns with populations up to 22,100. By the same standards, a 20-man volunteer crew is adequate protection for up to 5,400 residents. The fire insurance rating for this area is 6.

1.24 Pateros had about five houses, seven apartment-type units, and about 35 trailer spaces for rent. Rents ranged from $80 to $150 for houses, $60 to $150 for apartments and $35 to $50 for trailer spaces.

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[1] Interview with R.L. Parish, Angle Trailer Park, August 20, 1974

[2] Interview with Bill Laws, Superintendent of Schools, August 21, 1974

[3] Division of Curriculum and Instruction--Program Operation, Olympia, September 19, 1974

[4] Interview with Neal Shenyer, City Superintendent, August 21, 1974.

Coulee Dam, Washington

1.25 The city of Coulee Dam is bisected by the Okanogan-Douglas County line and is 39 road miles east of Chief Joseph Dam. As with the neighboring communities of Grand Coulee and Electric City, Coulee Dam developed as a result of construction of Grand Coulee Dam. Combined resources with the other two towns provide community services and facilities. Coulee Dam has a planning commission and building codes, and requires building permits. City zoning ordinances regulate the use and location of mobile homes.

1.26 The Grand Coulee Dam schools, School District 301J, include all public schools in Grand Coulee, Electric City, Coulee Dam and Elmer City. The district has facilities for kindergarten through grade 12 and has a maximum capacity of 1,200 students. The September 1974 enrollment was 1,404[1] students, a decrease of about 100 students from the preceding year. The inflated enrollment of recent years has been caused by construction on Grand Coulee Dam which may be continued into 1975-76. Ten relocatable classrooms and a building which the school district declared substandard are available to house the overflow of students under crowded conditions. The Grand Coulee Dam School District has maintained a good quality educational program. The high school is rated 1.

1.27 Grand Coulee, Electric City, Elmer City and Coulee Dam contract with a commercial solid waste collection company. The four towns also share a sanitary landfill located on land owned by the U.S. Bureau of Reclamation. Coulee Dam sewage facilities, including secondary treatment, have a population equivalent capacity of 3,000. The city's treated water supply comes from the Columbia River, Roosevelt Lake and springs. The total supply capacity is 2,880,000 gallons per day. Total reservoir capacity is 3,400,000 gallons. Average use by small businesses and homes within the city limits is 800,000 gallons per day. Average per capita use is 484.2 gallons daily. This seemingly high consumption rate may be due to leakage within the system, but because customer services are not metered there is no means of substantiating this. The estimated population capacity of the Coulee Dam water system is 12,600.

1.28 The Coulee Dam Fire Department consists of a 28-man volunteer crew and two pumper trucks. Fire hydrants are spaced throughout the town and there is adequate water storage for this purpose. The fire insurance rating for this area is 5. According to the standards used by the National Board of Fire Underwriters, two pumper truck companies, adequately manned, a 28-man crew is more than sufficient for a population of 5,400. The city employs two police officers, a ratio of one officer to every 825 residents. This is 84 fewer residents per police officer than the average for rural areas of the United States.

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[1] Telephone interview, Grand Coulee Dam Schools Administration, September 10, 1974.

1.29 Available vacant housing is in short supply. A preliminary survey indicated that there were 460 houses in the town of Coulee Dam. Ninety-two of these were rental units, with 21 vacancies. Monthly rentals for dwellings range from $80 to $200. Apartment units number about 44 with about 4 vacancies. Apartment rentals are $60 to $180 per month. One trailer park provides 186 spaces of which 110[2] were vacant. Trailer space rentals range from $35 to $60 per month.

1.30 Present information indicates that when the new powerhouse at Grand Coulee Dam is completed by Januarty 1975, about 300 construction jobs will be eliminated. The skills involved include ironworkers, carpenters, concrete workers and laborers. These 300 workers represent a total worker and family population of about 1,280 and about 330 students. Since these worker skills would be needed for construction at Chief Joseph Dam during 1975, a number of the unemployed workers would undoubtedly be attracted to the Chief Joseph Project. Some workers may continue to reside in Coulee Dam and commute the 39 miles to Chief Joseph Dam, while others will move closer to the project. By about 1977, construction is expected to start on six additional hydroelectric units at Grand Coulee Dam. No information is available at the present time to determine the impact on Grand Coulee of this possible new work force for Grand Coulee Dam.

Okanogan, Washington

1.31 Okanogan, located in Okanogan County, is 31 road miles north of Chief Joseph Dam. The town has a local planning commission and building codes which require building permits for new construction. Zoning ordinances permit use of mobile homes when placed on permanent foundations. Re-classification of zoning was completed in February 1974[3] to allow mobile home trailers in two specified areas of the community.

1.32 The Okanogan school district has facilities for kindergarten through grade 12, with a present (September 1974) enrollment of 946[4] students and a maximum capacity of 1,050 students. The Okanogan high school is rated 1.

1.33 Okanogan and Omak jointly own a sanitary landfill. Both towns contract a commercial solid waste collection company. A survey on the status of public facilities during the summer of 1974 reported no recent changes in the Okanogan sewer and water supply systems. A sanitary sewer system and a disposal plant providing both primary and secondary treatment serve Okanogan residents. Additional capacity is available to handle about 600 new residents.

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[1] Interview with Mary Alice Fossun, City Hall, August 22, 1974

[2] Interview with Earl Samsel, Earl's Trailer Court, August 1974

[3] Interview with Red Cusick, City Superintendent; Okanogan City Zoning Ordinance No. 458

[4] Telephone interview Okanogan School Administration, September 10,1974.

Okanogan relies on springs and three wells for its water supply; the total daily supply capacity is 1,870,000 gallons. Storage capacity is 775,000 gallons.[1] The average daily consumption rate is 600,000 gallons. Approximately 70 percent of the total water consumed is used by small businesses and homes within the city limits. This is an average of 420,000 gallons per day or 188.8 gallons per capita per day. Water usage is 85 percent metered. The Okanogan water system can supply up to about 1,000 additional people or a total population of about 3,225 given the storage capacity limitations and heavy summer water usage.

1.34 Thirty volunteer firemen, a paid chief, and three trucks, one of which is a pumper, constitute the Okanogan Fire Department. According to the applied standards, this is sufficient equipment and staffing for protecting up to 5,400 residents. The area fire insurance rating is 6. Okanogan employs four[2] police officers, a ratio of one officer for every 551 residents. This is 358 fewer residents per police officer than the average for rural areas in the United States.

1.35 Available vacant housing is in short supply in Okanogan. The preliminary survey indicated 1,593[2] houses in the city with about 250 dwellings considered as rental units. Of these about 39 were vacant and available for rent. Rentals for houses usually were in the range of $90 to $250 per month. There were about 45 apartment-type units with five vacancies. Apartment rents ranged from $75 to $200 per month. Two trailer parks provided 45 spaces, five[2] of which were vacant. Trailer space rentals ranged $35 to $60 per month.

Mansfield, Washington

1.36 Mansfield, located in Douglas County, is 18 road miles south of Chief Joseph Dam via a rural road and 36 road miles over State highways. Mansfield has no local planning commission or building codes, nor does the city require building permits. The city zoning ordinances apply to only two square blocks of the downtown area.

1.37 Mansfield schools, covering grades 1 through 12, have a maximum capacity of 200[3] students. The September 1974 school enrollment was 120[4].

1.38 As reported in the Douglas County Washington Comprehensive Water and Sewer Plan, 1970-1990,[5] Mansfield's municipal dump is unsanitary due to

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[1] Comprehensive Water and Sewer Plan, Okanogan County, Washington, R.W. Beck and Associates, May 1967

[2] Interview with Red Cusick, City Superintendent, August 21, 1974

[3] Interview with John DeFigh, Superintendent of Mansfield School

[4] Telephone interview with Doris Kinsel, Mansfield School Secretary, September 10, 1974

[5] Prepared by Munson-Nash-Futrell and Associates. Submitted 26 August 1969.

uncontrolled burning, rodents, insects, and inadequate cover operations. However, by July 1975[1] the County Solid Waste System will transfer solid waste from Mansfield to a sanitary landfill near Waterville.

1.39 The city of Mansfield has upgraded its sewer disposal system to meet quality standards.[2] The population equivalent design capacity of the system is 500[2]. It is now serving an equivalent population of about 347[1]. The source of the Mansfield water supply system is two wells. The daily supply capacity is 580,000 gallons. The average daily use by Mansfield small businesses and homes is 40,000 gallons or 132 gallons per capita. The water system is not metered. Its estimated population capacity is 2,450.

1.40 Mansfield has one appointed full-time[2] police officer and one part-time special deputy. Douglas County Fire District No.5 owns five trucks, one of which is a pumper truck. Fifty volunteers comprise the volunteer firefighting crew. The fire insurance rating for this area is 8. According to the National Board of Fire Underwriters, one pumper company comprised of a 20-man crew is adequate protection of up to 13,800 residents.

1.41 The water supply system is adequate for a population increase of about 2,153. Assuming that the service of two part-time police officials is equal to that of one full-time officer, Mansfiels's population can increase by 1,017 before exceeding the average population-to-police-protection ratio of rural areas in the United States. Both the existing fire protection equipment and crew are up to standard protection for 5,100 more people. The school system can accommodate approximately 309 more residents. There were five vacant houses during August 1974.

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[1] Telephone interview with Mrs. Verne Kind, Mansfield resident, August 1974
[2] Interview with Verne Kind, City Judge, August 22, 1974

SECTION II - POPULATION TRENDS AND PROJECTIONS

2.01 Current and future population estimates for each of the six study communities are presented in this section. The projections have been based on the assumption of "normal" growth, without the impact of Chief Joseph Dam construction.

2.02 The approach was to project population change for each community by: 1) determining economic and demographic characteristics, 2) evaluating locational attributes, including access to and relationship of each community to its service area and to other communities, 3)considering major growth forces within the region, 4) identifying past growth rates for each town on the basis of average annual and percentage change for different periods, 5) judging the population development potential for each community, and 6) selecting the statistical projection rate which most nearly approximates such development potential.

2.03 The April 1974 population estimates for the six communities as prepared by the Office of Program Planning and Fiscal Management are as follows:

Town	April 1974 Population
Bridgeport	1,060
Brewster	1,143*
Pateros	530
Coulee Dam	1,547*
Okanogan	2,207*
Mansfield	347*

*Special 1974 Census

2.04 As would be expected historical population trends for the six communities vary widely, as illustrated on Table I for selected periods since 1940. Population changes during the 1970-1974 period reflect the influence of such growth forces as construction at Grand Coulee Dam, continued orchard development, construction of the North Cascades highway, and increased tourism. As indicated on Table II, the greatest numerical growth for the four-year period occurred in Okanogan (192) and the least in Pateros (58). In contrast, the four-year percentage growth rate was highest for Mansfield (27.1%) and lowest for Coulee Dam (6.1%).

TABLE I

POPULATION TRENDS 1940-1974

Town	1940	1950	1960	1970	1971	1972	1973	1974
Bridgeport	320	802	876	952	1,056	1,060	1,060	1,060
Brewster	447	851	940	1,059	1,176	1,150	1,143	1,143
Pateros	484	866	673	472	486	520	530	530
Coulee Dam	--	--	1,344	1,458	1,704	1,718	1,652	1,547
Okanogan	1,735	2,013	2,001	2,015	2,068	2,170	2,225	2,207
Mansfield	349	414	335	273	302	303	303	347

TABLE II

POPULATION CHANGE 1970-1974

Town	4 year numerical change	Average annual numerical change	4 year percentage change	Average annual percentage change
Bridgeport	108	27	11.3%	2.8%
Brewster	84	21	7.9%	2.0%
Pateros	58	14	12.3%	3.1%
Coulee Dam	89	22	6.1%	1.5%
Okanogan	192	48	9.5%	2.4%
Mansfield	74	19	27.1%	6.8%

2.05 Estimated population changes for each of the six communities which could have been anticipated if no expansion of Chief Joseph Dam occurred are presented for the years 1975, 1978, and 1980 (Table III).

Bridgeport, Washington

2.06 After relatively slow growth between 1950 and 1970, the growth rate of Bridgeport amounted to an average of approximately 2.8% per year between 1970 and 1974. By applying this average annual rate to the selected projection years, population would range from approximately 1,090 in 1975 to 1,240 in 1980 (Table III).

Brewster, Washington

2.07 Average annual percentage growth for Brewster (approximately 2.0% per year) for the past four years if projected as "normal" growth for the future would result in population levels of approximately 1,165 in 1975 increasing to 1,280 in 1980 (Table III).

Pateros, Washington

2.08 The town of Pateros, which has had its population ups and downs as a result of Wells Dam construction, experienced an average annual percentage growth of about 3.1% during the past four years. Use of this rate would result in populations of 545 in 1975 increasing to 630 in 1980.

Coulee Dam, Washington

2.09 "Normal" projections for Coulee Dam take into consideration the decline in population between 1972 and 1974 as well as potential for future power house expansion. Due to scheduled completion of certain phases of Coulee Dam construction the population would be expected to decline from 1,547 in 1974 to 1,500 in 1975. For the three year period to 1978 the population should remain relatively constant at about 1,500, subsequently increasing to 1,700 in 1980, assuming further expansion of electrical generating facilities at Grand Coulee Dam. These population estimates are based upon reasonable expectations of future events rather than use of the recent population trends as a guide to growth.

Okanogan, Washington

2.10 Although the population of Okanogan has remained relatively static for the two decades between 1950 and 1970, this town and other Okanogan County communities have experienced recent population increases. Consequently, the average annual percentage growth rate (2.4%) between 1970 and 1974 has been used to indicate "normal" levels of future population, ranging from 2,260 in 1975 to 2,525 in 1980.

TABLE III

POPULATION PROJECTIONS 1974-1980
(Without Chief Joseph Dam construction)

Town	1974	1975	1978	1980
Bridgeport	1,060	1,090	1,180	1,240
Brewster	1,143	1,165	1,235	1,280
Pateros	530	545	595	630
Coulee Dam*	1,547	1,500	1,500	1,700
Okanogan	2,207	2,260	2,420	2,525
Mansfield**	347	365	420	460

*Due to phase-out of Coulee Dam construction, population will decrease to 1,500 in 1975 and hold steady through 1978. Increase to 1,700 is due to the assumption of beginning construction of the Fourth Power House, now in the planning stage.

**Straight line 1970-1974 base, annual increase 19 people.

Mansfield, Washington

2.11 The methodology used to project the future population for Mansfield has been derived by applying the average annual numerical increase between 1970 and 1974 to the target years. This appears to be more indicative of actual future trends than would be projections on the basis of percentage increase. Mansfield's numerical increase between 1970 and 1974 was 74 (approximately 19 per year) which, if projected would result in "normal" population levels of about 365 in 1975 increasing to 460 in 1980.

SECTION III - IMPACT POPULATION ALLOCATION

3.01 In this section the projected impact population of 2,200 (graph following) has been allocated to the six communities under study (and to some key outlying areas) under three alternatives. Such factors as time-distance, housing availability, capacity of public facilities, and the availability of amenities including recreation and commercial outlets have been considered for each of these alternatives. Alternative I allocations are identical with those presented in the Army Corps of Engineers February 1974 Community Impact Report; Alternative II utilizes new estimates of 2,200 (in contrast to 2,000) new population and allocates all of the population to the incorporated areas of the six communities--it also assumes support for development in Bridgeport and relative resistance to major development in Brewster. Alternative III allocates most of the projected 2,200 new people to the six communities, but in addition allocates a portion of the population to certain "outside" areas (it also reflects more support for development in Brewster than was assumed under Alternative II).

Alternative I. 3.02

a. Methodology. The approach used to allocate population to the six communities was to rank them numerically as to desirability by 1) distance from Chief Joseph Dam, 2) school capacity, 3) sewer capacity, and 4) water capacity. Driving distance was weighted twice that of each of the other factors. The rankings were then converted to percentages which were applied to the 2,000 "impact population" to derive the numerical allocation for each town on the basis of relative desirability.

b. Assumptions. This allocation assumes that new people will move into those communities in proportion to the communities' capabilities of supporting the new population with existing service systems, recognizing the importance of travel distance between residence and place of work.

c. Allocation. Of the 2,000 anticipated new people, Brewster was expected to receive the most (1,000) and Mansfield the least (none) (Table IV).

Alternative II. 3.03

a. Methodology. The new population (2,200) has been allocated to each of the six communities principally on the basis of time-distance factors and housing availability (existing and potential). Other factors such as community service facilities and amenities are important but secondary considerations since all of the six communities studied have in existence the basic services including schools, public utilities, and police and fire protection. Hospital and other health services, while not available in all of the communities, are less than 30 miles from the most distant town.

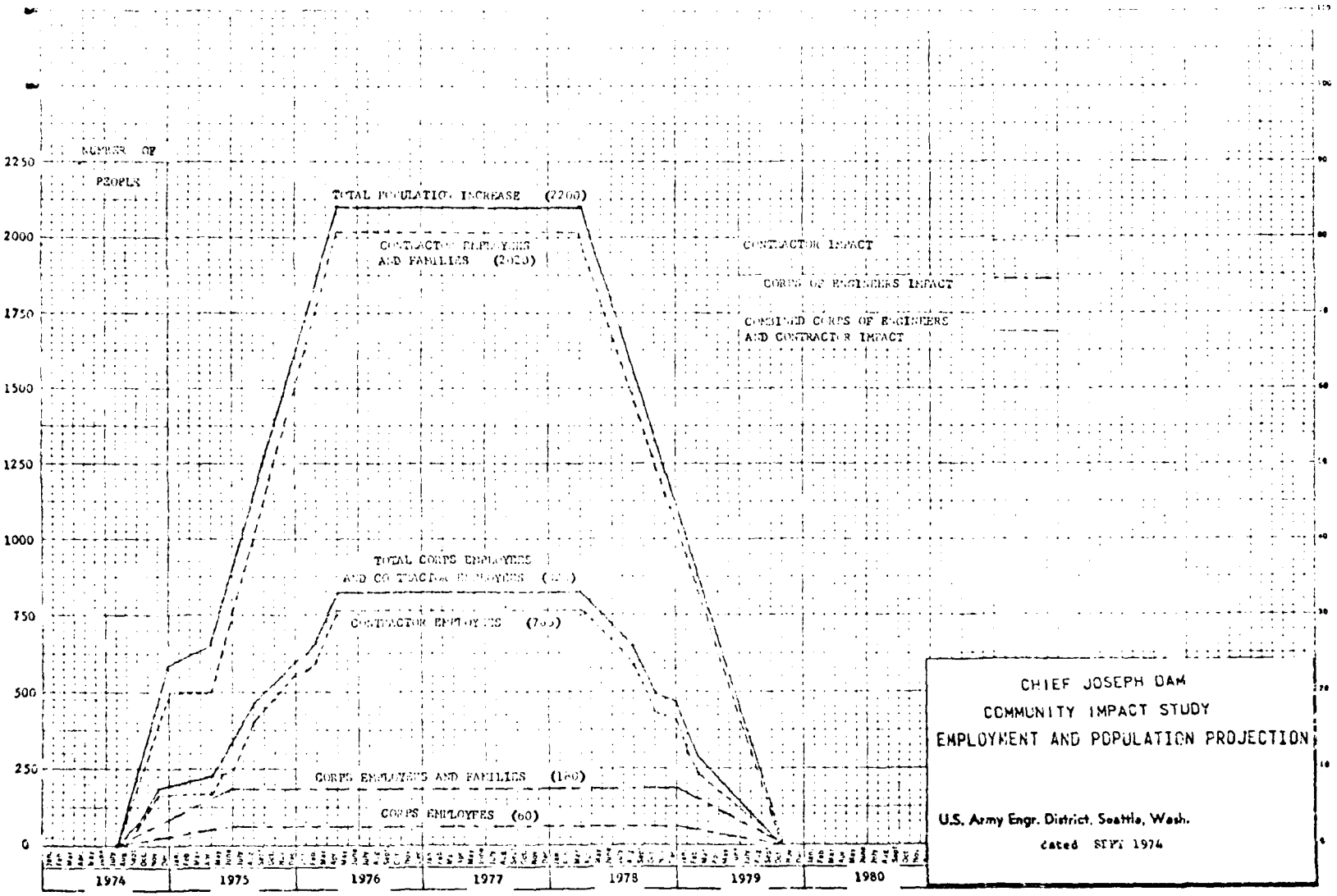

NUMBER OF PEOPLE
2250
2000
1750
1500
1250
1000
750
500
250
0
TOTAL POPULATION INCREASE (2200)
CONTRACTOR EMPLOYEES AND FAMILIES (2020)
CONTRACTOR IMPACT
CORPS OF ENGINEERS IMPACT
COMBINED CORPS OF ENGINEERS AND CONTRACTOR IMPACT
TOTAL CORPS EMPLOYEES AND CONTRACTOR EMPLOYEES
CONTRACTOR EMPLOYEES (750)
CORPS EMPLOYEES AND FAMILIES (180)
CORPS EMPLOYEES (60)
1974
1975
1976
1977
1978
1979
1980
CHIEF JOSEPH DAM
COMMUNITY IMPACT STUDY
EMPLOYMENT AND POPULATION PROJECTION
U.S. Army Engr. District, Seattle, Wash.
dated SEPT 1974

TABLE IV

ALTERNATIVE I

"COMMUNITY IMPACT REPORT"

ESTIMATED IMPACT POPULATION

Town	Total	% Of Total
Bridgeport	300	15
Brewster	1000	50
Pateros	200	10
Coulee Dam	400	20
Okanogan	100	5
Mansfield	---	0
TOTAL	2000	100%

b. Assumptions.

1. The actual build-up of market demand for residential units, including single-family housing, apartments, and mobile homes will develop directly in response to time-distance considerations. Obviously there will not be an equivalence of housing supply (or community services and amenities) in each of the communities, and consequently such differences will influence the final residential site selection of workers. Assuming that reasonably competitive prices for housing, especially mobile home rental units and tracts will be maintained, it would appear that the Bridgeport-Brewster area would accommodate the majority of new population entering the "impact" area.

2. One of the most important factors influencing where the workers and their families will eventually live is the decisions by developers as to locations for mobile home lots and parks and perhaps to some extent other types of new housing. These developer decisions in turn, are strongly influenced by locational considerations--specifically time-distance relationships between place of residence and place of work as well as community cooperation in regard to their proposed projects. Bridgeport city officials seem especially cooperative toward responsible developers interested in providing facilities for the anticipated influx of new people in the community.

c. Background Information.

1. Brian J.L. Berry and Frank Horton have indicated that commuting fields show "a gradual decay with distance,"[1] and Wilfred Owen reported that in a six state study, more than 60% of the workers surveyed lived within three miles of their places of employment.[2]

2. Recent settlement trends resulting from the construction of the Third Power Plant at Grand Coulee Dam further illustrate the importance of proximity to work and housing availability in the establishment of settlement patterns. According to report and interview information from Mr. Samuel Rey, Administrative Officer, Grand Coulee Third Powerplant Construction Office, workers live "as close as possible to the jobsite." He further indicated that 74% of the Grand Coulee Dam workers were "local".

3. The year 1972 was the peak construction period at the Third Power Plant and it was also the year of maximum population of the four nearby towns: Electric City, Grand Coulee, Coulee Dam, and Elmer City. Between 1960 and 1972 these four towns experienced a population increase of 1,426 (46.4%). During this same period Wells Dam was constructed which had an influence on population change in the Brewster-Bridgeport-Pateros area. With the exception of Bridgeport and Brewster, which grew in population by 21% and 22% respectively, no other town within 50 miles of Grand Coulee Dam had significant population expansion during these twelve years. Therefore in establishing a population projection schedule for the impact zone of Chief Joseph Dam, proximity to the Dam and availability of housing facilities are of primary importance.

---

[1] Brian J.L. Berry and Frank E. Horton, Geographic Perspectives on Urban Systems (Englewood Cliffs, N.J., 1970), p.261.

[2] Wilfred Owen, The Metropolitan Transportation Problem (The Brookings Institution, Washington, D.C., Revised Edition 1966), p.247.

d. Allocation

1. In arriving at a theoretical allocation of population to each of the six communities on the basis of the time-distance factor alone, the distance from each community to Chief Joseph Dam has been converted to average driving time. Bridgeport, located approximately five minutes driving time from the Dam, is obviously most advantageously situated to attract workers if the significance of all other attractions was eliminated.

2. Conversion of the time-distance to a weighted scale was undertaken by selecting a base of 30 into which each of the time-distances (5, 15, etc.) was divided. Any of an infinite number of bases (10,60, etc.) could have been used since the purpose was to arrive at a percentage distribution of time-distance weights. The weights range from .7 for Coulee Dam (farthest from the Dam) to 6 for Bridgeport (Column 3, Table V).

3. Of the total of the weights (12.4), Bridgeport's percentage is 48 and Coulee Dam's is 6, reflecting the gradual decay of commuting attraction as distances increase (Column 4).

4 Application of these percentages as time-distance market share attractions would result in a housing demand level for Bridgeport of 48%, which, applied to the 2,200 "impact" population would result in 1,056 people for Bridgeport (Column 5).

5. Housing availability as well as proximity is a key to future population settlement patterns in the impact area. At the present time there are an estimated 369 dwelling units (Column 6) (including mobile home spaces, of which 42 have been leased to the Army Corps of Engineers) available in the six towns. At a ratio of 2.6 people per family unit, existing available housing and mobile home sites could accommodate 959 people (Column 7). Of these, the greatest number would be located in Coulee Dam (302) and the fewest in Mansfield (13).

6. By subtracting the estimated population which could be housed in existing units and spaces (959, Column 7) from the time-distance market share allocation (2,200, Column 5), an excess (unsatisfied demand) (or in the case of Coulee Dam, a deficit) of population for each community is demonstrated. The range is from 170 deficit demand population (excess housing to apparent demand) at Coulee Dam to 835 more people than can be satisfied by existing units/spaces at Bridgeport (Column 8).

7. Under the extreme growth pressures which could be expected in the Bridgeport area, severe pressure on community services could create a less attractive development climate which in turn could inhibit further development of housing facilities.

8. Thus, significant difference in "excess" people to be accommodated in Bridgeport (835) in comparison with Brewster (178) suggests that substantial pressures for development will be transferred from Bridgeport to Brewster even though such factors as zoning and land availability for development in Brewster may at the outset be less conducive to development. Consequently, a population shift in Time-Distance market share of about 100 (106 decrease for Bridgeport and 98 increase for Brewster) has been assigned. Similarly, reallocation of population share to and from other communities has been made on the basis of 1) increase for Coulee Dam because of housing availability and construction skills, and 2) decrease for Mansfield because of lack of housing, small size, and adverse winter driving conditions.

TABLE V
(ALTERNATIVE II)
ALLOCATION OF IMPACT POPULATION

Town	(1) Distance (to Chief Joseph Dam)	(2) Time-Distance (minutes)	(3) Time-Distance Weight Factors (30 base)	(4) Market Share (%)	(5) Market Share Number	(6) Housing Availability	(7) Potential Population (@2.6/family)	(8) Excess (Deficit) Population	(9) Population Allocation
Bridgeport	2	5 (@ 25 mph)	6.0	48	1056	85	221	835	950
Brewster	14	15 (@ 55 mph)	2.0	16	352	67	174	178	450
Pateros	21	23 (@ 55 mph)	1.3	11	242	47	122	120	250
Coulee Dam	39	43 (@ 55 mph)	.7	6	132	116	302	(170)	300
Okanogan	31	34 (@ 55 mph)	.9	7	154	49	127	27	150
Mansfield	18	20 (@ 55 mph)	1.5	12	264	5	13	251	100
			12.4	100	2200	369	959	1241	2200

9. The population allocation ranges from 100 additional "impact" people for Mansfield to 950 for Bridgeport (Column 9, Table V).

Alternative III. 3.04

a. Methodology. Population allocations developed here relate to the previously discussed alternatives but are distinct in that they also consider population growth possibilities for areas outside of the six target communities. The original effect of Chief Joseph Dam construction on population levels within the new "impact" area has been used as an indication of possible future settlement trends.

b. Assumptions.

1. It has been assumed that the development climate will be about the same in both Bridgeport and Brewster (in contrast to the Assumptions under Alternative II that it would be substantially easier for developers to construct new housing facilities in Bridgeport).

2. The Bridgeport, Brewster, and Bridgeport Bar area is considered to be the major population impact zone within the overall impact area.

c. Background Information.

1. Between 1940 and 1950 the net population increase for the six subject communities amounted to 1,611 (Table VII). The percentage share of this new growth ranged from 4% for Mansfield to 30% for Bridgeport; Coulee Dam Town population was unreported in the 1940 Census.

2. Another area which did not appear in the statistical comparison between 1940 and 1950 is Bridgeport Bar.

3. A mobile home development is under construction on Bridgeport Bar and reportedly will have 20 spaces for permanent units and 12 spaces for overnight use. Another small mobile home project on Bridgeport Bar has been discussed locally as possibly available for space rental if demand warrants.

d. Allocation.

1. If the 1940 to 1950 percentages are applied to the 2,200 future impact population, the population allocations would range from 88 for Mansfield to 660 for Bridgeport. Bridgeport and Brewster collectively would account for 55% of the total. By adding the Pateros and Mansfield allocations, 83% of the total new population would live within 25 miles of the dam.

2. On the basis of the 1940-1950 trend information, updated to account for current conditions, a 60% market share of impact population has been assigned to the Bridgeport-Brewster zone (including Bridgeport Bar).

3. Of the 60%, 10% of the full population (220) has been assigned to the unincorporated area; 27% (approximately 600) has been assigned to Bridgeport and 23% (500) to Brewster. Bridgeport is most advantageously located in respect to the dam site and past development trends as well as support of growth by local officials suggest that Bridgeport will receive the highest proportion of population of all of the communities. However, Brewster housing will also be in high demand resulting in population demand pressure, second only to Bridgeport.

TABLE VI

HISTORICAL TRENDS AND POPULATION ALLOCATION

Town	1940-50 numerical increase	% of total		1940-50 % applied to 2200 population	%		Population allocation
Bridgeport	482	30	55%	660	27		600
Brewster	404	25		550	23	60%	500
Bridgeport Bar	--	--		--	10		220
Pateros	382	24		528	10		220
Coulee Dam	--	--		--	15		330
Okanogan	278	17		374	5		110
Mansfield	65	4		88	2		50
Total	1611	100		2200	92		2030
"Outside Areas"					8		170
					100		2200

4. Pateros has been assigned a 10% (220) share of impact population, down from the 24% of the 1940-1950 period. However, Pateros has changed dramatically in size, shape, and composition since the 1940's due to the construction of Wells Dam and the resulting slack water pool. Consequently Pateros seems less likely to be able to absorb major additional population now than was the case in the 1940's.

5. Coulee Dam, with its available mobile home spaces and alternative construction employment potential may expect approximately 15% of the projected new population (330).

6 Okanogan, 31 miles from the dam and with a dearth of available housing is expected to absorb only about 5% (approximately 110) of the "impact" population.

7. Mansfield has been assigned a 2% share (approximately 50 people) because of its restricted size, distance from the dam, and potential travel difficulties under winter blizzard conditions.

8. The new population allocated to the six communities and Bridgeport Bar represents 92% of the total (2,030). The other 8% (170) has been allocated to unincorporated areas such as the corridor zone between Okanogan and Omak and to unspecified other communities such as Elmer City, Electric City, Grand Coulee, and Omak.

3.05 Conclusion. On the basis of our investigation of past trends, travel time, housing availability, community facilities, and other local and regional conditions, it is recommended that the population allocations as presented under Alternative III be used for development planning purposes. Obviously major shifts in local, county, or federal action affecting type and location of residential development could drastically alter the pattern of settlement potential as presented here. However on the assumption that the Bridgeport-Brewster area officials (and general public) will be willing for their communities to absorb the new population desiring local housing, it can be anticipated that at least 60% of such new residents will establish their homes within this area.

SECTION IV - POPULATION IMPACT

4.01 Section IV presents graphically and textually the current status of public facilities in the impact communities together with an indication of the adequacy of such facilities to meet the requirements of projected population. The information presented is arranged by community with six descriptive plates appearing at the end of the section. All references in this section to "impact" population refer to Alternative III (Table VIII).

Bridgeport, Washington

4.02 Plate 1 represents graphically the capacities of public facilites and possible future shortages. The analysis indicates a possible shortage of school, sewer system and housing facilities for the town of Bridgeport. The school system will need space for approximately 164 additional students by 1978. Assuming all new residents would be served by the municipal sewage system, an impact of 430 people above the present capacity of 1,350 can be expected by 1978. About 230 construction related families will need housing in Bridgeport in the period 1975-1978. About 69 families are expected to have their own house trailers or campers and will require trailer spaces.[1]

Bridgeport Bar, Washington

4.03 It is expected that approximately 85 families will require housing on the Bridgeport Bar during the peak construction period. There are in excess of 32 trailer spaces available at the present. Since the Bridgeport Bar is a rural area, water and sewage disposal systems will probably be provided by private enterprise and individuals as the demand occurs. Fifty-seven students are expected to attend Brewster and Bridgeport schools from the Bridgeport Bar. Police and fire protection appear to be adequate (Section I).

Brewster, Washington

4.04 Plate 2 graphically presents the capacity of public facilities in Brewster. Information available in mid-1974 indicates that public facilities, except housing, are generally adequate to support the estimated 500 increase in population which may be composed of about 192 families. Approximately 58 families are expected to have their own house trailers or campers and will require trailer spaces.

---

[1] Based on an estimate that 30% of the workers will bring in their own mobile home units.

Pateros, Washington

4.05 As shown graphically on plate 3, Pateros appears to have sufficient public services to accommodate the approximately 220 people associated with Chief Joseph Dam construction, as well as projected resident population. Approximately 85 families will require housing during the peak construction period. About 26 families are expected to have their own house trailers or campers and will require trailer spaces.

Coulee Dam, Washington

4.06 As shown graphically on plate 4, public facilities, except police protection, appear to be adequate to accommodate the approximately 330 people related to Chief Joseph Dam construction activities. The ratio of police officers to population would exceed the average for rural areas by 12 people.

Okanogan, Washington

4.07 As shown graphically on plate 5, Okanogan has adequate public facilities to accommodate a total of approximately 110 people associated with Chief Joseph Dam construction, as well as projected resident population increases. About 42 families will require housing in Okanogan during the construction period 1975-1978. About 12 families are expected to bring their own trailers or campers and will require trailer spaces.

Mansfield, Washington

4.08 As shown graphically on plate 6, Mansfield appears to have adequate public facilities to accommodate approximately 50 people associated with Chief Joseph Dam construction as well as normal population increases. It is expected that about 19 families will require housing in Mansfield during the 1975-1978 construction period, about six of which will bring their own trailers or campers and will require trailer spaces.

TABLE VII

ALTERNATIVE III POPULATION ALLOCATION

Town	Estimated Population 1978		
	Normal	Impact	Total
Bridgeport	1,180	600	1,780
Bridgeport Bar	--	220	--
Brewster	1,235	500	1,735
Pateros	595	220	815
Coulee Dam	1,500	330	1,830
Okanogan	2,420	110	2,530
Mansfield	420	50	470
"outside" areas	--	170	--
Total		2200	

SECTION V CONCLUSIONS

5.01 According to the Army Corps of Engineer projections:

A. Chief Joseph Dam construction workers will begin arriving in the area in mid-1974 and the last workers will leave in late 1979.

B. The peak work period (with 825 workers) will be from early 1976 to early 1978.

C. Peak population (workers and families) will amount to approximately 2200 "impact" people.

5.02 The six communities which can be expected to accommodate most of the new population are: Bridgeport, Brewster, Pateros, Coulee Dam, Okanogan, and Mansfield. Unincorporated Bridgeport Bar will also grow.

5.03 If it were not for the Chief Joseph Dam construction, population expansion of the aforementioned communities would be expected to be modest.

5.04 On the basis of analyses of such factors as "time-distance" travel, housing and community facilities availability, and other community characteristics, the following projected allocation (Alternative III) of the 2200 impact population has been prepared and is recommended for planning purposes:

Bridgeport	600
Brewster	500
Bridgeport Bar	220
Pateros	220
Coulee Dam	330
Okanogan	110
Mansfield	50
Other "outside" Areas	170
Total	2200

5.05 Capacities of most community facilities appear adequate to provide for the needs of the projected future populations; however existing housing will be inadequate in all of the "impact" communities except for Okanogan.

5.06 Bridgeport - Existing school and sewer facilities apparently would need to be expanded to serve the projected future population.

5.07 Bridgeport Bar - No community water or sewer services are available; police and fire protection appear adequate; but additional pressure on Bridgeport and Brewster schools can be expected.

5.08 Brewster - Public services appear to be adequate to support the projected population.

5.09 Pateros - Public services appear to be adequate to accommodate the projected population.

5.10 Coulee Dam - Public facilities, except police protection, appear to be adequate to serve the projected population.

5.11 Okanogan - Public facilities appear to be adequate to meet the needs of projected population.

5.12 Mansfield - The expected modest growth of Mansfield during peak construction at Chief Joseph Dam can be accommodated by public services, at currently existing capacities.

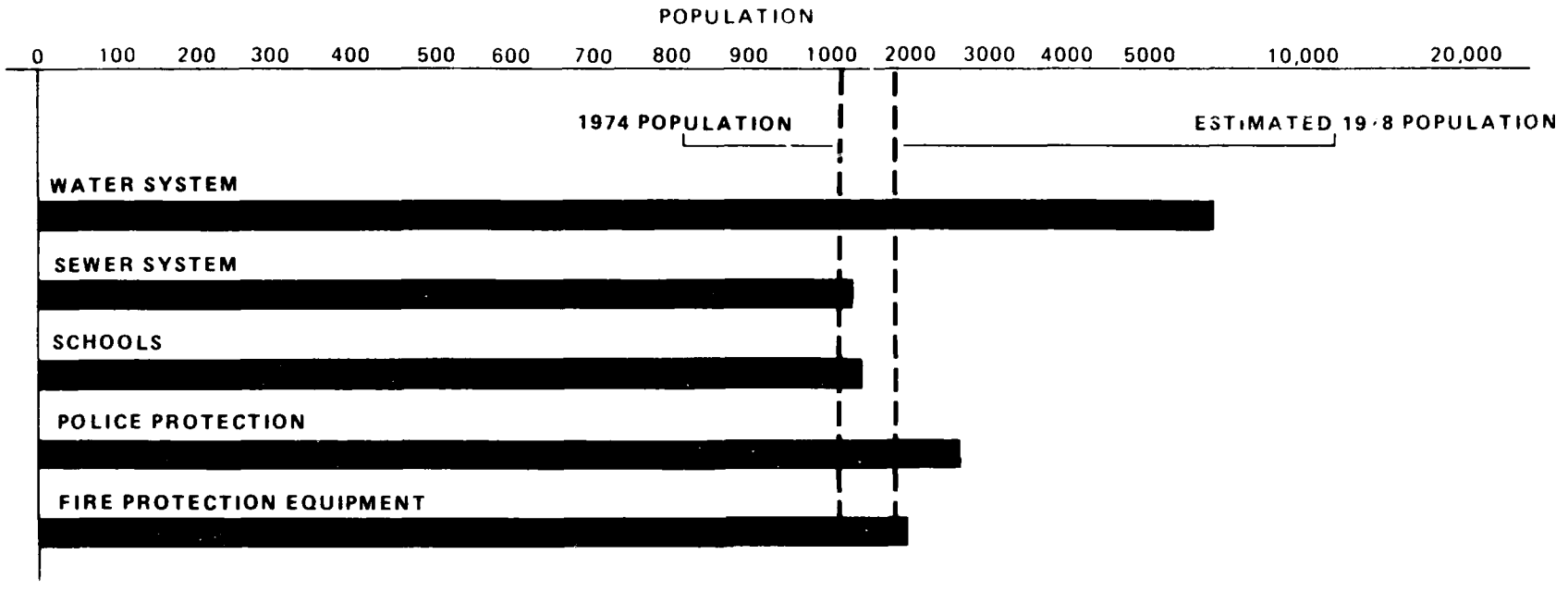


PLATE 1

BRIDGEPORT, WA.
COMMUNITY
IMPACT STUDY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

BRIDGEPORT, WA.

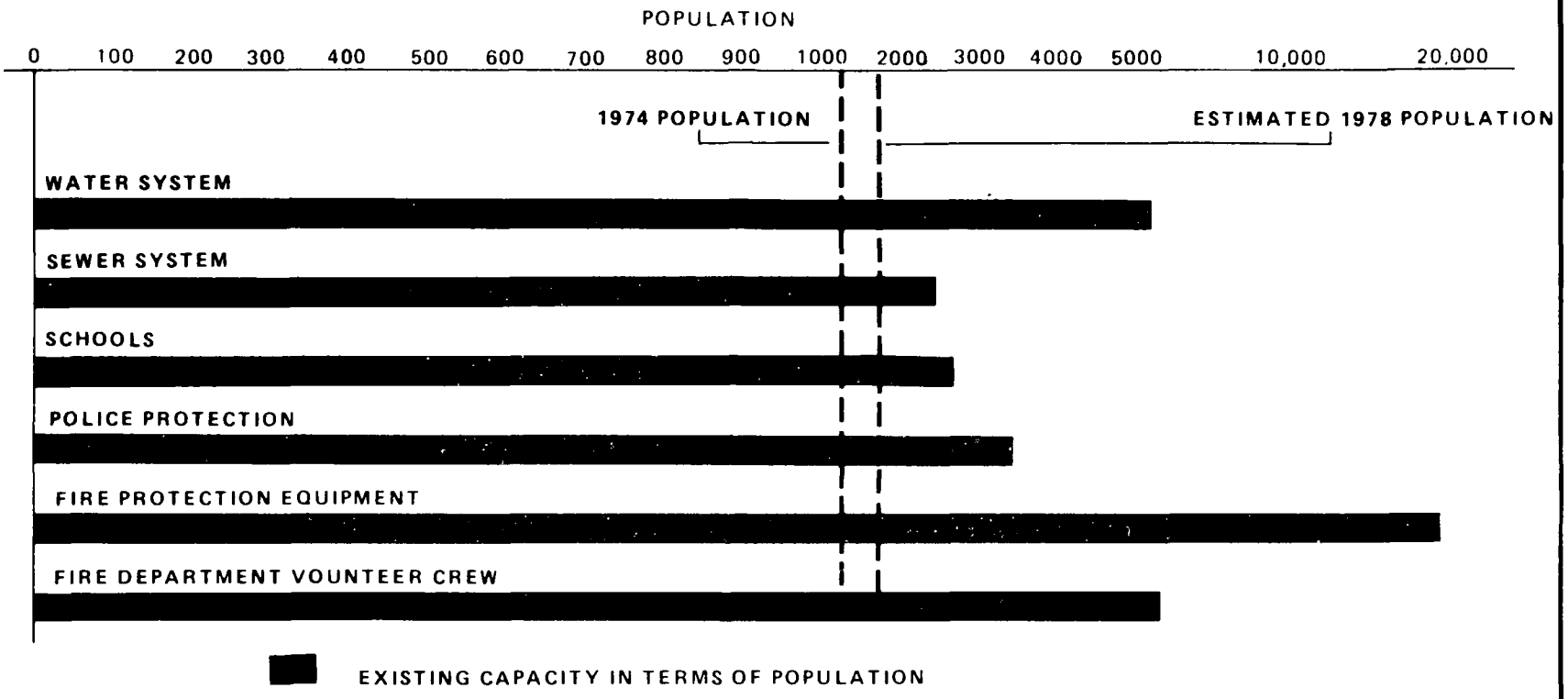


PLATE 2

BREWSTER, WA.
COMMUNITY
IMPACT STUDY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMMARY

BREWSTER, WA.

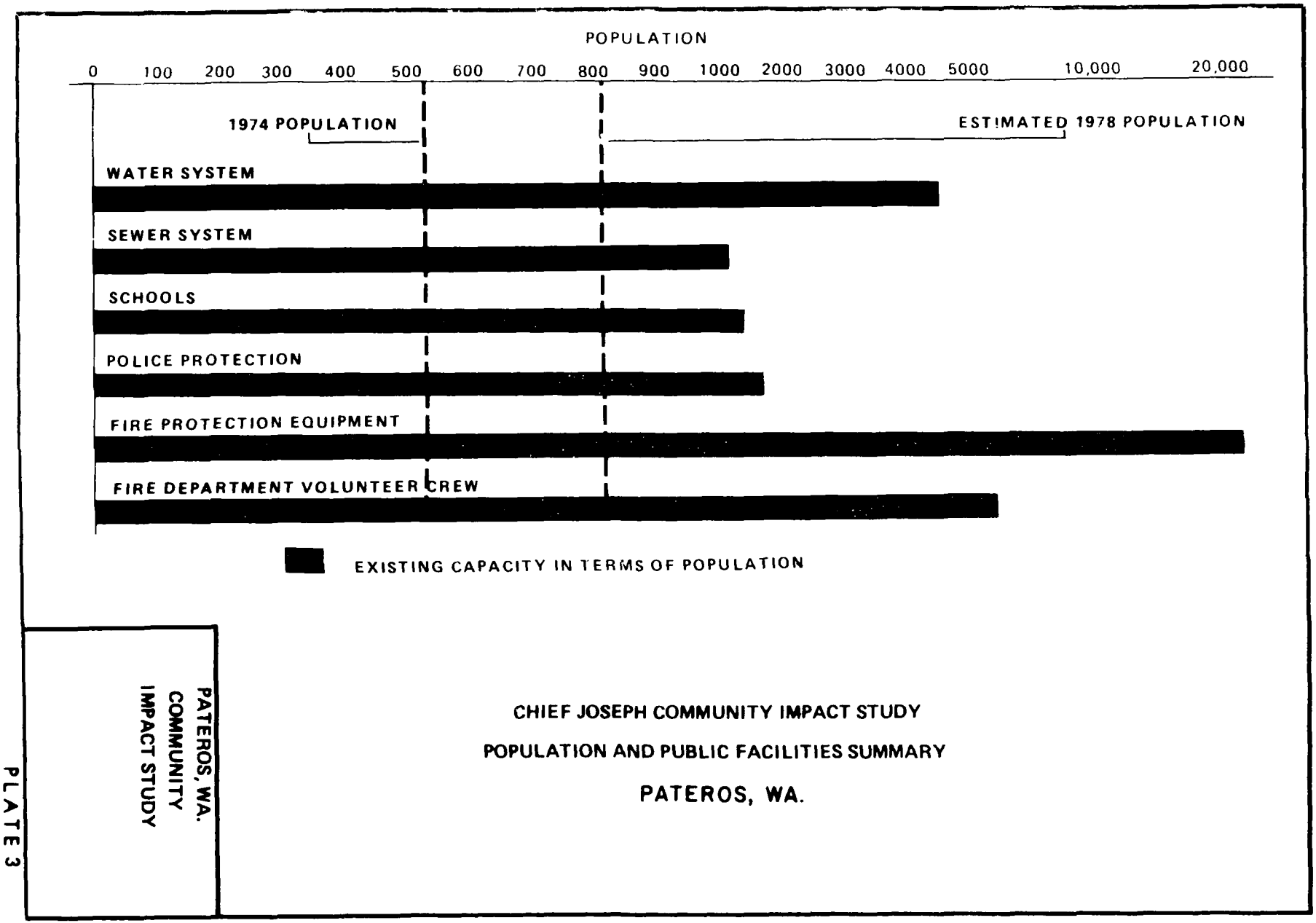


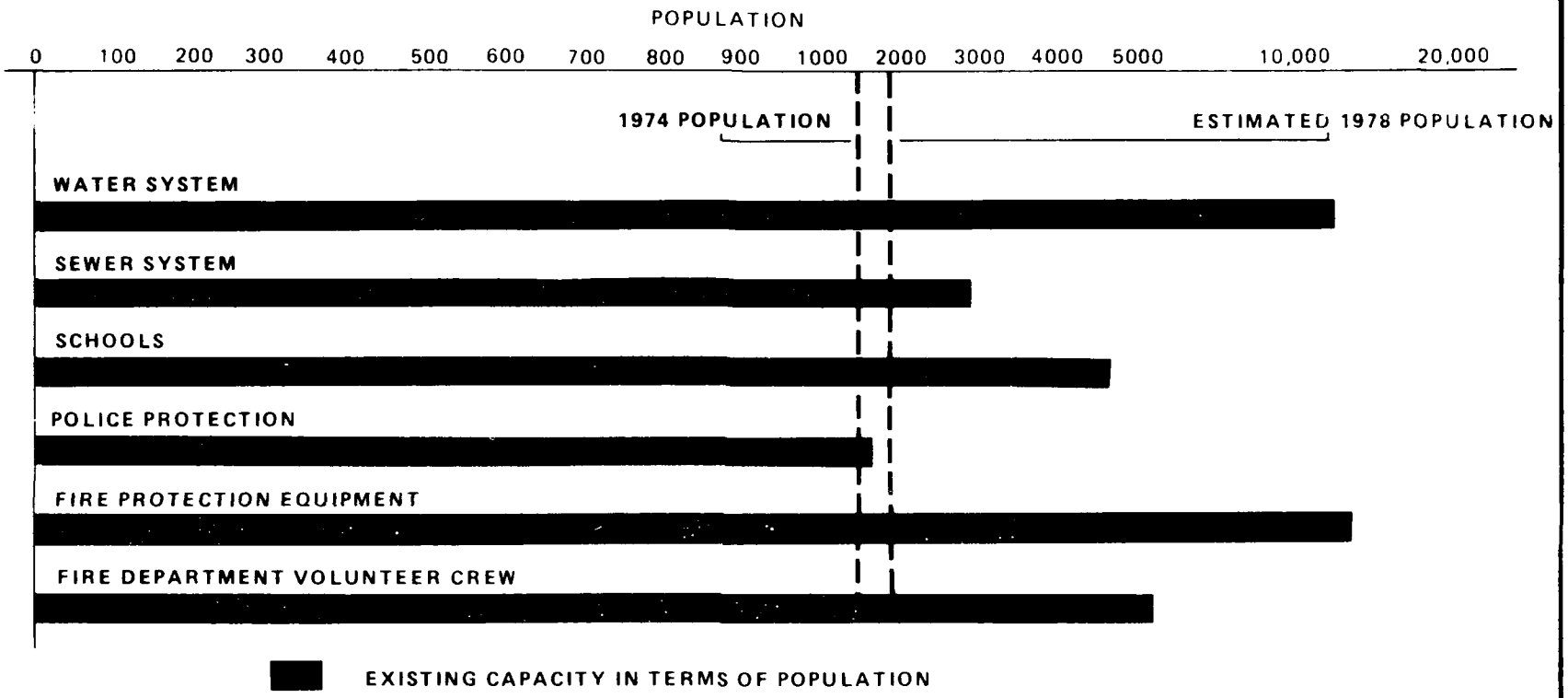
PLATE 3

PATEROS, WA.
COMMUNITY
IMPACT STUDY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

PATEROS, WA.



COULEE DAM, WA.
COMMUNITY
IMPACT STUDY

PLATE 4

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

COULEE DAM, WA.

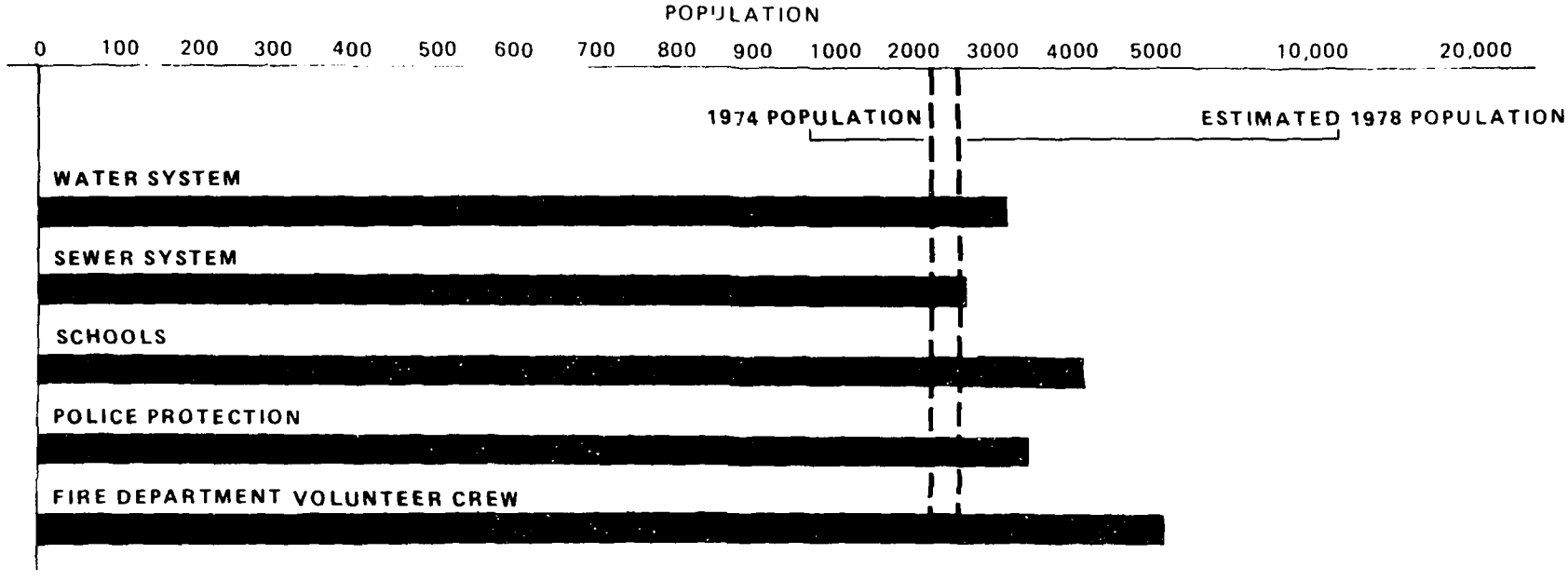


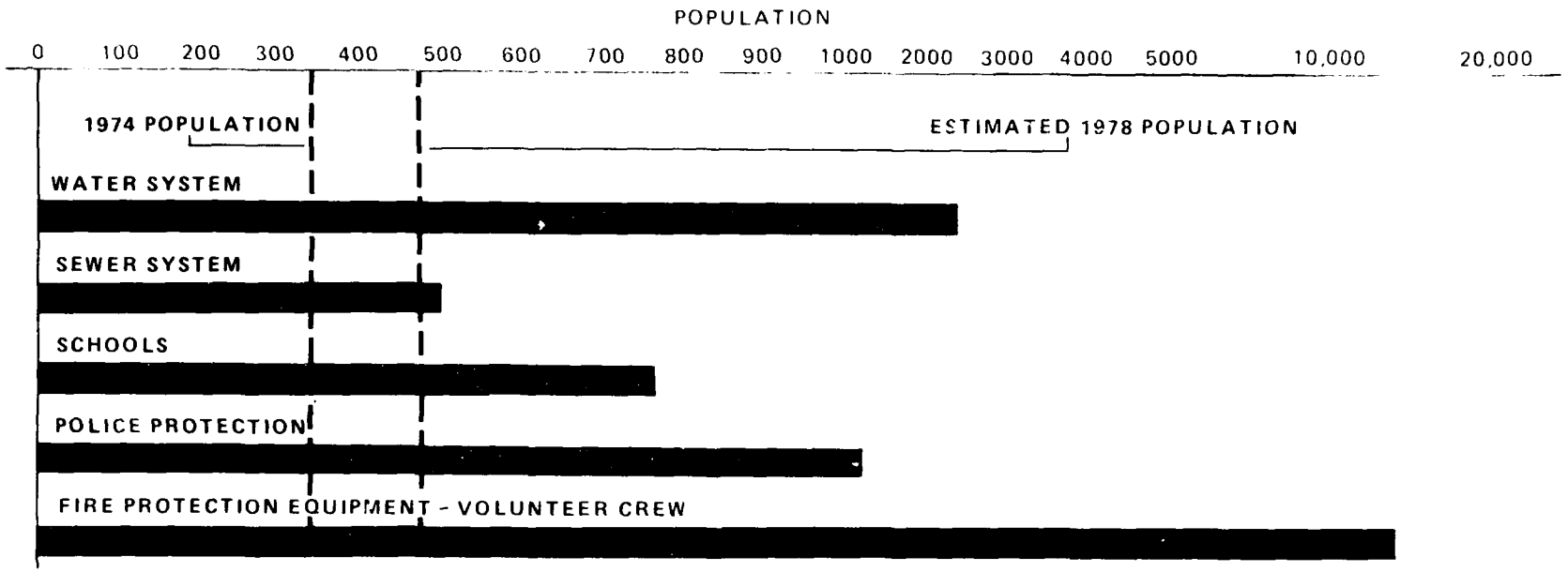
PLATE 5

OKANOGAN, WA.
COMMUNITY
IMPACT STUDY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

OKANOGAN, WA.



EXISTING CAPACITY IN TERMS OF POPULATION

PLATE 6

MANSFIELD, WA.
COMMUNITY
IMPACT STUDY

CHIEF JOSEPH COMMUNITY IMPACT STUDY

POPULATION AND PUBLIC FACILITIES SUMMARY

MANSFIELD, WA.

COMMUNITY IMPACT REPORT

Chief Joseph Dam

COLUMBIA RIVER, WASHINGTON

UPDATE II

MEASURING CONSTRUCTION RELATED IMPACTS ON LOCAL SCHOOLS

APRIL 1978
REPRINT MARCH 1980

CHIEF JOSEPH DAM
Columbia River, Washington

COMMUNITY IMPACT REPORT
UPDATE II: MEASURING CONSTRUCTION RELATED IMPACTS ON LOCAL SCHOOLS

A Report Submitted to:

U.S. Army Engineer Institute for Water Resources
Kingman Building
Fort Belvoir, Virginia 22060

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APRIL 1978

IWR CONTRACT REPORT 78-3

UNCLASSIFIED

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REPORT DOCUMENTATION PAGE

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19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

Social Impact, Construction, Impact, Community Impact, Service Impact, Mitigation, Educational Services, Operation and Maintenance Impact, Intergovernmental Coordination, Planning.

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

The study provides a case history of impact problems arising from a large scale construction project and how these problems were solved. The study reviews practical methods for projecting these impacts, ways of financing mitigation efforts and ways to avoid future problems.

DD FORM 1 JAN 73 1473 EDITION OF NOV 65 IS OBSOLETE

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TABLES

PREFACE

This report is one of a series prepared by Seattle District, U.S. Army Corps of Engineers, to document the impact on local communities as a result of major construction activities at Chief Joseph Dam, Washington. Chief Joseph Dam Community Impact Report (February 1974) and Community Impact Report Update I (October 1974) were prepared prior to construction and discussed the anticipated impact. This report, Community Impact Report Update II, was prepared at the request of the Institute for Water Resources and discusses the Corps of Engineers' response to meeting increased educational expenses of the affected communities. An additional study, Update III (February 1978), will evaluate all community facilities and services during the peak of the construction period. A subsequent report (scheduled for 1980) will document community adjustment to postimpact conditions. A final report (also scheduled for 1980) will analyze the entire experience from pre- to postimpact conditions. The final report will discuss and evaluate community response, Corps of Engineers-community relations, and provide guidelines for Federal action in future major construction projects. This report has been prepared under the directive of Mr Arthur Harnisch of the Corps Seattle District in consultation with Dr. Jerry Delli Priscoli of the Corps' Institute for Water Resources.

SECTION 1 - INTRODUCTION

Purpose

The purpose of this study is to provide a case history documentation of impact problems and solutions resulting from enrollment increases at local schools due to construction activities of the U.S. Army Corps of Engineers at Chief Joseph Dam, Washington. The study provides information that may be useful in planning future projects.

Scope

Scope of the study includes data on public school facilities prior to impact, projected enrollment increases, and additional physical facility and operating expense needs resulting from the influx of construction-related (impact) students. Section 1 of this study provides introductory material. Section 2 includes enrollment projections, facility needs, and construction and engineering assistance provided by the Corps of Engineers. Section 3 discusses increased operating costs experienced by the impacted schools and methodology developed to reimburse districts for increased costs. Section 4 summarizes the school impact experience and makes recommendations for future planning actions in support of local schools in advance of major construction projects.

Project Description

Chief Joseph Dam is on the Columbia River in north central Washington State near the small communities of Bridgeport and Brewster (figure 1). The 1977 population of Bridgeport was 1,623 and Brewster was 1,471. The dam is one of the major projects in the Comprehensive Water Resource Development Plan of the Columbia River Basin in the United States and Canada. Construction of the dam and 16 hydroelectric power units was completed in 1958. Construction activities to add 11 additional hydropower units and raise the dam and pool by 10 feet commenced in 1973. The additional units will increase installed capacity from 1,024,000 kW to 2,069,000 kW. The first major influx of construction workers arrived during the 1975-1976 school year. A peak work force of almost 900 occurred during the summer of 1977. Project completion is scheduled for late 1980.

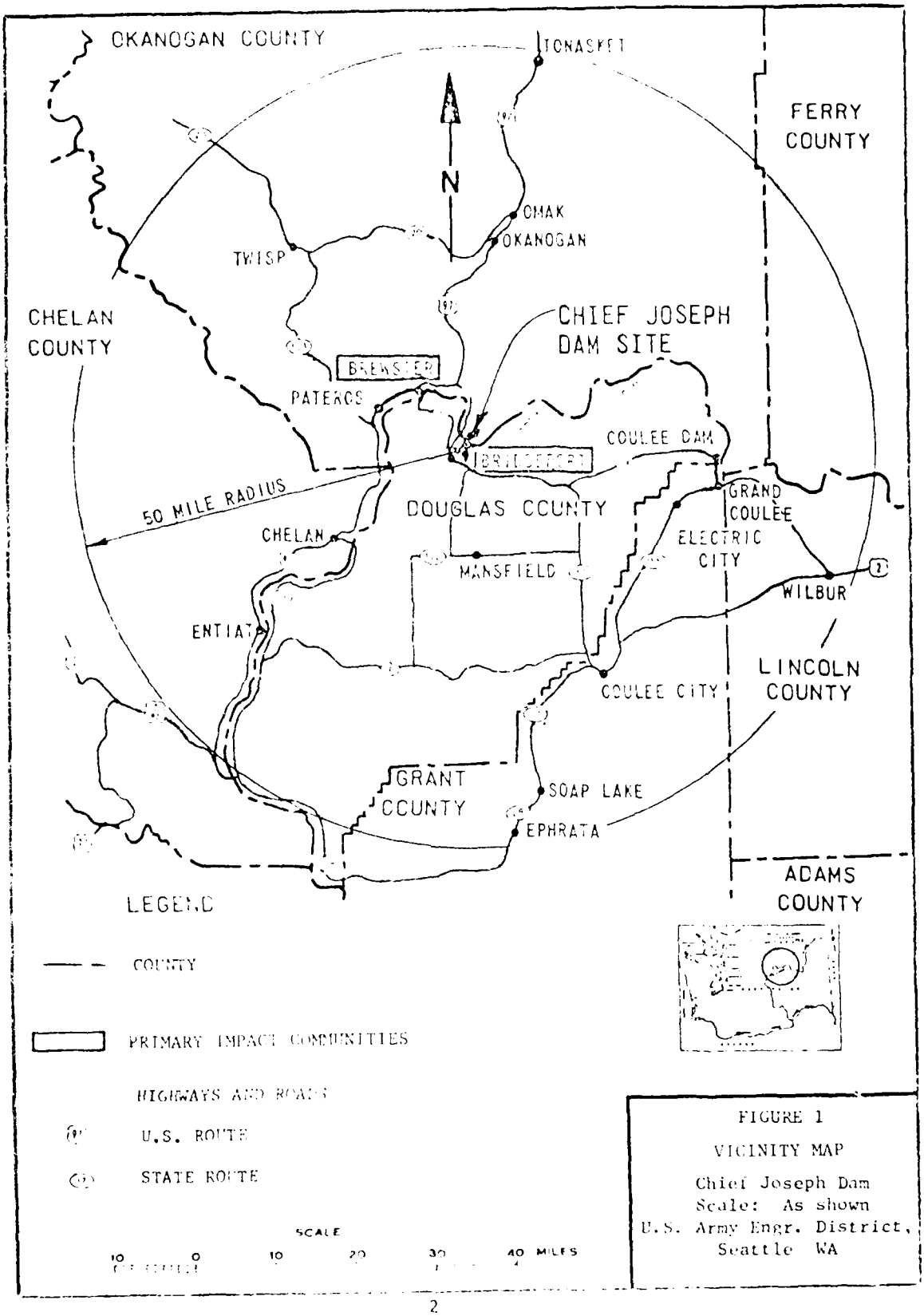


FIGURE 1

VICINITY MAP

Chief Joseph Dam
Scale: As shown
U.S. Army Engr. District,
Seattle WA

SECTION 2 - SCHOOL ENROLLMENT IMPACT AND FACILITY NEEDS

Preimpact Conditions

The Bridgeport elementary school building was in poor physical condition prior to impact (figure 2). The facility failed to meet state standards for either building space per student or outdoor recreational space. The junior-senior high school was in better physical condition, but also had numerous physical and functional deficiencies (figure 3). During the peak impact period, the school district was expected to have an enrollment in excess of capacity. A capital construction levy for the full cost of providing the needed facilities was not likely to be approved by the local electorate. Financial assistance for capital construction was not available from either the State of Washington or the U.S. Department of Health, Education, and Welfare during the impact period.

Elementary and high school facilities at Brewster were in fair to good physical condition prior to impact (figures 4 and 5). However, there were a number of physical and functional deficiencies which had to be corrected to meet state standards. School enrollment was expected to exceed capacity at peak impact. A school district construction levy had failed shortly before construction activities began at Chief Joseph Dam. Again, funding for construction was not available from either the State of Washington or U.S. Department of Health, Education, and Welfare during the impact period.

Previous Studies and Surveys

The Seattle District, Corps of Engineers, had published an initial impact study, Chief Joseph Dam Community Impact Report (CIR), in February 1974. The CIR documented conditions as of 1973 and provided preliminary projections of the construction impact on school enrollment in the project area. The report included impact predictions covering all major community services and facilities within a 50-mile radius of the construction site. Population capacities of the facilities and services were determined to assess the ability of the impact area to absorb anticipated population influx.

An updated study, Community Impact Report Update I, published in October 1974, revised projections based on updated information regarding community facilities and services. Update I also placed greater emphasis on commuting distance than on community services and facilities as a factor in attracting people to the community. As a result, a larger proportion of projected impact population was allocated to Bridgeport, located less than a mile from the damsite. Therefore, peak school enrollment projections for Bridgeport were higher than in the CIR. The report correctly anticipated a shortage

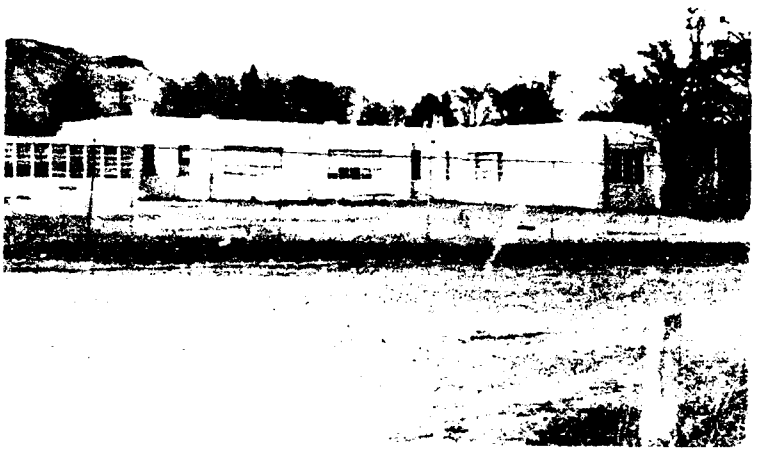


FIGURE 3 - Bridgeport Elementary School, March 1976

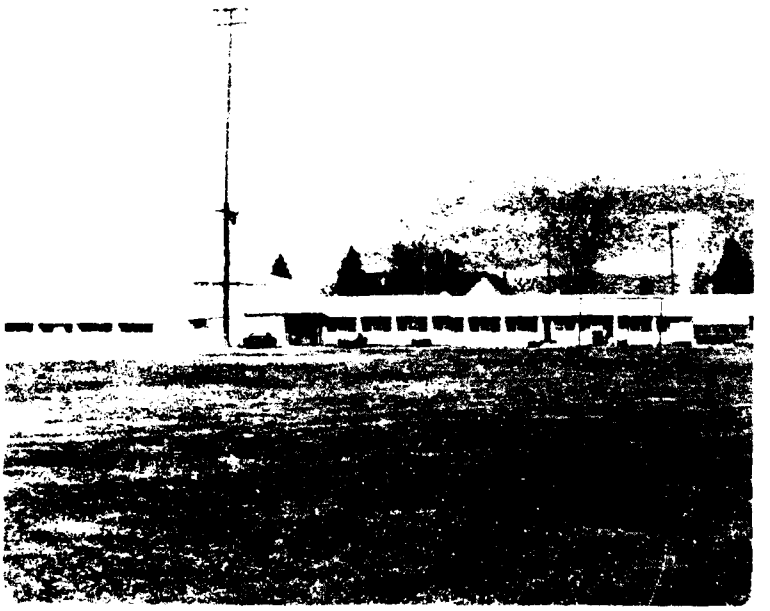
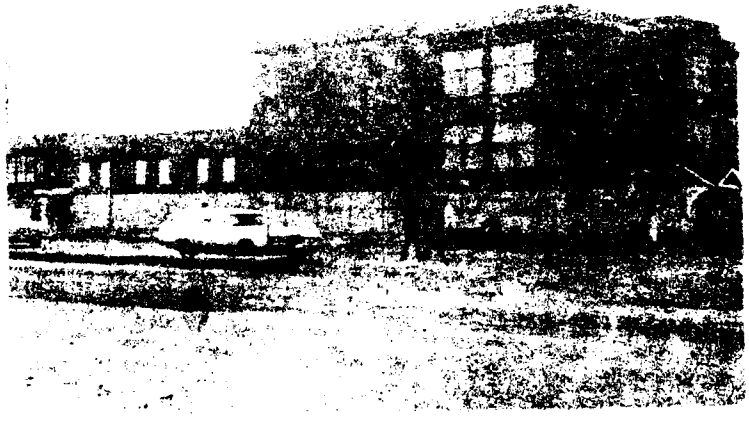


FIGURE 4 - Bridgeport Junior - Senior High School
March 1976



in capacity of Bridgeport schools and [illegible] problems accompanying the peak employment period. Updated [illegible] the [illegible], had assumed that Brewster school expansion plans would [illegible] in time to meet peak enrollment demands. However, [illegible] failure, Brewster did not implement these plans.

In September 1975, the Seattle District, Corps of Engineers, provided United States Representative Mike Lowry (the impacted area is part of U.S. Congressional District 1, State of Washington) a letter report which included data on the impact of Chief Joseph Dam construction on local school enrollment. The report incorporated information from the Resident Engineer, Chief Joseph Dam Project, and the major private contractors regarding number of workers then employed on the project, as well as residential distribution of those workers throughout the project area. The superintendents of Bridgeport and Brewster schools reported enrollment figures for children whose parents were employed on dam construction. This information was forwarded along with a revised construction schedule.

In an October 1976 survey, each major contractor and the Corps of Engineers' Resident Engineer reported the number and residential location of construction employees. Payroll records for all contractor and Corps of Engineers' construction staff [illegible] verified this information and yielded additional [illegible] subcontractor employees. Brewster and Bridgeport school superintendents submitted updated student enrollment, grade distribution, and school capacity figures.

During March and April 1977, current employment [illegible] was obtained and updated estimates of employment for the remainder of the impact period prepared. Each school district submitted current enrollment and identified number of impact students [illegible], based on actual experience at near-peak employment, provided the framework for preparing final school enrollment forecasts for measuring the peak impact and preparing the Corps of Engineers' response.

Construction Schedules

Throughout the preimpact study period, projected construction schedules for Chief Joseph Dam Additional Units provided the foundation for peak employment predictions, construction-related population, and peak school enrollment forecasts. Due to changes in funding and construction schedules, estimated peak number of employees and duration of peak employment period varied with each projection. During the 3-year preimpact study period, peak employment estimates ranged from 760 to 960 workers. Anticipated duration of the work force at peak employment ranged from 1 to 3 years.

Employment projections were based on the contract schedule method which utilized expected timing and employee requirements for each separate construction contractor. Corps of Engineers' supervisory

FIGURE 6
ACTUAL AND PROJECTED CONSTRUCTION WORKER PROFILE
CHIEF JOSEPH DAM ADDITIONAL UNITS

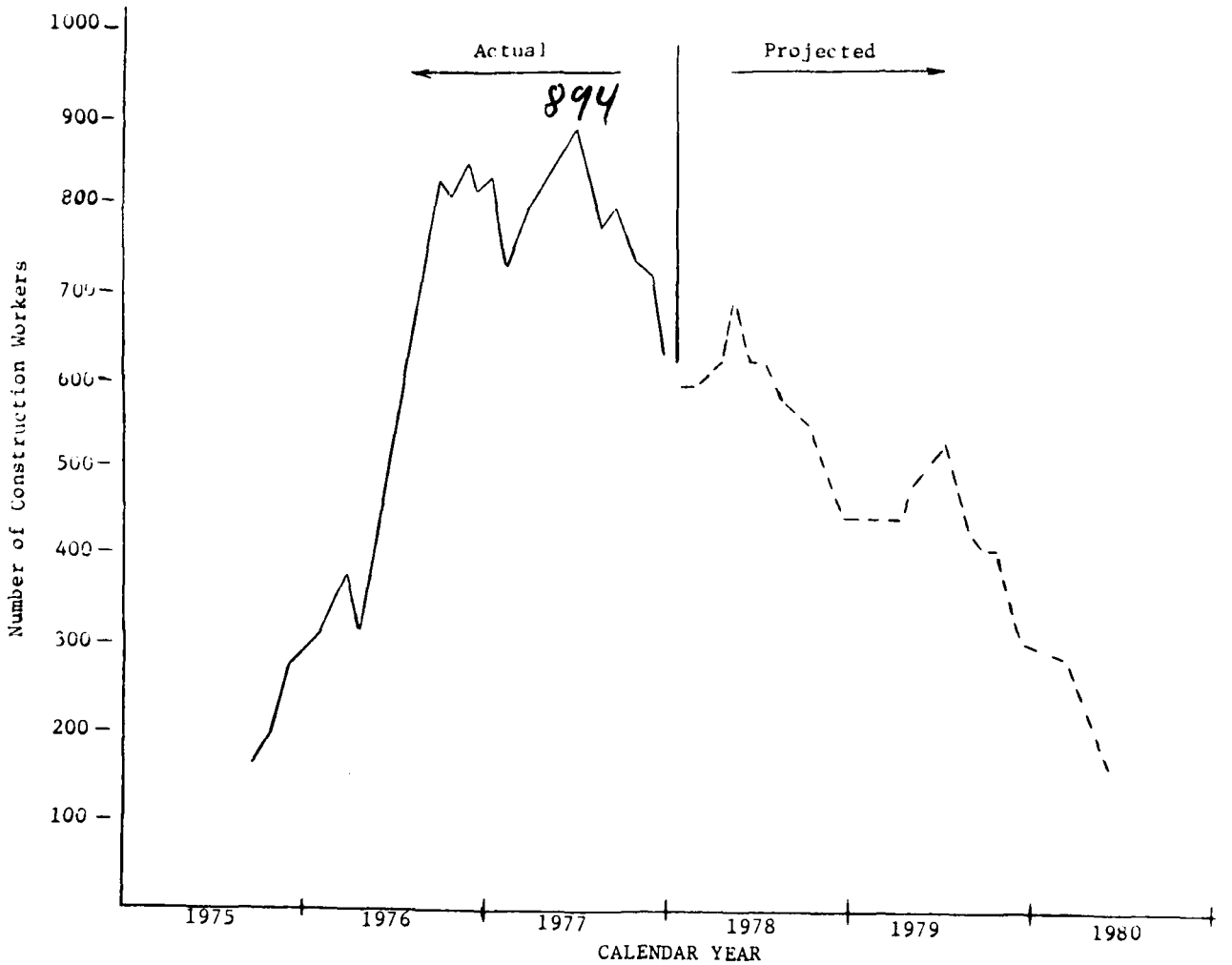


FIGURE 6

personnel and contractor employment schedules were added to determine total employee requirements throughout the construction period.

One method tested for projecting the employment schedule of Chief Joseph Dam construction was based on forecasted project budgets. Each element of the construction budget was graphed according to amount expected to be expended toward project completion on that element each month. For example, according to the budget graph, about 45 percent of the total amount appropriated for powerhouse construction was expected to be spent by October 1977. Adding the expenditures for each element budgeted for a certain month resulted in the total planned project cost for that month. The estimated proportion of the forecasted total expenditure assumed to be allocated for labor costs for a specific month (30 percent) was divided by the actual number of working hours available in the month. The resulting construction curve closely resembled the shape of the construction curve based on the individual contract schedules. However, projected employee requirements were slightly lower than those estimated by the contract schedule method.

The contract schedule method was believed to yield more accurate employment projections primarily because the budget method was based on three general assumptions: (1) projected budget for contract payments accurately reflected future construction progress, (2) 30 percent of the total project expenditure would be allocated for labor costs, and (3) average cost per laborer for the project would be $14 per hour. The project budget-based method was of greatest value when estimating labor requirements early in the project planning stage. At that time, specific employment details for the project were unknown and the assumptions provided an adequate projection.

The validity of the contract schedule method for projecting employee requirements relied on the accuracy of estimates of construction timing and employee requirements for each contract and subcontract. These estimates, made by construction management personnel, were based on knowledge of similar contract work.

The construction contract schedule upon which final forecasts were estimated was prepared in March 1977. Peak work force occurred during June 1977 with 890 workers, including on-site Corps of Engineers construction-related employees. Number of workers is expected to decline until project completion in 1980 (figure 6).

Employee Residential Location

Preliminary employee residential location projections in the 1974 CIR were based on a judgmental scoring system which reflected the expected attractiveness of each project area town to workers.

According to the CIR, Brewster was expected to attract the greatest number of construction employees due to the quality and capacity of the services and facilities in this town. Update I, however, revised these projections, and predicted that Bridgeport would receive a slight majority of the impact population due to the short commuting distance between this town and the damsite.

Several surveys were conducted to document the employee residential distribution. A September 1975 survey was taken when project employment was equal to about 30 percent of projected peak employment. The fall 1976 and spring 1977 project surveys were conducted when employment was near peak. Employee income tax withholding and exemption forms (W-2 forms), held by employers for each employee, provided place of residence claimed by each employee. Utility company records of connections during the construction period supported this information.

Table 1 compares final survey results to the previous projections. The majority of workers located in Bridgeport as anticipated. A much higher proportion of the Corps of Engineers employees (76 percent) lived in Bridgeport than contractor employees (25 percent) due to provision of a larger number of Government-housing trailers for Corps of Engineers employees at Bridgeport than in Brewster.

Survey results indicated an unexpected high percentage of contractor workers (40 percent) commuted from outside a 50-mile radius of the project site. Representatives for major construction firms advised that the majority of those claiming permanent residence outside the area were actually "geographical bachelors" who lived in trailers, campers, and motels in the Brewster and Bridgeport vicinity during the work week and commuted to permanent residences and families on weekends. A Spokane-area contractor reported that the majority of his employees residing outside the area commuted from the Spokane vicinity, while those employed by a Seattle-area contractor are believed to have permanent residences in the Seattle vicinity.

Employee residential distribution patterns (table 1) from the October 1976 and April 1977 surveys provided the basis for peak work force residence forecasts. Corps of Engineers and contractor employee ratios were used for projecting overall construction employee location patterns.

Student Enrollment Estimates

The original impact student enrollment estimates in the CIR were based on the 1970 Washington State population factor of 3.26, which is the ratio of total population to children between the ages of 6 and 18 years.

TABLE 1

COMPARISON OF EMPLOYEE RESIDENTIAL LOCATION PROJECTIONS
CHIEF JOSEPH DAM ADDITIONAL UNITS

	September 1975				October 1976				April 19[illegible]			
	Contractor		Corps of Engineers		Contractor		Corps of Engineers		Contractor		[illegible]	
	Number of Employees	1/ (%)	Number of Employees	1/ (%)	Number of Employees	1/ (%)	Number of Employees	1/ (%)	Number of Employees	[illegible]	[illegible]	[illegible]
Wenatchee	45	(22)	8	(22)	102	(13)	12	(18)	106	(15)	11	[illegible]
Tri-Cities	57	(27)	26	(72)	192	(24)	48	(74)	185	(25)	55	[illegible]
Within 50-mile radius of dam	56	(27)	2	(6)	192	(24)	4	(6)	144	(20)	6	[illegible]
Outside 50-mile radius of dam	50	(24)	0	(0)	306	(39)	1	(2)	294	(40)	--	--
TOTAL	208	(100)	36	(100)	792	(100)	65	(100)	729	(100)	72	[illegible]

1/Employee residential distribution rate.

TABLE 1

Beginning with Update I, student-to-employee ratios were used rather than total population to school-age children. In Update I, the 360 impact students projected to attend Bridgeport and Brewster schools and the 495 workers expected to reside in these towns gave a student-to-employee ratio of .73 to 1.0. A more detailed count taken in October 1976 disclosed student-to-employee ratios of 0.80 to 1.0 at Bridgeport and 0.91 to 1.0 at Brewster. The final survey in April 1977 showed student-to-employee ratios of 0.82 to 1.0 at Bridgeport and 1.01 to 1.0 at Brewster (table 2).

The fact that a higher percentage of workers located in Bridgeport supported the findings in Update I, which assumed that commuting distance would be the decisive factor for most construction workers in choosing a place to live. However, the majority of contractor employees with school-age children apparently preferred to live in Brewster with its larger selection of community services and facilities. In addition, the Brewster schools were in better physical condition than those in Bridgeport, and operating expenditures per student historically have been higher in Brewster. The majority of the workers not bringing families ("geographical bachelors") are believed to have located in Bridgeport.

Confidence in the observed overall ratios was supported by student-to-employee ratios observed during construction at Libby Dam, Montana (1960-1974), which ranged from .85 to 1.0 and 1.12 to 1.0. Projections based on the overall ratios were compared to projections based on the separate ratios for Corps of Engineers and contractor employees. There was little difference between the two.

Final projected distribution of impact-area students throughout grade school and high school classes was based on enrollment information gathered during April 1977. Both school districts provided headcounts of students by grade and identified the number in each grade whose parent(s) was working on dam construction. The latter information was obtained by questionnaires sent home with the pupils. Impact and nonimpact student grade distributions were projected. Nonimpact students were all students whose parents were not employed on Chief Joseph Dam construction. Area enrollment for nonimpact students historically has been highest during the fall harvest season when migrant farm workers and their families resided in the area. Influx of migrant workers typically added 5 to 10 percent of school enrollments during the fall. The projected nonimpact student distribution assumed all nonimpact students enrolled in April 1977 would advance one grade in their respective school districts by October 1977. This also assumed that the majority of children of migrant workers locating in the area in fall 1977 would be the same students who resided in the area in fall 1976, and that there would be minimal change in the total number of nonimpact students. Kindergarten enrollments and Bridgeport learning development class enrollment in October 1977 were assumed to approximate the respective October 1976 enrollments.

TABLE 2

RATIO OF STUDENTS TO CONSTRUCTION EMPLOYEES
BRIDGEPORT AND BREWSTER
CHIEF JOSEPH DAM ADDITIONAL UNITS

April 1977

	Corps of Engineers Construction			Contractor			
	Number of Students	Number of Employees	Ratio	Number of Students	Number of Employees	Ratio	Overall Ratio
Bridgeport	44	55	.80 to 1.0	153	185	.83 to 1.0	.82 to 1.0
Brewster	13	11	1.18 to 1.0	105	106	.99 to 1.0	1.01 to 1.0

The number of impact students enrolled in both Brewster and Bridgeport schools was higher in April 1977 than in any previous month observed during the construction period. These impact students were expected to remain in the school districts and to advance one grade in the 1977-1978 school year. Impact student enrollments in kindergarten and in the Bridgeport special learning class were expected to remain about the same.

An average fall 1977 enrollment was projected based on the number of construction workers expected during September to November 1977. The school superintendent of each impacted district provided specific information on expected local conditions which might cause a distribution different from that projected using historical ratios. Projected October 1977 school enrollments, upon which construction plans were made, are presented in table 3. The month of October was selected because that month normally has peak enrollment for the year and is a major reporting period for the State Office of the Superintendent of Public Instruction. Both school districts accepted the final projections as being reasonable.

Construction Plans

Separate analysis was required in order to avoid construction of facilities in excess of what could reasonably be utilized and maintained after construction activities ceased. Population projections were prepared for the 1980-1990 period and additional discussions were held with the local school districts. Construction design plans were prepared for maximum flexibility so that rooms utilized as classrooms during construction could become special-purpose rooms after impact. The local school districts felt that the final construction plans would leave them with facilities that they could maintain financially and utilize adequately after construction impact.

The Seattle District, Corps of Engineers, worked closely with the impacted school districts to assess physical plant needs and provide necessary engineering and financial support. Design Memorandum 51, Support to Local School Districts (Seattle District, Corps of Engineers, May 1977), provides substantial detail on construction plans, cost estimates, and legal considerations.

The age and condition of the existing elemeatary school at Bridgeport and the high school at Brewster, coupled with inadequate land for construction, made it infeasible to provide additions to these schools to provide for the impact students. The school districts proposed, and the Corps of Engineers recommended, that new permanent facilities be constructed to house the impact students and that the Federal Government contribute the cost of temporary facilities toward such construction. The school districts purchased land for the permanent facilities and developed conceptual designs.

TABLE 3

PROJECTED OCTOBER 1977 SCHOOL ENROLLMENT
BRIDGEPORT AND BREWSTER
CHIEF JOSEPH ADDITIONAL UNITS

	BRIDGEPORT			BREWSTER		
GRADE	NONIMPACT STUDENTS	IMPACT-RELATED STUDENTS	TOTAL STUDENTS	NONIMPACT STUDENTS	IMPACT-RELATED STUDENTS	TOTAL STUDENTS
K	22	19	41	42	10	52
1	19	21	40	33	10	43
2	28	16	44	40	6	46
3	24	22	46	37	9	46
4	21	13	34	38	9	47
5	21	16	37	34	6	40
6	19	17	36	44	10	54
LEARNING DEVELOPMENT	4	7	11	--	--	--
7	21	14	35	46	12	58
8	20	17	37	45	8	53
9	20	11	31	37	9	46
10	28	19	47	46	12	58
11	22	15	37	39	6	45
12	21	7	28	38	11	49
TOTALS	290	214	504	519	118	637

TABLE 3

Proposed permanent facilities incorporated preengineered components to facilitate design and construction. Estimated cost of the Government contribution toward construction of the impact-related educational facilities was $2.6 million. Building alterations to accommodate grade transfers were scheduled to be completed prior to the 1977-1978 school year. Permanent facilities were scheduled to be available for beneficial occupancy during November 1977.

Congressional Authority

Authority to provide school facilities for dependents of persons working on Chief Joseph Additional Units had been granted by virtue of Section 151, Public Law 94-587, 94th Congress, approved 22 October 1976. However, funding was not permitted until Fiscal Year 1978. Since the peak impact was expected to occur during the 1977-1978 school year, the school districts, with support of their Congressional delegations, obtained funding through passage of Section 305, Title III, Public Law 95-26, 95th Congress, approved 4 May 1977.

Liaison Activities

Close liaison between staff of the Seattle District, Corps of Engineers, and the school districts was maintained throughout the impact period. Initial contacts between the Seattle District, local schools, and appropriate Federal, state, and local agencies were established in 1973 during preparation of the Community Impact Report. After passage of the 1977 authorizing legislation for school assistance, and particularly during preparation of final forecasts and school design, contacts occurred almost daily. Primary liaison during this latter stage was between Chief of Design Branch, Engineering Division, and each Superintendent of School. Seattle District staff involved in the community impact evaluation included economists and sociologists. District lawyers and fiscal specialists participated during the contract phase of the assistance. The Washington State Office of the Superintendent of Public Instruction and Seattle Regional Office of the U.S. Department of Health, Education, and Welfare were kept apprised of assistance activities throughout the impact period and provided important information on school facility standards and funding sources.

SECTION 3 - SCHOOL OPERATIONS AND MAINTENANCE IMPACT AND REIMBURSEMENT

Fiscal Impact

Many workers on the Chief Joseph construction project moved into the area and used available school facilities, but provided little school financial support. In the State of Washington, operation and maintenance of school facilities are primarily dependent on revenues generated from taxes on real estate. Property owners in a given school district are asked to support the cost of education not covered by Federal or state revenues by voting a levy for additional taxes. When land use changes from agricultural to trailer park or general residential use, property is reassessed. However, reassessments do not generally result in higher tax payments to local governments until a year or two later. In addition, a high percentage of construction workers did not buy property, but rented or lived in mobile homes. Mobile homes are subject to property taxes the same as permanent dwellings. However, due to the mobility and short-term employment of many construction workers, assessment and collection of these taxes are often difficult. In addition, a large number of Corps of Engineers' employees lived in Federally-owned mobile homes which were exempt from property taxes. A number of workers lived in travel trailers which pay no property taxes but do pay state excise tax. The excise tax, however, goes into a state fund, only a fraction of which is returned to small communities like Bridgeport and Brewster. Educational costs of dependents of short-term construction workers were therefore largely absorbed by permanent property owners in the community. Property tax income was spread over a larger student population, resulting in a lower level of expenditures per pupil.

Federal Funding Sources

The Federal Government provides financial assistance to schools under a variety of acts. Public Law 81-874, administered by the U.S. Department of Health, Education, and Welfare (HEW), provides operation and maintenance assistance to schools impacted by Federal activities. School children of construction workers and Corps of Engineers' employees at Chief Joseph Dam qualified under Public Law 81-874 and local schools received financial support under the act. The Public Law 81-874 program has not been fully funded, and the level of support to cover the construction impact was not considered adequate by the school districts, the Washington State Office of the Superintendent of Public Instruction (SPI), or the Seattle District, Corps of Engineers. However, U.S. Code Annotated Section 243 prohibits appropriations by any Federal department or agency other than HEW for the purpose of funding school expenditures. This prohibition was superseded by Section 151 of the Water Development Act of 1976

(below). HEW continued to fund eligible students under Public Law 81-874 in the impact area. HEW contributions to school operation and maintenance were considered in determining the amount of additional reimbursement by the Corps of Engineers.

Congressional Authority

Specific authority to assist the school districts of Bridgeport and Brewster was therefore obtained through Section 151 of the Water Development Act of 1976 (Public Law 94-587, 22 October 1976, and Section 305, Title III, Public Law 95-26, 95th Congress, approved 4 May 1977). This section authorized the Secretary of the Army ". . . acting through the Chief of Engineers, . . . (to) enter into cooperative arrangements with local and Federal agencies for the operation of such Government facilities, for the expansion of local facilities at Federal expense, and for contributions by the Federal Government to cover the increased cost to local agencies of providing the educational services required by the Government." The authority granted under the final portion of the act was interpreted to apply to the additional school operation and maintenance costs resulting from the influx of construction-related students.

Reimbursement Methodology

Meetings were held with the Seattle Regional Office of HEW and Washington State Office of Superintendent of Public Instruction to determine the best methods to measure the financial impact of construction and methods of reimbursement by the Corps of Engineers. A large number of methods of estimating O&M assistance levels was evaluated. Methods given most serious consideration were:

a. Historical Average. This method based Corps of Engineers' payments on a 3-year historical average of O&M costs per pupil, minus all Federal and state revenues. The number of impact students, multiplied by the cost per student, gave the total payment for each year.

b. Actual O&M Expenditures. This method calculated reimbursement payments on a share of expenditures each year based on percentage of enrollment consisting of impact students.

c. HEW Tier 3. Congressional funding of Public Law 81-874 has been insufficient to provide for full entitlement payments. HEW, therefore, developed a payment schedule based on three funding levels called "tiers." Tier 1 provides 25 percent of allowable entitlement dollars to all qualified students. Tiers 2 and 3 provide additional payments based on a priority system, with such categories as handicapped or residency on Indian reservation receiving higher payments. In the case of Bridgeport and Brewster, payments are under tiers 1 and 2 and have amounted to about 60 percent of full entitlement dollars. This method would base payments by the Corps of Engineers on the equivalent of tier 3 to bring payments up to the full entitlement allowance.

d. Comparable Schools. This method based payments per impact student on an average local contribution per student in a number of school districts in the adjacent geographical area which were of similar size, but not currently impacted by any major construction or unusual economic conditions.

Each method was evaluated by the Seattle District on the basis of four primary criteria:

a. Adequacy of Funding. Would the method provide sufficient funds to help the school districts meet added costs created by the impact?

b. Equality. Would the method create, worsen, or alleviate differences in funding levels per student between the two impacted school districts?

c. Legal Acceptability. Would the method violate any Federal or state statutes governing school funding? Would the method meet the intent of the authorizing legislation?

d. Technical Accuracy and Ease of Calculation. Could the method rely upon accurate, readily obtainable data sources? Could the calculations be easily made and audited?

Selected Method

The selected method was a combination of alternatives b and d and provided for payment of actual additional school operation and maintenance expenses incurred per impact student per school year. Maximum O&M expenditure per student was limited to the average O&M expenditure per student provided by local revenues at 10 comparable school districts. A summary description follows:

Step 1. Budgeted O&M expenditures for the upcoming year provided by the school districts to the Seattle District.

Step 2. Anticipated revenues from all state and Federal sources (other than the Corps of Engineers' contribution) subtracted from the budgeted expenditures presented by each school district. The balance of O&M expenditure needs represented estimated revenues required to be provided from local sources.

Step 3. Both local school districts provided the Corps of Engineers with estimated anticipated total enrollment for the entire school year. The estimated enrollments anticipated the average of actual counts to be taken as discussed in step 4. Balance of O&M expenditures from step 2 was divided by estimated enrollment figures to convert to per-pupil basis for the next school year.

Step 4. The school districts provided two enrollment counts, one during the first trimester and the second during the third trimester. These counts determined the number of students associated with the construction activities which have caused an increase in O&M expenditures. Total enrollment counts were taken on the same dates. Counts of Federally-connected (Corps of Engineers plus project construction contractor) students were compared to the Federally-connected (Corps of Engineers) enrollment count for a base year. The 1974-1975 school year was selected as the base year because it represented the period immediately preceding the beginning of construction of additional units on Chief Joseph Dam and influx of impact students. Increased enrollment from the base year represented the number of impact students. The average of these two counts, minus the base year count, multiplied by the per-student cost in step 3, determined the Corps of Engineers' total contribution for the school year.

Step 5. To provide a maximum amount for Corps of Engineers' contribution per student per school year, average local contributions per student not covered by Federal or state revenues for 10 comparable Washington school districts were determined. Comparable school districts were selected with assistance from SPI based on similarity in size, geographical location, and legal classification to the impacted districts. Comparable districts were not experiencing any major construction impact or other economic disruption. Budgets from the second school year preceding the school year for which Corps of Engineers' assistance was planned were used, since actual expenditure and revenue data were needed. Balance per student was increased to the next school year basis by an estimated price escalation factor provided by SPI.

Step 6. Corps of Engineers' funding for increased costs for operation and maintenance services in the school districts was made in three payments. Payments were made at the end of first and second trimester, based on budgets presented by the school districts at the beginning of the school year and estimated Federally-connected (Corps of Engineers and construction contractor) and total enrollment counts. A final payment to each district was made at the end of the school year. Final payments were based on audits of actual expenditures and receipts for operation and maintenance activities during the entire year, as well as revised enrollment counts using the average of counts taken during the first and third trimesters. The final payment to each district allowed for any necessary adjustments regarding the prior two payments.

An example of the methodology used is given in table 4. The selected method appeared to provide sufficient additional funds to cover increased school operating costs. It was also legally acceptable, simple to calculate, and relied upon readily available state data forms. The method, however, did maintain an historical difference in

funding levels which existed between the two school districts. A legal interpretation of the authorizing legislation determined that the intent of the law was to reimburse school districts for increased costs, not alleviate differences in funding levels or subsidize a district which supported local education below state or regional averages. The selected method was acceptable to the local school districts; Washington State Office of the Superintendent of Public Instruction; and the Regional Office of Health, Education, and Welfare.

Retroactive O&M reimbursement payments on the 1975-1976 school year were mailed to the school districts in July 1977. Retroactive payments for the 1976-1977 school year were mailed in August 1977. The reimbursement program appeared to be operating satisfactorily as construction activity entered its third year in the fall of 1977. Estimated total O&M reimbursement over the 1975-1980 construction impact period was $200,000 at each school.

TABLE 4

SCHOOL OPERATION AND MAINTENANCE ASSISTANCE
EXAMPLE OF METHODOLOGY

Step		
1.	Budgeted school district O&M expenditures for upcoming school year	$500,000
2.	Anticipated State and Federal (excl. Corps of Engineers) revenues	$300,000
	Revenues from local sources ($500,000 - $300,000) =	$200,000
3.	Estimated enrollment	500 students
	Revenues per student from local sources ($200,000 ÷ 500) =	$400/student
4.	Estimated number of Federally-connected (Corps of Engineers and construction contractor) students	100 students
	Number of Corps of Engineers students in base year	10 students
	Net gain in impact students (100-10)	90 students
	Corps of Engineers' estimated assistance for upcoming school year ($400 x 90) =	$36,000
5.	Comparable schools local revenues per student	$450/student
	(NOTE: Average per-student local revenues at 10 comparable schools were calculated using same procedures as steps 1-4. If average local revenue per student in step 5 was less than impact school local revenue per student, the comparable school amount would form the maximum that could be paid per impact student.)	
6.	Payments for amount in step 5 made in three increments. Final payment at end of school year based on actual enrollment, expense and revenue data, and subject to audit.	

SECTION 4 - SUMMARY AND RECOMMENDATIONS

Enrollment Impact and Facility Needs

Projections of increased school enrollment due to construction activity at Chief Joseph Dam were prepared prior to construction. Initial projections were based on student-to-worker ratios obtained from earlier projects and anticipated worker residency preferences. Projections were adjusted to reflect specific conditions in the Chief Joseph Dam project area. Final projections were based on a series of surveys taken during early stages of project construction. Actual school facility construction plans were based on the final projections. Projections and construction plans were prepared with the cooperation of local school districts. Congressional authority was obtained for the Corps of Engineers to assist local schools in developing new facilities. Government contribution was limited to the cost of temporary facilities needed based upon impact conditions in the fall of 1977. Facilities were designed so as not to overbuild for postimpact conditions.

Operations and Maintenance Impact

School financing in Washington State depends heavily on local property taxes for revenues. Construction workers moving into the area for work on Chief Joseph Dam were found to be living in travel trailers or mobile homes and contributing little towards support of local schools. The same construction workers, however, were responsible for a large influx of new students into the local school districts. Authority was obtained from Congress to provide Federal funds to cover any increased operating costs. A variety of methods to estimate increased costs were evaluated. The selected method provided Corps of Engineers' reimbursement based on actual cost increases not covered by existing Federal or state revenue sources. A ceiling on Corps of Engineers' aid was determined by average expenditures at 10 comparable local schools. Final methodology was acceptable to the local school districts; Washington State Office of the Superintendent of Public Instruction; and U.S. Department of Health, Education, and Welfare.

Recommendations

Potential impacts on school facilities or increased operating expenses should be identified as early as possible prior to start of project construction. Impacted school districts should be encouraged to seek financial assistance through Federal agencies such as the Department of Housing and Urban Development; Department of Health, Education, and Welfare; or from state sources. If aid is not available from these agencies, then the local districts must request funds through Congressional appropriation. Preliminary forecasts of enrollment increases, based on experience at

other major construction sites (as adjusted for local housing conditions and transportation network), appear adequate for early determination of needs. Final plans must be coordinated closely with the impacted school districts and any local, state, or Federal agency with appropriate expertise.

Wenatchee, Wash.
World
(Cir. D. 26,447)
(Cir. Sun. 28,144)

DEC 12 1977

Bridgeport, Brewster

Dam fallout aids school buildings

By MARV BARHAM
Okanogan County Bureau Chief

Expansion of Chief Joseph Dam is having a beneficial fallout in the form of new school buildings now taking shape in the Bridgeport and Brewster school districts.

A four-building elementary school campus is now headed toward completion at Bridgeport, while a complex geared toward specialized-type instruction is rising at Brewster.

Both school projects are heavily dependent on precedent-setting federal grants awarded through the U.S. Army Corps of Engineers. The special monies represent recognition by federal authorities that expansion of the dam is generating abnormally high enrollments that must be handled by the local school districts.

The Bridgeport school has received a $1,569,000 grant, while Brewster has won a $987,000 grant to help finance the facilities needed to handle that enrollment impact. In each case, the federal monies were meant to provide temporary facilities for the districts to weather high enrollments generated by a large dam work force.

Rather than accepting lower-cost temporary facilities, both school districts have elected to come up with the extra money needed to make the facilities permanent.

Voters in the Brewster District have approved an $825,000 bond issue, while Bridgeport voters have floated a $175,000 bond issue.

What the commitment by district taxpayers means is that both districts are coming up with school projects that should help the districts to meet the needs for local students for many years in the future.

The Bridgeport schools, according to Superintendent Harry Rhodes, are gaining a four-building complex for kindergarten through fifth graders to be located on a 13 acre site.

The project includes two units with four classrooms, one unit with two classrooms, a library, counselor offices and other work space and a fourth unit with a kitchen, multipurpose room and administrative offices. All four units are attractive brick buildings that are being scattered so as to provide centrally located and covered playground areas.

It is hoped that youngsters will be able to move into the new units after Christmas vacation or soon thereafter.

The new facilities will allow the district to spread out its enrollment into already existing facilities in coming years, giving students much more space for their studies.

Brewster Superintendent Clyde Brown is also hopeful that his district's youngsters will be able to move into the shop portions of his district's new school complex later this month.

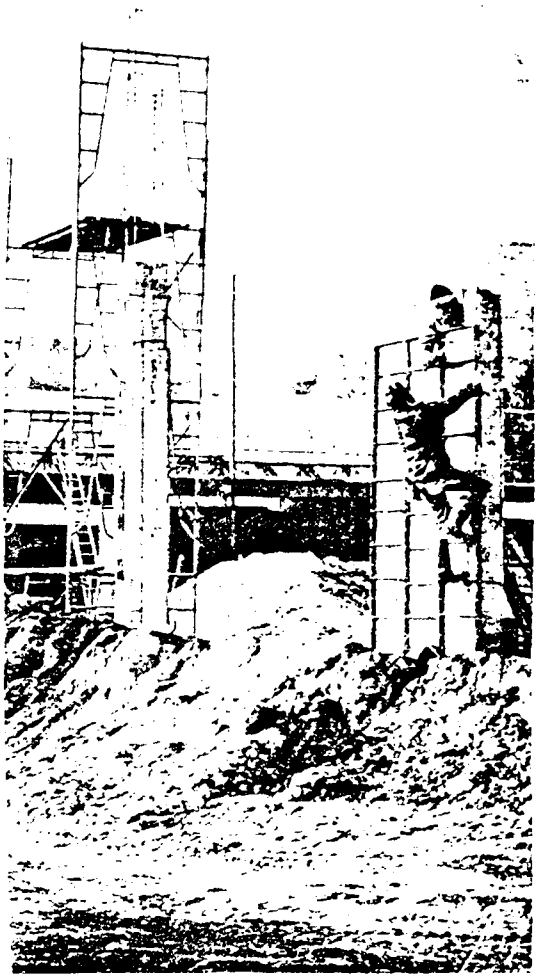
The specialized learning complex includes a gymnasium with seating for 900, shops, the music department, science rooms, an art room, one general classroom and other space.

According to Brown, the new complex will provide space for specialized learning that is now grossly inadequate in the district.

The Brewster School District hopes to play at least its last high school basketball game in the new gymnasium this winter.

The superintendents of both school districts credit the Corps of Engineers and the federal grants with making it possible for the two school districts to acquire major school improvements at minimal cost to district taxpayers.

"Without the federal money, it just wouldn't have been possible," Brown said.



WORKMEN ON THE JOB AT BREWSTER
Gym may be ready for last game

EXHIBIT - Local Newspaper Reference to Corps of Engineers Support to Local Schools, Chief Joseph Dam Additional Units Project, Washington

EXHIBIT

ACKNOWLEDGMENT

This report was prepared by the Economic and Social Evaluation Section, Planning Branch, Engineering Division, Seattle District, Corps of Engineers. Valuable and courteous assistance was provided by the Superintendents of School of Bridgeport and Brewster, Washington; the Division of Financial Services, Superintendent of Public Instruction, Olympia, Washington; and U.S. Office of Education, U.S. Department of Health, Education and Welfare, Region X, Seattle, Washington. Corps of Engineers personnel participating in the study were:

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COMMUNITY IMPACT REPORT

Chief Joseph Dam

COLUMBIA RIVER, WASHINGTON

UPDATE III

CONDITIONS AT PEAK IMPACT

DECEMBER 1978
REPRINT MARCH 1980

CHIEF JOSEPH DAM
Columbia River, Washington

COMMUNITY IMPACT REPORT
UPDATE III: CONDITIONS AT PEAK IMPACT

A Report Submitted To:

Institute for Water Resources
U.S. Army Corps of Engineers
Kingman Building
Fort Belvoir, Virginia 22060

By

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DECEMBER 1978

IWR RESEARCH REPORT 78-R2

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20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report examines how current peak construction social impacts at Chief Joseph Dam, Washington compare with those projected in pre-construction phases. The report examines, in depth, the construction workers at the dam site; their previous employment, current living conditions and impacts on local communities. The report also generalizes about the methodologies for projecting social impacts.

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MAY 80 A A HARNISCH, W R BURTON, K G CARSSOW

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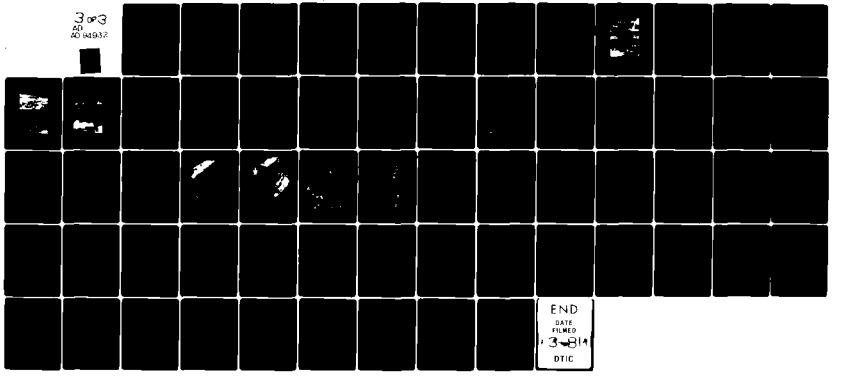

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PREFACE

This report is one of a series prepared by Seattle District, U.S. Army Corps of Engineers, to document economic and social impacts on local communities as a result of major construction activities at Chief Joseph Dam, Washington. Chief Joseph Dam Community Impact Report (February 1974) and Community Impact Report, Update I (October 1974) were prepared prior to construction and discussed the anticipated impact. Community Impact Report, Update II (April 1978) was prepared at the request of the Institute for Water Resources (IWR), Corps of Engineers, Washington, D.C., and discussed the Federal response in meeting increased educational expenses of the affected communities. This report, also prepared for IWR, is the result of a study of economic and social conditions during the peak construction period in late 1977. A subsequent report (scheduled for 1981) will document community adjustment to postimpact conditions. A final report will analyze the entire community experience from preimpact to postimpact conditions, including Corps of Engineers' community relations, and provide guidelines for predicting economic and social impacts of future major construction projects. This report has been prepared under the directive of Mr. Arthur Harnisch of the Seattle District in consultation with Dr. Jerry Delli Priscali of the Institute for Water Resources, Corps of Engineers, Fort Belvoir, Virginia.

SECTION I - INTRODUCTION

Purpose

The purpose of this report is to provide a case history documentation of economic and social impacts on rural communities during peak construction activities of the U.S. Army Corps of Engineers at Chief Joseph Dam, Washington. Information provided in this report will be used to establish guidelines in planning for economic and social impacts of future projects in rural areas.

Scope

Scope of the study includes data on public facilities, services, and other social and economic characteristics affected by a large influx of construction workers. Data on a profile of the construction work force was collected during period of peak construction.

Authority

Section 122 of the River and Harbor and Flood Control Act of 1970 obligates the Corps of Engineers to identify and assess all significant project-caused effects, including economic and social effects. Similar requirements have been imposed on all Federal agencies by the National Environmental Protection Act of 1969.

Project Description

Chief Joseph Dam is located on the Columbia River in north-central Washington State near the small communities of Bridgeport and Brewster (Figure 1). The dam is one of the major projects in the comprehensive water resource development plan for the Columbia River Basin in the United States and Canada. Construction of the dam and 16 hydroelectric power units was completed in 1958. Construction activities to add 11 additional hydropower units and raise the dam and pool by 10 feet commenced in 1973 with an estimated total cost of $410 million. The additional units will increase installed capacity from 1,024,000 kW to 2,069,000 kW. The initial major influx of construction workers arrived during the 1975-1976 school year. A peak work force of almost 900 occurred during the summer of 1977. Project completion is scheduled for 1981.

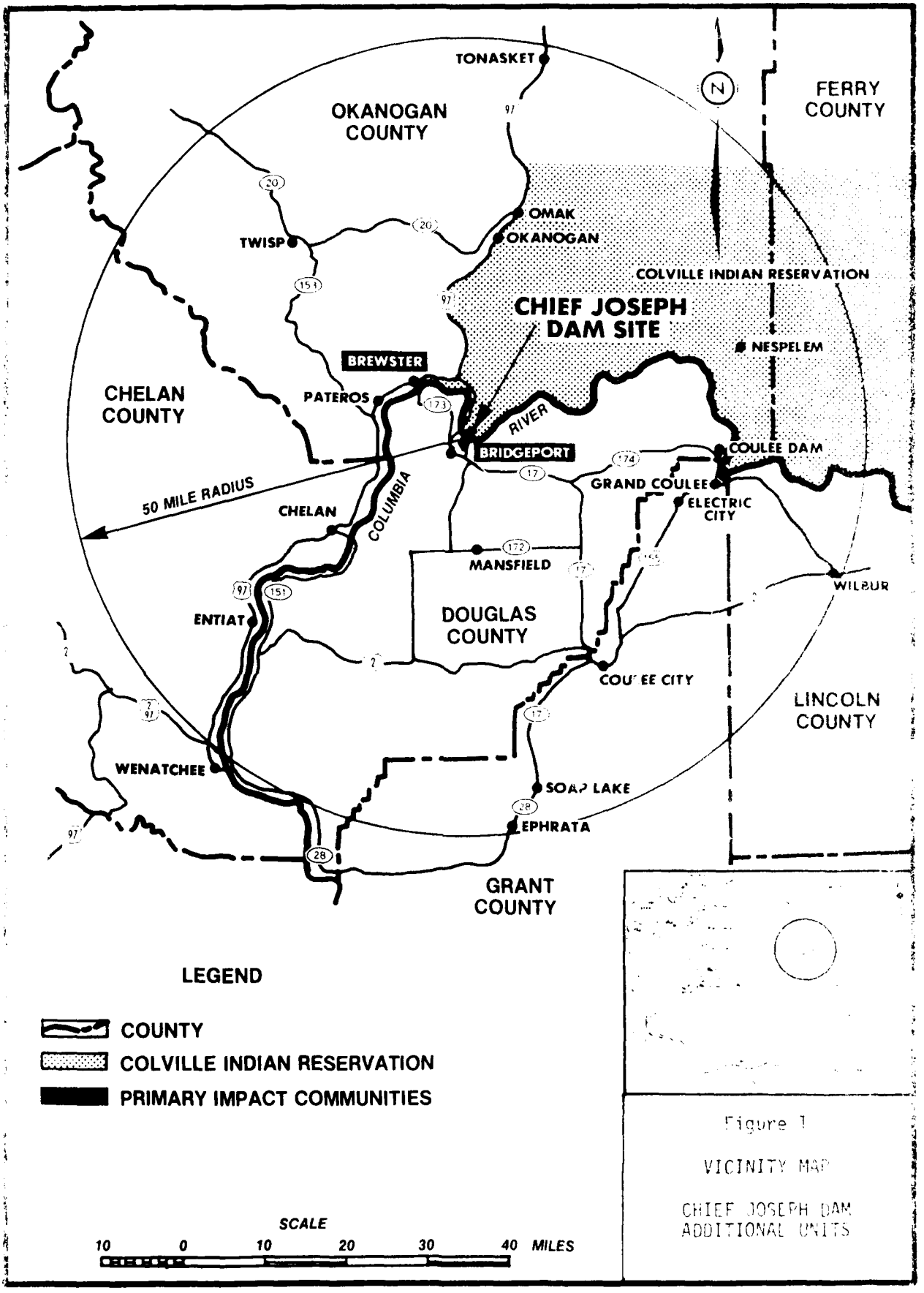

Figure 1

VICINITY MAP

CHIEF JOSEPH DAM
ADDITIONAL UNITS

SECTION 2 — PREVIOUS IMPACT REPORTS

The Seattle District, Corps of Engineers, initially discussed potential impact of construction worker influx in an environmental statement prepared in 1971. Bridgeport was identified as the primary impact community, and a brief statement was included as to the possible local effects of a sharp growth in population.

The first detailed report was Community Impact Report (CIR) published in February 1974. This report documented conditions as of 1973 and provided preliminary projections of the impact of the Chief Joseph Dam Additional Units Project. The report included impact population projections and an assessment of community facilities and services for all identifiable communities within a 50-mile radius of the dam. The CIR allocated project-related new population on a weighted town attractiveness basis. Availability of existing community facilities to accommodate additional population was considered an important factor. The town of Brewster was projected to receive the majority of the population influx, although significant numbers of people were also projected to select the communities of Bridgeport, Coulee Dam, Okanogan, and Pateros.

Community Impact Report, Update I, published in October 1974, presented revised population influx projections. Update I projections placed more weighting on commuting distance, and Bridgeport was identified as the primary impact community. Brewster, Coulee Dam, Okanogan, Pateros, Monitor, and Mansfield were named as other communities likely to receive a significant impact population. The major impact on facilities and services was experienced by local school districts, resulting in two additional publications: Design Population II, Subject to Local School Districts (May 1977) and Community Impact Report, Update II (April 1978). Both publications served as the basis for information provided to local school districts by the Corps of Engineers.

In addition to the above studies, several unpublished employment and population reports were provided at the request of congressional representatives. These interim projections were the result of changed construction schedules.

SECTION 3 - DESCRIPTION OF IMPACTED COMMUNITIES

General

The study area included all communities within a 50-mile radius of Chief Joseph Dam, Washington (figure 1). The area is predominantly agricultural, with scattered small rural towns. The climate exhibits seasonal characteristics of both maritime and continental air masses, with warm to hot summers and moderate to cold winters. Average yearly precipitation is meager, ranging from 12 to 15 inches in the northwestern part to less than 10 inches per year in the southeastern portion. High winds and blowing dust often occur in the more southerly portions. Topography is diverse, ranging from the Cascade foothills in the west to the Waterville plateau in the south. The study area lies in the drainage basin of the Columbia River which flows south and westward, eventually emptying into the Pacific Ocean.

Most land area in the region remains in forest or open range. Agriculture is an important component of the economy, with irrigated fruit crops, beef cattle, and wheat as primary products. Directly related to this economic activity are food processing and storage industries. Forested areas in the north and east supply raw materials for an active lumber and wood products industry. Wholesale and retail trade, personal services, tourist-related businesses, and local, state, and Federal Government employ a substantial portion of the work force.

Outdoor recreational opportunities predominate. Fishing, boating, and swimming are popular summer sports. During winter months, areas for skiing, ice skating, ice fishing, snow tobogganing, and snowmobile touring are within easy driving distance. Hunting for deer and waterfowl is good. Communities offer a limited variety of entertainment facilities.

Most of the incorporated communities in the study area (table 1) have a mayor-city council form of government. The majority of the communities also have planning commissions, zoning ordinances, and building codes. Unincorporated communities generally have no formal governing bodies and are under the jurisdiction of the county.

The land to the north and east of the project is part of the 1.4 million-acre Colville Indian Reservation. The Reservation is sparsely populated by approximately 2,500 members of the 11 bands comprising the Colville Confederated Tribes. Tribal administration is by an elected Tribal Business Council. The tribes have become increasingly active in recent years over controlling economic development and other activities on the Reservation.

TABLE [illegible]

IMPACT COMMUNITIES

CHIEF JOSEPH DAM ADDITIONAL UNITS

[illegible]	[illegible]	Population[2] [illegible]	[illegible]	[illegible]	Number of Chief Joseph Dam [illegible] Students[4]	Estimated Number of Chief Joseph Construction Workers at Peak [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	750	[illegible]	[illegible]	--	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1,140	1,100	[illegible]	[illegible]	[illegible]
Soap Lake	[illegible]	1,200	1,400	200	[illegible]	[illegible]
Tonasket	[illegible]	985	985	0	[illegible]	[illegible]
Entiat	50	[illegible]	406	[illegible]	--	[illegible]
[illegible]	[illegible]	5,140	[illegible]	[illegible]	6	[illegible]

1/Actual census.
2/Estimated to be less than 10 workers.
3/Population Trends, 1977, Population Studies Division, Office of Fiscal Management, State of Washington. Noncensus years estimated by state with the assistance of local communities.
4/Public Law 81-874 census of students reporting parent(s) working on Chief Joseph Dam. Mansfield, Electric City, Chelan, Twisp, and Entiat had no applications under Public Law 81-874 during that school year. Students from the town of Coulee Dam attend Grand Coulee district schools.
5/Estimated from December 1977 Survey and Construction Manpower Reports.
6/Does not include Grand Coulee Dam-related students attending Grand Coulee schools.

Selection of Primary Impact Communities

There are 31 incorporated towns within a 50-mile radius of the project. The two largest communities, Ephrata (1977 population 5,320), and Omak (4,126), are important regional trade and service communities for north-central Washington. The towns of Bridgeport (1,623) and Brewster (1,471) have been significantly affected by previous construction and operation of Chief Joseph Dam. Grand Coulee (1,375), Electric City (855), Coulee Dam (1,517), and Coulee City (602) owe much of their existence to activities at Grand Coulee Dam. Chelan (3,000) and Soap Lake (1,400) have local recreation attractions and have become popular retirement communities. Other communities in the impact area are small, with business districts of sufficient size to serve only the immediately surrounding rural area.

Analysis conducted during preparation of Community Impact Report and Update I narrowed to 17 the number of communities expected to experience some project-related impacts. Only two of the 17 actually received significant economic and social impacts. Table 1 lists criteria used to determine intensity of impact and primary impact communities. Changes in population from 1975 (preimpact) and 1977 (peak impact), numbers of school children whose parents were involved with the dam construction, and numbers of construction workers in each locality are presented. Bridgeport and Brewster (figures 2 and 3) received the major impact in all three categories and had the most severe demands placed upon facilities serving residents. These two communities are referred to as the primary impact communities and were examined in greater detail. The fact that impact was centered primarily in two towns, rather than the several predicted, intensified the impact experience. The substantial population growth at Soap Lake and Ephrata was unrelated to activities at Chief Joseph Dam. The relatively large number of Public Law 81-874 students at Grand Coulee, in combination with a slight population decline, indicates that many of these students lived in the Grand Coulee area prior to construction at Chief Joseph Dam.[1/] Grand Coulee experienced little impact on public facilities and services from Chief Joseph Dam construction.

The Colville Indian Reservation was only marginally affected by employment in construction activity. With the exception of a small Indian community near Omak, principal Reservation towns are all 50 or more road miles from the dam. Total number of Indians in the dam work force apparently never exceeded 10 to 15.

1/Public Law 81-874, administered by the U.S. Department of Health, Education, and Welfare (HEW), provides operation and maintenance assistance to schools impacted by Federal activities. Reporting requirements under the law include documentation of place of work by parents of recipient students.

FIGURE 2. BRIDGEPORT, WASHINGTON. MIDDAY VIEW OF MAIN BUSINESS STREET DURING PEAK IMPACT PERIOD (MAY 1977).

FIGURE 3. BREWSTER, WASHINGTON. MIDDAY VIEW OF MAIN STREET DURING PEAK IMPACT PERIOD (MAY 1977).

SECTION 4 - SOCIAL AND ECONOMIC EFFECTS

Population Growth

Bridgeport and Brewster have exhibited slow, steady growth rates except for boom years during construction of the original dam in the 1950's. Between 1960 and 1970, the two communities jointly gained only 195 residents. From 1970 to the spring of 1975, when the last preimpact population count was estimated, only 159 more residents were recorded. Within the following 2 years (1976-1977), 924 new residents were counted. Population growth closely followed the influx of construction workers (table 2 and figure 4). Although exact numbers are not available, numerous families and individuals also settled into unincorporated Bridgeport Bar between the two communities. Population influx into the areas easily exceeded 1,000 during the 2 years, about a 50 percent gain over the preimpact population. Population figures include only those individuals who claimed the towns as their permanent residence. In addition, the normal workday population also included: (1) weekly commuters, (2) short-term workers unaccompanied by families, and (3) workers accompanied by families who also maintained a permanent home elsewhere.

Housing

Both Bridgeport and Brewster exhibit characteristics typical of housing in construction boomtowns (figures 5 through 8). During impact conditions in the spring of 1977, 39 percent of Bridgeport population was living in mobile homes and trailers, while Brewster reported 18 percent in the same category (table 3). Despite the influx of construction workers, over 120 housing units were reported as vacant in the two communities. While this situation may be partially explained by normal turnover and temporary vacancies at the time of the census, it also reflected the large number of substandard housing units in the communities. A special housing census conducted in Bridgeport in 1976 by the Douglas County Regional Planning Commission reported 28 percent of the housing structures were dilapidated or deteriorated. Many workers undoubtedly chose to buy or rent mobile home or trailer space rather than live in available poor housing. About two-thirds of the nonlocal workers were found to be living in mobile homes and trailers, versus one-third of the local workers. A more complete presentation of types of housing selected by construction workers is given in table 4.

TABLE 2

POPULATION GROWTH AT BRIDGEPORT AND BREWSTER

CHIEF JOSEPH DAM ADDITIONAL UNITS

Year	Bridgeport Population	Change From Previous Decade	Brewster Population	Change From Previous Decade	Total Population Bridgeport and Brewster
1950	802	—	851	—	1,653
1960	876	74	940	89	1,816
1970	952	76	1,059	119	2,011
		Change From Previous Year		Change From Previous Year	
1975	1,050	—	1,120	—	2,170
1976	1,480	430	1,343	223	2,823
1977	1,623	143	1,471	128	3,094

Source: 1950, 1960, and 1970 from Federal Census. 1975 and 1976 from Population Trends, 1977, Population Studies Division, Office of Fiscal Management, State of Washington. 1977 special city census in both towns.

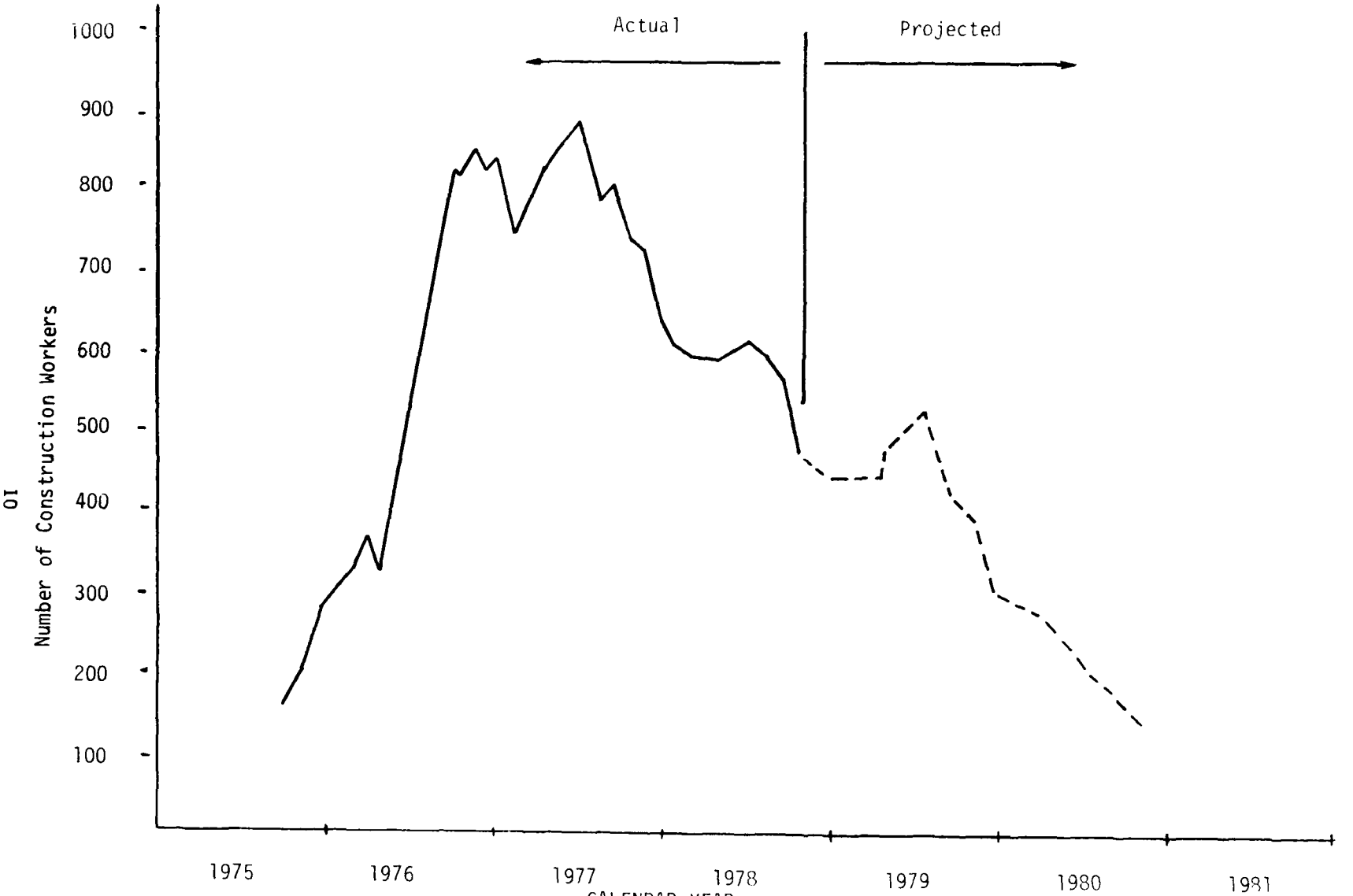

FIGURE 4

ACTUAL AND PROJECTED NUMBER OF CONSTRUCTION WORKERS
CHIEF JOSEPH DAM ADDITIONAL UNITS

FIGURE 5. ENTRANCE TO TOWN OF BRIDGEPORT, WASHINGTON. TRAILER COURT IN FOREGROUND (MAY 1977).

FIGURE 6. TYPICAL TRAILER COURT IN BRIDGEPORT, WASHINGTON.

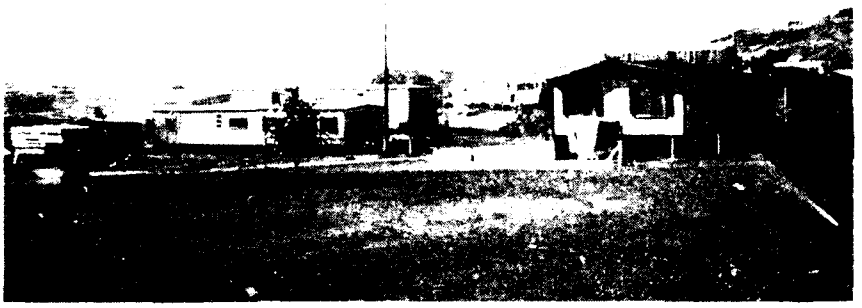

FIGURE 7. TRAILER COURT IN BRIDGEPORT BAR, WASHINGTON.

FIGURE 8. TRAILER COURT IN BREWSTER, WASHINGTON.

TABLE 3

HOUSING CHARACTERISTICS AT PEAK IMPACT

BRIDGEPORT AND BREWSTER

CHIEF JOSEPH DAM ADDITIONAL UNITS

Type of Housing Built	Bridgeport				Brewster			
	Total Housing Units	Vacant Housing Units	Occupied Housing Units	Population	Total Housing Units	Vacant Housing Units	Occupied Housing Units	Population
One-Unit Structure	360	38	322	832	367	16	351	805
Two-Unit Structure	6	1	5	8	21	0	21	45
Three- or More Unit Structure	116	12	104	155	112	14	98	265
Mobile Home[1/]	204	13	191	538	107	7	100	245
Trailer[1/]	66	12	54	90	24	10	14	21
TOTAL	752	76	676	1,623	631	47	584	1,471

Source: Population and Economic Studies Division, State of Washington, situation as of 1 April 1977.

1/Mobile home has wheels or axles removed or is attached to foundation or permanent structure. Trailers have wheels and axles attached and have no foundation or other type of permanent structure attached.

TABLE 4

HOUSING CHARACTERISTICS OF WORK FORCE 1/

CHIEF JOSEPH DAM ADDITIONAL UNITS

Type of Housing	Local Workers	Nonlocal Workers
Single Family Dwelling	58%	18%
Apartment	5	10
Mobile Home	33	47
Travel Trailer or Camper	3	23
Sleeping Room	1	6
TOTAL	100%	100%

NOTE: Housing in both Bridgeport and Brewster included. Totals also included workers residing outside the primary impact area.

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

Economy

Bridgeport. Before construction activities began, Bridgeport had a small business district with about 30 retail outlets. Representative stores included three service stations, three small grocery stores, two restaurants, two taverns, and a variety of other small shops. There was one dentist but no doctors, lawyers, accountants, or other professional people.

Retail sales increased from $2.5 million in the 1974 preimpact year to $3.8 million in 1977. While an estimated one-third of this increase was due to the effects of inflation, most of the remaining increase can be attributed to spending by construction-related firms and employees. Despite greater volume of sales, there was very little change in the number of businesses. The temporary nature of construction activities, in combination with the historical pattern of irregular growth, deterred prospective new business investors. Most residents and construction workers apparently bought staples locally and traveled to larger regional trade communities such as Wenatchee and Spokane for major purchases. The one bank in Bridgeport reported that deposits in 1977 were $1.8 million over the 1974 total of $2.9 million. The number of new accounts increased by 722 during the same period.

One observation about Bridgeport was the presence of abandoned commercial structures built during construction of the original dam in the 1950's. Even during peak employment at the additional units project, the business district of Bridgeport had numerous vacant and boarded-up buildings and lacked the appearance of a typical construction "boomtown."

Brewster. Due to the location of Brewster on a major highway and employment in several fruit packing establishments, local economic activity was much stronger and more diverse than in Bridgeport. Despite a similar population in 1974, there were about 100 retail establishments, triple the number of Bridgeport. Professional offices included doctors, dentists, attorneys, and accountants. Retail sales jumped from $8.8 million in 1974 to $13.4 million in 1977. As in Bridgeport, there was little change in the actual number of establishments.

Bank deposits increased by about $4.7 million over preimpact deposits of $6.3 million. Bank officials attributed only about one-fourth of this increase to the construction impact. The local fruit growing and packing industry, concentrated in the Brewster area, experienced an excellent year in 1977. Income from fruit sales resulted in a large inflow of funds into the Brewster bank. The bankers did report that major contractors on the dam were purchasing many supplies and services locally. These purchases injected money into the local economy, in addition to the direct spending of their employees.

Schools

The influx of children of construction workers into local school districts at Bridgeport and Brewster was the most severe impact felt by any local service or facility. Beginning with the 1975-1976 school year, the number of students grew rapidly with the increase in construction activity. Estimated number of impact students at the time of peak construction is presented in table 1. Maximum enrollment pressure on the schools occurred during the 1976-1977 and 1977-1978 school years.

Special congressional authority to provide school facilities for dependents of persons working on Chief Joseph Additional Units project was granted by virtue of Section 151, Public Law 94-587, 94th Congress, approved 22 October 1976. However, funds were not released under that law until Fiscal Year 1978. Bridgeport and Brewster school districts, working through congressional representatives, obtained a release of funding through passage of Section 305, Title III, Public Law 95-26, 95th Congress, approved 4 May 1977. Under this authority, the Corps of Engineers provided approximately $2.6 million in school construction assistance. Funding assistance was based on cost of temporary facilities

needed to meet the impact. Both school districts supplemented Federal funds with local monies and constructed permanent facilities. The new permanent facilities, along with certain existing school buildings in poor condition, gave the school districts some flexibility in meeting peak impact conditions, as well as planning for the postimpact period. For example, old buildings in poor condition may be eliminated if not repaired when the construction work force leaves the area.

The Seattle District, Corps of Engineers, advised the school districts in assessing physical plant needs and providing necessary engineering and financial support. Design Memorandum 51 (May 1977) provided substantial detail on construction plans, cost estimates, and legal considerations. Building alterations to accommodate grade transfers were completed prior to start of the 1977-1978 school year. Permanent facilities were scheduled for beneficial occupancy during the 1977-1978 school year. In addition to funds for school buildings, the Corps of Engineers will provide approximately $400,000 in school operation and maintenance (O&M) reimbursement funds under the same congressional authority during the impact period. Amount of funds was determined by a mutually agreeable formula and final audit. Reimbursement was based on O&M funds per student not covered by existing Federal or state sources. The per-student dollar amount was then multiplied times the number of impact students to arrive at the total reimbursement. Amounts reimbursed ranged from $250 to $450 per impact student per school year. Community Impact Report, Update II (April 1978) reported on the school impact in detail, including methodology and estimated funding assistance. Student O&M expense at 10 comparable schools determined maximum allowable expense for O&M at Bridgeport and Brewster.

Close liaison between staff of the Seattle District, Corps of Engineers, and the school districts was maintained throughout the impact period. After passage of authorizing legislation for school assistance, and particularly during preparation of final forecasts and school design, contacts occurred almost daily. Primary liaison during this latter stage was between Chief, Design Branch, Engineering Division, and each school superintendent. Seattle District staff also included economists and sociologists. Seattle District lawyers and fiscal specialists participated during the contract phase of the assistance. The Washington State Office of the Superintendent of Public Instruction and the Seattle Regional Office of the U.S. Department of Health, Education and Welfare were kept appraised of the assistance activity throughout the impact period and provided important information on school facility standards and funding sources.

Health and Safety

Health Care Facilities. Of the 15 hospitals located in the six counties surrounding the dam, seven were located within the actual impact area (table 5 and figure 9). These seven hospitals contained a total of 212 set-up (ready for occupancy) beds. Two hospitals located in Wenatchee, just outside the 50-mile radius of the dam, offered an additional 186 set-up beds for patient care. In addition to the hospitals in the area, there are several clinics providing mental health, outpatient, alcoholism, and migrant worker and Indian health treatment.

A preliminary study completed in 1977 by the Central Washington Health Systems Agency (CWHSA) (whose jurisdiction includes the four counties most heavily impacted by the project - Chelan, Douglas, Okanogan, and Grant) indicated that most hospitals in this area were in generally good financial health. However, they were troubled by low rates of utilization and an excess number of beds. Overall occupancy remained close to 50 percent between 1973 and 1976. The ratio of beds per 1,000 population has stayed close to 3.8 since 1973. Interviews with officials of the CWHSA indicate that, with scheduling and planning, a hospital can adequately serve area population with only two to three beds per 1,000 people.

Excess bed and low utilization rates are probably due to the shortage of physicians (typical in rural communities) in the impact area. Many physicians with specialties are located in either Wenatchee (about 60 miles from the damsite) or Spokane (about 110 miles from the damsite). Data in the Annual Hospitalization Report (State of Washington) indicate that patients travel to these two cities to receive routine as well as specialized care. A person consulting a doctor in either city was more likely to stay in a hospital in that city than in a hospital closer to home. This was referred to as the "escaping patient" phenomenon by local health authorities.

Medical and dental services for the Bridgeport-Brewster area are centered in Brewster. The town supports the 50-bed Okanogan-Douglas County Hospital. There is also a 73-bed convalescent center in Brewster which operates an ambulance service with a capacity of four patients. In 1973, there were five physicians registered to practice in Brewster; in 1977, there were three. Medical services in Bridgeport consist of one dentist, several volunteer firemen trained as medics, and a two-patient ambulance service operated by the fire department.

The Mayor of Brewster, who also is Administrator of Okanogan-Douglas County Hospital, stated that no major impacts on the health care facilities of the area were due to the influx of construction-related population. Apparently, many individuals associated with dam construction traveled to Wenatchee or Spokane for medical purposes. A major concern had been the probability, based on data from

TABLE 5

HOSPITALS IN THE SIX COUNTIES SURROUNDING
CHIEF JOSEPH DAM PROJECT AREA

CHIEF JOSEPH DAM ADDITIONAL UNITS

Hospital	Town	County	No. of Set-Up Beds	Located Within Actual Impact Area
Cascade General Hospital	Leavenworth	Chelan	20	No
Central Washington Deaconess and Rosewood Hospitals (Consolidated)	Wenatchee	Chelan	162	On Edge
Columbia Basin Hospital	Ephrata	Grant	29	Yes
Coulee Community Hospital	Grand Coulee	Grant	27	Yes
Eye and Ear Hospital of Wenatchee	Wenatchee	Chelan	24	On Edge
Ferry County Memorial Hospital	Republic	Ferry	15	No
Lake Chelan Community Hospital	Chelan	Chelan	28	Yes
Lincoln Hospital	Davenport	Lincoln	24	No
McKay Memorial Hospital	Soap Lake	Grant	21	Yes
Memorial Hospital	Odessa	Lincoln	21	No
Mid-Valley Hospital	Omak	Okanogan	27	Yes
North Valley Hospital	Tonasket	Okanogan	30	Yes
Okanogan-Douglas County Hospital	Brewster	Okanogan	50	Yes
Quincy Valley Hospital	Quincy	Grant	16	No
Samaritan Hospital	Moses Lake	Grant	50	No
TOTAL			544	

Source: 1976 Annual Hospitalization Report, Department of Social and Health Services, State of Washington.

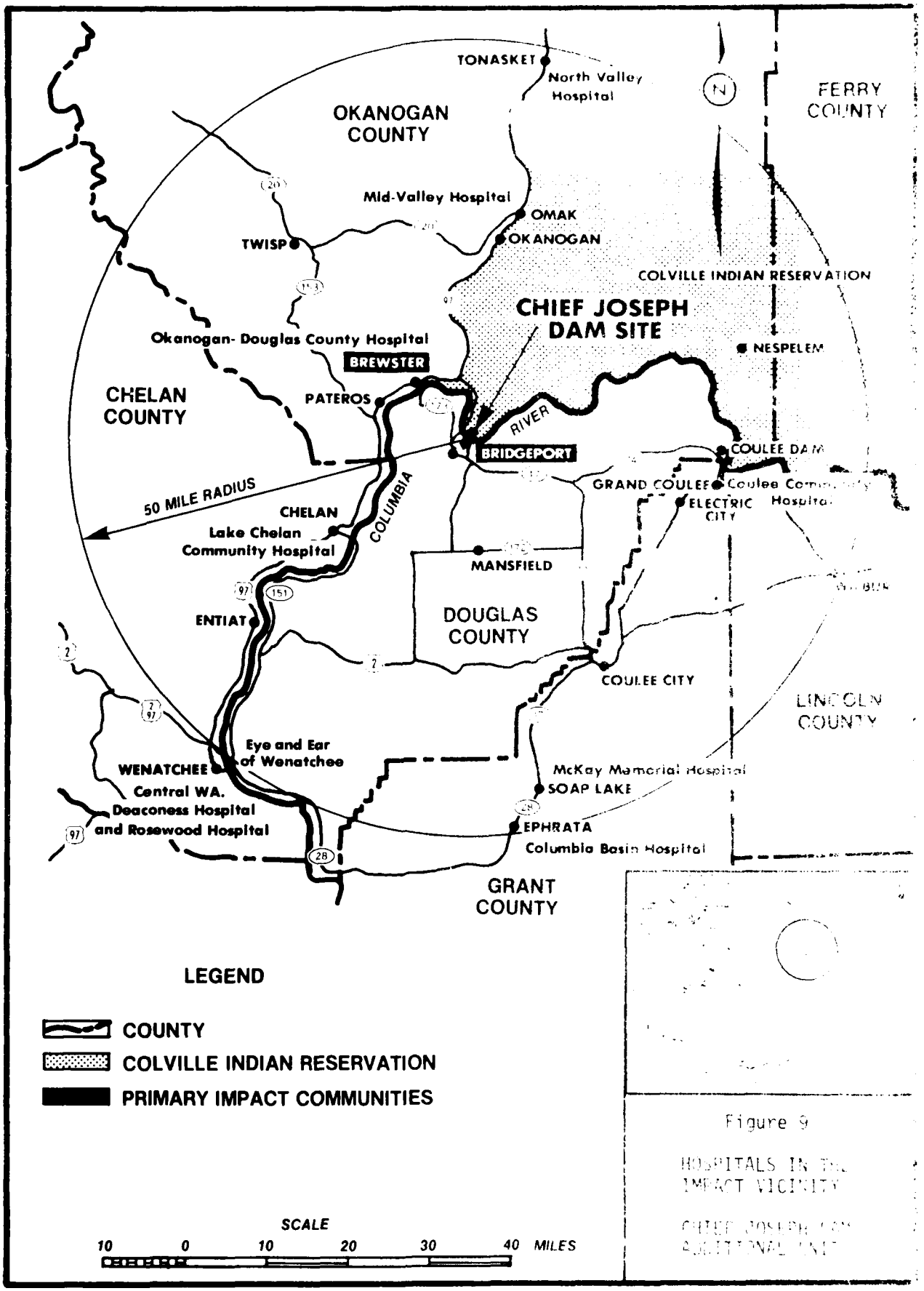

Figure 9

HOSPITALS IN THE IMPACT VICINITY

CHIEF JOSEPH DAM ADDITIONAL UNIT

previous construction projects, of serious accidents occurring at the damsite. However, the project to date has maintained an outstanding safety record during the course of construction work.

Traffic. Traffic density increased due to the hauling of materials for construction as well as the number of workers commuting to the damsite. The State Highway Department maintained traffic count records for several locations near the project (table 6). Increased traffic paralleled the increase in activity and the rise in population near the dam. A number of workers commuted from the Grand Coulee area, and were probably the cause of increased traffic on State Route 174.

Noise. Increased noise appeared to be an adverse factor only within the construction site. Turbine and generator operation produced a constant, low-frequency hum and hydraulic rumble which could be heard throughout the powerhouse. Noise in some work areas within the generator air housing and turbine pit exceeded 8-hour Occupational Safety and Health Administration (OSHA) standards when the generator was in operation. Workmen located in areas where the noise level exceeded 85 decibels were required to wear ear protection devices. The town of Bridgeport was at sufficient distance from the construction site so that the noise was substantially reduced.

Police Protection

Bridgeport. Bridgeport experienced difficulties with increased demands placed upon police services. Interviews with town officials revealed that an increase in vandalism, theft, and disorderly conduct occurred along with the increase in population. The town had no police department, but contracted with Douglas County for the services of three deputy sheriffs to provide local protection 16 hours a day. There are 368 residents per deputy sheriff which is less than the average number of residents per police officer for rural areas in the United States. However, town officials stated they could have utilized the services of one more deputy sheriff. Between 1974 (preproject) and 1977, police costs increased by $8,600. The city maintained a jail for 4-hour maximum detention only.

Brewster. The Brewster police department consisted of five fulltime police officers, one of whom was funded through Comprehensive Employment Training Act (CETA). A county sheriff also resided in Brewster, although his area of responsibility included the entire southern part of Okanogan County. Police protection services proved adequate to absorb the impact population in Brewster. Annual expenditures for law enforcement increased $33,600 during the 1974-1977 period.

TABLE 6

COMPARISON OF AVERAGE DAILY TRAFFIC VOLUMES IN IMPACT AREA
1974-1977

CHIEF JOSEPH DAM ADDITIONAL UNITS

Average Daily Traffic Volume*

Segment of Highway	Leg of Intersection	1974	1975	1976	1977	Percent Increase From 1974 to 1977
Junction of State Route 17 with State Route 173 (between Bridgeport & project site)	S	1,120	1,140	1,200	1,370	22.3
	N	1,060	1,420	1,500	1,550	46.2
Junction of State Route 173 with Pine Avenue (about halfway between Bridgeport and Brewster)	E	1,220	1,310	1,750	1,850	51.6
	W	1,240	1,320	1,800	1,900	53.2
Junction of State Route 174 with State Route 17 (about halfway between Grand Coulee area & project area)	—	610	510	680	710	16.4

Source: Annual Traffic Report, 1976, Washington State Highway Commission, Department of Highways (1977 figures obtained in telephone conversation with same).

*Volumes shown represent an estimate of one average day of the year.

Fire Protection

Bridgeport. Bridgeport had a crew of 21 volunteer firemen with two pumper trucks. Several of the volunteers, including the fire chief, were Corps of Engineers' employees. A potentially serious fire hazard existed where mobile homes utilized for temporary housing were placed too close together. The main fire concern was an inadequate water supply to meet the needs of an increased population. Lack of water for fire protection to the homes on higher elevations behind town and on the Bridgeport Bar was a major concern of fire officials. Fortunately, no large fires occurred during the peak construction period.

Brewster. Brewster had a 25-member volunteer firefighting crew equipped with two pumper trucks and three auxiliary trucks. Water pressure and storage capacity were satisfactory for adequate fire protection, according to standards set by the National Board of Fire Underwriters. Brewster fire department had the staff and equipment to protect a town three and one-half times present size including impact population. No major fires occurred during the peak construction period.

Utilities

Sewer.

Bridgeport. The existing sewage treatment plant is owned and operated by the town of Bridgeport, and was placed in operation in 1969. The plant was designed to handle an average flow of 200,000 gallons per day (g.p.d.). Assuming an average daily flow of 100 gallons per capita daily, the system was designed to handle a population of 2,000. (Census in 1977 was 1,623.) Average inflow during the peak impact, coupled with required sludge recirculation, substantially exceeded design capabilities of the existing clarifier. Cause of the excess flow was uncertain, but may have been due both to high per capita flow and a workday population which exceeded the permanent (census) population. Inflow and recirculation measured in August 1977 was approximately two times the design hydraulic loading. The effect of this overloading was visually apparent as a rolling, muddy appearance as sludge spilled over the weir. To alleviate the sludge overflow, the town hauled activated sludge and dumped it on open land near the town. Such dumping technically violated U.S. Environmental Protection Agency (EPA) standards.

In March 1975, prior to the construction impact, Bridgeport applied for funds to expand its sewer system under a Washington State funding program. In August 1977, the state offered a $30,000 loan to conduct engineering design studies and to fund subsequent financing applications. In March 1977, a step one facility plan, application for study, was submitted to the Washington State Department of Ecology and the EPA. An offer of $11,000 was made by these agencies in July 1977.

A step two application for final design plans and specifications was scheduled for December 1977. The timing of step three has yet to be determined. The 1977 estimated cost to upgrade and expand the Bridgeport sewer system was $242,000.[1/]

Brewster. The existing sewage treatment plant, owned and operated by the town of Brewster, was placed in operation in 1967. The plant was designed to handle an average daily flow of 250,000 g.p.d. Assuming an average per capita daily flow of 100 gallons, the system was designed for a population of approximately 2,500, well above normal plus impact population. Estimated average flow during the peak, however, was about twice the earlier estimate. Fruit-packing operations were estimated to contribute a peak of 90,000 g.p.d. to the system. Two of the four fruit packing operations in the town are connected to the sewer system, and are major contributors to the total flow. About two-thirds of the average flow is domestic sewage. Several large roof drains connected to the system, plus system infiltration during runoff periods, can contribute up to 200,000 g.p.d. of additional inflow to the system.

The capacity of the present system was exceeded during peak impact. Although influx of construction workers was not the primary factor that caused the strain on the Brewster sewer system, the added population did worsen the situation. Much of the overload was due to a new fruit processing technique used by the packing houses which uses more water than the old process. Because of this new process, and the possibility that other packers may hook into the system, the town is conducting engineering studies necessary for expansion of the sewer system. The design capacity of the new system is projected to be up to 750,000 g.p.d. Because of the uncertainty as to the capacity that will be needed to serve the packing houses, consulting engineers considered three alternative expansion programs. Each is designed to accommodate a population of 2,000 with the balance of system capacity varying with the service needed to service packing houses.

Brewster applied for EPA funding in December 1975. An initial $22,000 of funding was received in June 1977. Construction is planned for the summer of 1979. The city is exploring various ways of financing the contemplated system expansion.

1/Estimate based on discussions with consulting engineer for the town.

Water.

Bridgeport. Water usage records were not sufficient to measure consumption accurately. The 1977 physical condition of much of the water distribution system was unknown. Two of the three wells were unmetered, and total usage could only be estimated. Consumption by unmetered users was unknown, and may have been substantial. A 1975 study estimated average water usage at 700 gallons per capita daily (g.p.c.d.) and peak usage at 2,000 g.p.c.d. This contrasted sharply with reported national rates of 200 g.p.c.d. average use and 400 g.p.c.d. peak use[1/] for cities the size of Bridgeport. During peak usage (2.9 m.g.d.), the estimated pumping capacity of the three wells (2.3 m.g.d.) was exceeded, and the system suffered from low water pressure and a falling reservoir level.[2/] This lack of capacity constituted a considerable inconvenience for customers and a greatly increased fire risk. High usage rates appeared to be due to use of domestic water for large lawns and gardens, irrigation of some orchards, and for an extensive municipal park system. Although the water system had deficiencies prior to the influx of construction workers, the rapid population increase at the peak of the impact was a factor in the inadequacy of the system during the 1976-1978 period.

In March 1975, Bridgeport applied for state funds to upgrade its water system, and the state offered to fund 40 percent of construction costs ($134,799). In October 1976, Bridgeport submitted an application for $529,850 to the Economic Development Administration (EDA) to supplement funds offered by the state and to fund the construction of a city maintenance shop (an additional $188,160). Because unemployment was not sufficiently high in the area, the EDA did not make a grant award to Bridgeport (May 1977). In June 1977, the state withdrew its grant offer because the project had not commenced. The town also made a grant application to upgrade the water system in January 1977 to the Department of Housing and Urban Development (HUD). The following month, Bridgeport was notified no grant would be forthcoming because unemployment was not a problem in the area. As of May 1978, the city had not resolved the problem of obtaining funding. Although total water usage will taper off as the construction work force is phased out, the deteriorated condition of the system will require a long-term solution.

Brewster. The municipal water system is completely metered. According to studies conducted by engineers for the town, average demand was 0.75 million gallons per day (m.g.d.) with a peak demand of 1.25 m.g.d. These figures contrast with the supply capacity of 1.75 m.g.d. Major nonresidential users included the school system,

1/Evaluation Study of Impact Upon Utility Systems of Bridgeport, Washington, January 1975, prepared by Lee Johnson Associates.

2/Letter from Lt. Col. John Terpstra to Mayor Dennis Hardie, dated 30 August 1977.

hospital, rest home, four apple packer/processors, a motel, two supermarkets, a laundromat, and a trailer court. The engineers estimated 4 percent of the meters account for about 20 percent of the average daily summer demand.

On the average, 0.75 m.g.d. was pumped into the system, and 0.65 m.g.d. was recorded on service meters and sold. The difference between production and sales was attributable to fire flow, leaks, pipe flushing, flow through inoperative meters, and municipal uses (unmetered) such as irrigation, the town hall, and sewage plant. The ratio of water produced to water sold during the winter indicated the water system was efficient and in good condition. No orchards or other agricultural crops within the confines of the distribution system were irrigated with the municipal supply. The population growth associated with project construction was not sufficient to create water supply problems.

Although the supply of water at the source was deemed adequate by engineers for the town, improvements were being sought in the distribution system. An application was made in January 1974 under State Referendum 27 for funds to upgrade the distribution system. Approval was received in May 1977 for an $80,000 grant covering 40 percent of construction costs ($200,000). Brewster paid for the balance through a bond issue. In November 1976, the Economic Development Administration (EDA) rejected an application by the city for funds to upgrade the water distribution system. The city is presently working through its consulting engineers to find other sources of financing.

Other. Other utilities such as electrical and telephone service expanded to meet the impact population without difficulty.

City Finances

Bridgeport. Revenues and expenditures were balanced at $71,600 in 1974 (preimpact) and $90,200 in 1977 during peak impact (table 7). Revenue categories such as retail sales taxes, licenses, permits, and miscellaneous fees and fines all increased substantially over preimpact figures. Unfortunately, the need for additional services also rose rapidly, and the necessity to balance the budget limited expenditures. In addition, due to the high rate of inflation during the 1974-1977 period, about one-half of the added revenues were lost in terms of real purchasing power. The mayor of Bridgeport felt that the quality of services such as police protection had suffered due to lack of additional operating revenues.

Brewster. Revenues and expenditures in Brewster were $94,200 in 1974 and $129,600 in 1977 (table 7). With a smaller influx of workers, larger tax base, and more diversified economy, Brewster was better able to maintain sufficient community services. The mayor of Brewster felt that his community had financially absorbed the worker impact with little effect on the quality of services provided.

TABLE 7

CURRENT EXPENSES AND REVENUES
BRIDGEPORT AND BREWSTER
1974 and 1977

CHIEF JOSEPH DAM ADDITIONAL UNITS

	Bridgeport		Brewster	
	1974	1977	1974	1977
1. Revenues.				
Cash on Hand	$7,000	$6,000	$30,000	$15,000
Taxes[1/]	13,500	27,100	33,000	65,100
Licenses, Permits, Fines	3,800	7,800	10,100	10,800
Intergovernmental Revenues[2/]	30,800	20,300	18,800	38,200
Miscellaneous[3/]	16,600	29,000	2,400	500
TOTAL	$71,700	$90,200	$94,300	$129,600
2. Expenditures.				
Current Expenditures[4/]	$56,700	$65,600	$44,000	$45,700
Police	12,000	20,600	41,000	74,100
Fire	3,000	4,000	9,300	9,800
TOTAL	$71,700	$90,200	$94,300	$129,600

Source: Town fiscal records.

1/Sales and use, property, utility district, and amusement.

2/Revenue sharing, Federal and state (including grants).

3/Bridgeport includes garbage service; Brewster does not.

4/Wages and salaries (other than police and fire), supplies, and other operating costs.

Esthetic Values

Visual Landscape and Patterns of Land Use. The project area still shows scars from construction of Chief Joseph Dam original units 20 years ago. Remains of a short-lived commercial boom can be seen in the vacant buildings, substandard housing, and scattered lots in the Bridgeport and Bridgeport Bar area. Present construction has further impacted the appearance and land-use patterns of the area.

Results from the construction worker survey discussed in section 5 showed that about 1,000 new residents moved into the impact area. Bridgeport and Brewster received the bulk of this new population. Many construction-related families lived in mobile homes and trailers. Residential development primarily in the form of trailer parks occurred on the outskirts of both towns. Mobile homes were scattered on previously vacant lots throughout the towns. Since most trailers were quite new, the overall impression was not unpleasant. Some attempts were made to landscape many of the trailer sites. The influx of school-age population was great enough to require the construction of attractive new school facilities in both towns, with major financial assistance from the Corps of Engineers. Aerial photographs of both towns, taken before impact and during peak impact, are included as figures 10 through 13.

Bridgeport did not experience an economic boom similar to that of the 1950's during original construction, so random and unplanned location of short-lived businesses was not a problem in the 1970's.

The impact area should experience a reduction in residential land use as the construction workers move away. Substantial amounts of landscaping are planned around the dam after construction is completed. These combined activities should help create a more pleasant landscape.

Recreational Facilities. The impact area contained a variety of recreational facilities. The communities of Bridgeport and Brewster maintain a bowling alley, libraries, parks, swimming pools, and picnic areas. The outdoor facilities were heavily used during the hot summer months by tourists and local residents. The increase in impact population at peak added to this use. Adverse effects upon recreational facilities of the communities consisted of some overcrowding at the municipal pool, and some acts of vandalism at the pool and public toilets at Bridgeport.

, WASHINGTON, DURING FEB
ED DEVELOPMENT. SEPT 19

RE 12. AERIAL PHOTOGRAPH OF [illegible], WASHINGTON,
IMPACT, MAY 1974.
[illegible] 668' ±

Archeological Resources. Several cultural resource reconnaissance and survey investigations have taken place in northeastern Washington since 1945. Corps of Engineers-sponsored [illegible] at the Chief Joseph project has identified 272 prehistoric and historic cultural resource sites. In 1977, test evaluation of sites that may be affected by the project was undertaken by the Corps of Engineers to identify properties eligible for the National Register of Historic Places, and to determine the need for salvage/preservation of significant cultural data. On the basis of existing information, the Colville Confederated Tribes and the Washington State Historic Preservation Officer maintain that many sites presently endangered are crucial to the full understanding of the cultural and environmental history of the area and people, and have taken steps to nominate the Rufus Woods Lake area to the National Register as an Archeological District. The Corps of Engineers began salvage operations in early summer of 1978. About 30 persons moved temporarily into the project area, located in the Nespelem and drawing upon the community facilities of that town. An additional 25 persons may be hired from the local labor force. About half of the salvage crew were seasonal transient workers living in trailers in a base camp onsite during the summer work season and leaving the area during the winter. Fewer than 10 persons were projected to move into the area for the duration of the salvage operation. Current estimates indicate that up to 20 Colville Confederated Tribal members may be employed. The complete salvage and preservation program is estimated to cost up to $2.4 million, and may continue through 1983.

Civic Organizations and Community Growth, Cohesion, and Response

Civic Organizations. A few service, fraternal, and business-related organizations, representative of those found nationwide, are also found in the primary impact area. Examples include the American Legion and the Chamber of Commerce. Recently organized youth activities include the Boy Scouts and Girl Scouts of America.

Involvement of contractor employees and their families tended toward organizations of personal interest and benefit such as the school board and Scouts. Corps of Engineers' employees were more active in community service and local government such as the Chamber of Commerce and the volunteer fire department.

Interviews with officials indicate that workers were encouraged to participate in any activity of their choosing. Officials said workers appeared to support community organizations, but were not active to any large extent. Their participation did not significantly affect the leadership or goals of these organizations.

Community Growth. The development of social, economic, and political systems within a given community comprises community growth. Such growth was only temporarily affected in Bridgeport and Brewster due to the short term nature of construction activities and population increase. Although numerous employees and their families became active in civic organizations, their relatively short-lived stay in the community prevented their participation from affecting any permanent changes in the existing social structures.

An economic boom atmosphere with substantial business expansion occurred during the original dam construction in the 1950's. Many businesses started at that time closed soon after construction ceased, as it became apparent that the postconstruction economy could not support the new businesses. Potential investors were wary of repeating that experience in the 1970's. In spite of substantial gains in bank deposits and retail sales over preimpact conditions, very few new businesses were established. The postimpact financial composition of both towns will probably be much as it was before construction.

Any project-related, long-term growth may be associated with increases in tourism and use of proposed nearby recreational facilities and the related increased need for support services. Community representatives appear to favor such long-term growth.

The basic political structure of both towns appeared to be unchanged by the construction impact. Both mayors were long-time residents. The majority of the construction workers appeared to have little interest in local politics.

The nearby Colville Indian Reservation was little affected by construction. Indian employment on the construction project never exceeded 10 to 15 people. All major Indian communities were at a substantial distance from the dam. Negotiations between the Colville Confederated Tribes and the Federal Government over electrical power revenues, land acquisition, and archeological preservation are in progress. The outcome of these negotiations may have a major impact on future growth on the Reservation. An Indian culture theme, which may be featured in the public use facilities at the dam, would likely draw visitor attention to the Reservation.

Community Cohesion. Community cohesion is the unifying force which allows a group to establish patterns of interrelationships, common institutions, commonly agreed-upon ways of behaving, and a common identity. The essential elements of community cohesion are physical proximity, social similarities, and group activities. The introduction of several hundred construction personnel and their families into the towns near the project was the greatest

project-related threat to the community cohesion of [illegible]. With such a large concentration of impact population, Brewster were the towns most likely to experience changes in community cohesion. (The project was not expected to affect the cohesion of the Colville Confederated Tribes.)

Interviews with officials indicated that no significant changes in the cohesiveness of either town was experienced. In spite of their relative residential isolation, construction workers and their families were active to some extent in community affairs. Officials noticed no tension or conflict of interest between 'local' groups and new residents. Construction workers and their families participated in activities in which they were likely to work with long-time residents toward similar goals. Although some demographic differences existed between long-time residents and new residents (for instance, new residents were older, more likely to be married, and had slightly smaller families than long-time residents), these differences did not appear to prevent these groups from working together. Contributing toward the cohesiveness of both towns was the fact that almost 60 percent of the work force was [illegible] local residents who were already established members of the communities.

Community Response. The reaction of community leaders in Bridgeport and Brewster to the influx of construction workers was mixed. Increased retail sales and the prestige and publicity associated with expansion of one of the largest hydropower dams in the world were widely appreciated. Overcrowded schools and the strain on local utilities and services, however, caused considerable feelings of resentment. Anger and frustration were primarily directed at the Federal Government and not the construction workers. [illegible] authority to assist local schools was widely praised, but the lack of funding for utility improvements remained a major source of tension. The general reaction of many local officials was that, since the Federal Government brought in the workers, the Federal Government should pay for any impact created by the [illegible] population. The presence of economists and sociologists from the Corps of Engineers who were negotiating potential impacts before construction led some people to believe that federally financed assistance was in progress. The communities did not appear to have the expertise necessary to deal effectively with the complicated Federal and state bureaucratic and regulatory structure from which funds might have been obtained. The lack of provisions for the Corps of Engineers to mitigate local social and economic impacts was not widely understood or appreciated by the [illegible].

SECTION 5 - CONSTRUCTION WORKER PROFILE

Introduction

Demographic characteristics of the expected work force are an essential component of any community impact planning process. The Chief Joseph Project provided an opportunity to obtain such data from a large number of workers at a major construction site. Statistics gathered from the survey can be compared with studies by other Federal or state agencies to develop a construction worker profile. This profile provides basic data which can be utilized to project worker characteristics for future community impact studies.

Three brief construction worker surveys at the Chief Joseph project were conducted at the request of congressional representatives between late 1975 and early 1977. These surveys only determined numbers of workers and residency patterns during the preliminary construction phases. Additional information was needed for a more complete community impact study. Recognizing this need, major contractors on the project agreed to assist in conducting a survey of their workers in December 1977. Substantial construction activities were in progress on that date, with over 600 workers employed onsite.

Methodology

A survey form, the size of a computer card, was distributed by contractor administrative staff to each worker with his weekly paycheck at the end of the first week in December 1977. Workers were requested to return the completed form by the following payday. Over 80 percent of the cards were returned in usable form. Basic information was requested on residency, occupation, housing, previous employment, and family characteristics. A sample form and details on editing and processing are included as appendix A.

Source of Work Force

Workers were classified as local or nonlocal according to where they had lived prior to employment on the project. A local worker was one who still lived in the same town he had lived in before employment on the project. A nonlocal worker was one who had lived in a different town prior to starting work on the project.

TABLE 8

LOCAL/NONLOCAL COMPOSITION OF WORK FORCE 1/

CHIEF JOSEPH DAM ADDITIONAL UNITS

	Number	Percent
Local	234	57.5
Nonlocal	173	42.5
TOTAL	407	100.0

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

The CIR and Update I both assumed the majority of workers would be new to the area. A recent analysis of construction work force at 26 small construction projects in the western states also reported that most workers were from outside the local area.1/ The unexpected high percentage of local workers indicated that a substantial pool of available labor existed locally. A number of the local workers were from towns near Grand Coulee Dam, about 40 miles east of the project. Many workers from the Third Powerplant project at Grand Coulee apparently remained in the area, and were able to find work at Chief Joseph. The percentage of local workers may be slightly inflated in that a few workers who moved into the area in anticipation of project work, but without an actual job, would have been reported by the survey as local workers.

Residency

Worker residential patterns at the time of the survey are presented in table 9. Predictions of residency were made in the original CIR and in Update I. The CIR predicted that 50 percent of the impact population would live in Brewster and 15 percent in Bridgeport. That report assumed that the majority of the workers would be nonlocal, and most would want to live in a community with better community services, facilities, and housing, even if a few miles farther away from work. Update I revised residency projections, giving more emphasis on commuting distance to the project site.

1/Construction Worker Profile, Final Report, prepared by Mountain West Research, Inc., for the Old West Regional Commission, Washington, D.C. (December 1975). Construction Worker Survey, Final Report, prepared by Mountain West Research, Inc., for the U.S. Bureau of Reclamation, Denver, Colorado (October 1977).

Update I predicted that 27 percent of the work force would locate in Bridgeport, 23 percent in Brewster, and 10 percent in the Bridgeport Bar area. Actual data from the survey was 43 percent at Bridgeport, 17 percent at Brewster, and 3 percent at Bridgeport Bar. This indicates that workers preferred to live close to the project rather than in a community a short distance away with more amenities. About 30 percent of the work force commuted from towns up to 50 miles away. A small number gave their address as communities over 50 miles away.

TABLE 9

RESIDENTIAL DISTRIBUTION OF WORK FORCE 1/

CHIEF JOSEPH DAM ADDITIONAL UNITS

Town	Local		Nonlocal		Total	
	No.	%	No.	%	No.	%
Bridgeport	55	23.5	115	66.5	177 3/	42.7
Brewster	40	17.1	32	18.5	72	17.3
Bridgeport Bar	7	3.0	4	2.3	11	2.7
Grand Coulee Area 2/	40	17.1	6	3.5	47 4/	11.3
Other Communities within 50-Mile Radius of Dam	68	29.1	13	7.5	81	19.5
Outside 50-Mile Radius of Dam	24	10.3	3	1.7	27	6.5
TOTALS	234	100.1	173	100.0	415	100.0

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/Grand Coulee area includes towns of Coulee Dam, Coulee City, Electric City, and Grand Coulee.

3/Includes seven workers who did not respond to question of local/nonlocal residency.

4/Includes one worker who did not respond to question of local/nonlocal residency.

Nonlocal workers were questioned as to their residence prior to project employment. As shown in table 10, most workers came from other areas in the state. Many out-of-state workers came from Montana or Idaho, where other Corps of Engineers projects were recently completed. These findings support the thesis that many workers migrate between major construction projects.

Prior Employment Status

Prior employment status of the surveyed workers is presented in table 11. A significant finding is that almost 60 [illegible] workers had some period of unemployment in the 6 weeks [illegible] working on the project. Over one-fourth of all workers [illegible] of work for 31 or more days in the 6 weeks prior [illegible] employment. The impact on local unemployment rate [illegible] quantified from available data. Unemployment stat[illegible] gathered by the state to the county level. Bridgeport [illegible] each lie in different counties, thus scattering [illegible] between two reporting areas. The peak construction [illegible] nearly 900 amounted to less than 4 percent of the two[illegible] work force at that time. The large number of local [illegible] been unemployed prior to starting work on the project [illegible] that a significant reduction in unemployment must have [illegible] the primary impact communities.

Occupational Distribution

Occupational distribution of the work force is presented in table 12. The local labor market provided substantially more craftsmen and laborers than did the nonlocal work force. Only in [illegible] professional/technical, operatives, and clerical categor[illegible] nonlocal worker predominate. The cause for nonlocal [illegible] workers apparently is that administrative, supervisory, [illegible], and clerical staff were more likely to be employees of the Corps of Engineers and to have come into the area from other projects.

The substantial number of local craftsmen was [illegible]. Apparently, many skills acquired by the local work [illegible] agricultural and local construction jobs were [illegible] transferable to project needs.

Age Distribution

Median age of the work force was 42.8 years. There was little difference in age distribution between local and nonlocal workers (table 13). The bulk of the work force was between the ages of [illegible] and 59. More workers were found in the ages between [illegible] than are found in the general male population in the State of Washington.

TABLE 10

RESIDENCY OF NONLOCAL WORKERS
PRIOR TO EMPLOYMENT AT
CHIEF JOSEPH DAM ADDITIONAL UNITS[1]/

Prior Residence	Number of Nonlocal Workers
Washington:	
Towns within 50-mile radius of dam	23
Seattle-Tacoma-Everett	16
Spokane	14
Tri-Cities	10
Other towns outside 50-mile radius, but in Washington	38
Total Washington	101
Other States:	
Montana	21
Idaho	18
Oregon	11
Other	20
Total Other States	70
Other Countries:	2
GRAND TOTAL	173

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

TABLE 11

EMPLOYMENT STATUS OF WORK FORCE
PRIOR TO EMPLOYMENT AT
CHIEF JOSEPH DAM ADDITIONAL UNITS[1]

	Local Workers (N=234)[3]	Nonlocal Workers (N=173)	Total Work Force[2] (N=415)
Percent experiencing no unemployment in the 6 weeks prior to working on this project.	35.9	47.4	40.5
Percent experiencing some unemployment in the 6 weeks prior to being employed on this project.	62.0	52.0	57.8
No response as to prior employment.	2.1	0.6	1.7
TOTAL	100.0	100.0	100.0
Of those experiencing some unemployment, percent unemployed by duration:			
Unemployed 1-10 days of prior 6 weeks.	15.2	16.7	15.8
Unemployed 11-15 days of prior 6 weeks.	4.8	8.9	6.3
Unemployed 16-20 days of prior 6 weeks.	6.2	11.1	7.9
Unemployed 21-25 days of prior 6 weeks.	8.3	8.9	8.3
Unemployed 26-30 days of prior 6 weeks.	30.3	25.6	28.3
Unemployed 31 and more days of prior 6 weeks.	27.6	24.4	27.1
Unemployed, but no response as to how long.	7.6	4.4	6.3
TOTAL	100.0	100.0	100.0

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/Total includes eight workers who did not respond to question of local/nonlocal residency.

3/N = number of respondents.

TABLE 12

OCCUPATIONAL DISTRIBUTION OF WORK FORCE

CHIEF JOSEPH DAM ADDITIONAL UNITS

	Total Work Force[2]	Local Workers as Percentage of Total Workers	Nonlocal Workers as Percentage of Total Workers
Professional/Technical	50	42.0%	58.0%
Craftsmen	208	62.5	35.6
Ironworker (35)			
Cement Mason (8)			
Millwright (10)			
Pipefitter (11)			
Carpenter (71)			
Mechanic (11)			
Welder (2)			
Driller (3)			
Electrician (23)			
Oiler (12)			
Teamster (13)			
Warehouseman (2)			
Heavy Equipment (5)			
Plumbers (2)			
Laborers	74	79.7	18.9
Helpers	11	63.6	36.4
Operatives	22	40.9	59.1
Clerical & Others	48	16.7	79.2
No Responses	2	--	50.0
	415	57.5%	42.5%

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/Includes eight workers who responded to question of occupation but not to question of local/nonlocal residency.

TABLE 13

AGE DISTRIBUTION OF WORK FORCE[1]/

CHIEF JOSEPH DAM ADDITIONAL UNITS

Age	Local Workers #	Local Workers %	Nonlocal Workers #	Nonlocal Workers %	Total Work Force[2]/ #	Total Work Force[2]/ %	Males in State of Washington, Ages 15-69[3]/ #	Males in State of Washington, Ages 15-69[3]/ %
15-19	2	0.9	2	1.2	4	1.0	169,152	15.1
20-29	45	19.2	38	22.0	83	20.0	269,889	24.3
30-39	55	23.5	37	21.3	95	22.9	188,172	16.8
40-49	52	22.2	38	22.0	90	21.7	195,688	17.5
50-59	58	24.7	42	24.2	102	24.5	176,967	15.8
60-64	18	7.7	13	7.5	32	7.7	67,484	6.0
65-69	2	0.9	2	1.2	4	1.0	50,137	4.5
No Response	2	0.9	1	0.6	5	1.2	--	--
	234	100.0	173	100.0	415	100.0	1,117,490	100.0

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/Total includes eight workers who did not respond to question of local/nonlocal residency.

3/Population Trends, Population Studies Division, Office of Fiscal Management, State of Washington, 1977.

Marital Status and Family Size

Marital status of the work force was disproportionate to that found among males over 14 years old in the State of Washington. Table 14 indicates that 83 percent were married, 6 percent were single, and 7 percent were separated, widowed, or divorced. In 1970, 64 percent of Washington State males were married, 28 percent were single, and 8 percent were separated, widowed, or divorced. Data for rural areas (such as the project area) are similar. Marital status varied by few percentage points between locals and nonlocals. Nonlocal married workers were more likely to have no children or one child, while local married workers were more likely to have two, three, or four children. Local workers were more likely to be single. Average family sizes are given in table 15 for those married workers who had their families with them in the project area. Local workers appeared to have slightly larger families than nonlocal workers. About 40 percent of nonlocal married workers were not accompanied by their families to project area.

School Age Children

The CIR projected numbers of construction-related students based on a population-to-student ratio from the 1970 census. Update I revised these predictions, using student-to-employee ratios. Student-to-employee ratios were recalculated in brief surveys during October 1976 and April 1977. Ratios estimated in these surveys were based upon a sampling of workers' residency. The December 1977 worker survey provided the first verification of the preliminary ratios. Results were surprisingly close to the earlier estimates (table 16).

Population Influx

One of the most significant results of the Construction Worker Survey was the calculation of population influx per 100 construction workers (table 17). Approximately 229 people per 100 nonlocal construction workers moved to the impact area. Two hundred and eighty-two persons were associated with every 100 local construction workers. For all construction workers together, 260 persons were associated with every 100 workers. These ratios, if proven to be typical, will be useful for planning purposes. Once the expected work force for a project is determined, and proportion of local-to-nonlocal workers estimated, the approximate influx of new population can be calculated. Community planning and any mitigation of impacts can then proceed based upon the expected population gain.

TABLE 14

MARITAL STATUS AND NUMBER OF CHILDREN[1]/
18 YEARS OR UNDER OF WORK FORCE[2]/

CHIEF JOSEPH DAM ADDITIONAL UNITS

Marital Status	Local Workers		Nonlocal Workers		Total Work Force[3]/	
	#	%	#	%	#	%
Single	18	7.7	8	4.6	26	6.3
Divorced, Widowed, or Separated	13	5.6	13	7.5	27	6.5
Married, No Children	45	19.2	47	27.2	93	22.4
Married, One Child	35	15.0	36	20.8	74	17.8
Married, Two Children	55	23.5	26	15.0	83	20.0
Married, Three Children	23	9.8	14	8.1	38	9.2
Married, Four Children	11	4.7	5	2.9	16	3.8
Married, More Than Four Children	4	1.7	5	2.9	9	2.2
Married, No Response as to Number of Children	17	7.3	16	9.3	33	8.0
No Response as to Marital Status	13	5.6	3	1.7	16	3.8
TOTALS	234	100.1	173	100.0	415	100.0

1/Includes children living with worker and away from worker.

2/Construction Worker Survey, Chief Joseph Dam, December 1977.

3/Total includes eight workers who did not respond to question of local/nonlocal residency.

TABLE 15

AVERAGE FAMILY SIZE OF MARRIED
CONSTRUCTION WORKERS WITH FAMILY PRESENT 1/

CHIEF JOSEPH DAM ADDITIONAL UNITS

	Local Workers	Nonlocal Workers	State 3/
Average Family Size of Married Respondents with Family Present 2/	3.64	3.25	3.58

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/Children and spouse are living with worker in impact area.

3/1970 Federal Census.

TABLE 16

COMPARISON OF STUDENT-TO-EMPLOYEE RATIOS
BRIDGEPORT AND BREWSTER

CHIEF JOSEPH DAM ADDITIONAL UNITS

	CIR	Update I	Oct 76 Survey	Apr 77 Survey	Dec 77 Survey
Bridgeport	3.26 1/ to 1.00	0.73 to 1.00	0.80 to 1.00	0.82 to 1.00	0.81 to 1.00
Brewster			0.91 to 1.00	1.01 to 1.00	0.97 to 1.00

1/Ratio of total population to children between the ages of 6 and 18 years in the state.

TABLE 17

AVERAGE POPULATION INFLUX PER 100 CONSTRUCTION WORKERS[1]

CHIEF JOSEPH DAM ADDITIONAL UNITS

	Worker Did Not Respond as to Marital Status	Worker Single, Widowed, Divorced, Separated	Worker Married But No Response as to Presence of Family	Worker Married But Family Absent	Worker Married and Family Present			Total Population "Influx"[2]
					Worker	Spouse	Children	
Local Workers (N=234)[3]	13	31	24	5	161	161	264	659
Nonlocal Workers (N=173)	3	21	9	41	99	99	124	396
Total Work Force[4] (N=415)	16	53	33	47	266	266	397	1,078

Average Population "Influx" per 100 Local Workers = 281.6. 282 people per 100 workers.
Average Population "Influx" per 100 Nonlocal Workers = 228.9. 229 people per 100 workers.
Average Population "Influx" per 100 Workers = 259.7. 260 people per 100 workers.

1/Construction Worker Survey, Chief Joseph Dam, December 1977.

2/The term "influx" is used loosely here for all but the nonlocal workers, since local workers and their families were already living in the impact area prior to start of construction. A calculation such as the above, however, is useful for determining the number of people in a community related to construction workers.

3/N = number of respondents.

4/Total includes eight workers who did not respond to question of local/nonlocal residency.

Profile of a "Typical" Worker

The Construction Worker Survey was designed to measure certain demographic characteristics of the Chief Joseph Dam work force. The survey revealed that a worker was more likely to originate from within, rather than outside, 50 miles of the project. He preferred to live close to his place of work, rather than living in a town with more social and economic amenities further away. Travel time to the job was an important consideration in selecting a place to live. Chances were good that, if he was new to the project area, he had moved from some other part of Washington State. If he was from another state, he was likely to be from a neighboring state in which other Corps of Engineers' projects were located. He was likely to have experienced several weeks of unemployment prior to employment on the additional units project. If he was from out of the area, he was likely to face competition from local workers for the skilled labor jobs. A worker was likely to be older than the nonconstruction-related male population of the area. Few workers were unmarried. A nonlocal worker was not as likely as a local worker to have his family with him at the project area. If he did, it was a slightly smaller family than those of local workers and the state average. For every 100 workers, there were about 260 people in the community associated with them. This number was smaller (229) if the worker was nonlocal and larger (282) if the worker was local. The kinds of worker patterns established by these data are valuable in predicting worker profiles on future projects.

SECTION 6 - SUMMARY AND MAJOR FINDINGS

Construction of additional hydroelectric units at Chief Joseph Dam, Washington, resulted in an influx of about 1,000 new residents into the small communities of Bridgeport and Brewster. This influx was equivalent to a 50 percent population increase during a 2-year period. Severe strains were placed on many local facilities and services. Quality and availability of housing were insufficient. Much of the construction-related population lived in mobile homes or trailers, apparently preferring that to substandard housing. Local schools received the major impact, and enrollments rapidly exceeded capacity. The Corps of Engineers received congressional authorization to provide funds for temporary school facilities and operational expenses to alleviate the crowded situation. Despite efforts to coordinate the availability of services with the needs of the communities, the provision of expanded school facilities occurred approximately 2 years late. Local school authorities added funds to contract new facilities. Sewer and water utilities also operated at or in excess of capacity. The local communities only met with limited success in applying for financial assistance from Federal and state agencies with funding authority for utility expansion. Although local health facilities were minimal, they appeared adequate during the peak impact period.

The town of Bridgeport received the bulk of the population impact. Of the two communities, Bridgeport was less able to provide local funds for alleviation of project impacts. Since the Corps of Engineers only had authority to assist the community for school impacts, relations between the community and the Corps of Engineers became significantly strained over responsibility for alleviating other impacts, such as water and sewer. In the eyes of the local small communities, the Corps of Engineers was the Federal Government and any delay or lack of mitigating local impacts (regardless of Corps of Engineers-voiced limits of authority) were considered to be due to ineffective planning or apathy on the part of the Corps.

The town of Brewster absorbed the impact with much less difficulty due to a smaller impact population, larger tax base, and more diversified economy.

Aside from new school facilities and crowded trailer courts, the local communities exhibited little physical change from preimpact conditions. Indications are that the towns will rapidly revert to preimpact population levels as dam construction is completed.

Major findings from the study include the following:

- Construction workers preferred to live close to the project rather than in a community a short distance away which had more social and economic amenities.

- Construction workers preferred to live in mobile homes and travel trailers rather than substandard housing.

- A high percentage of the work force consisted of local workers, indicating that a substantial pool of unemployed labor existed locally.

- Despite major increases in retail sales and bank deposits, new businesses were not attracted to the impact area.

- The new population impact was much more concentrated than had been predicted from the earlier community impact reports.

- Workers as a group were older than would be expected for construction industry, with median age being around 43 years.

- City revenues in the primary impact communities did not expand sufficiently to meet increased need for services.

- Local schools received the major impact and need for financial assistance.

- Community reaction concerning overcrowded schools and deteriorating services was primarily directed at the Corps of Engineers, not the construction workers.

- Small rural communities need funds and technical assistance in applying for Federal or state financial aid with such support provided on a timely basis.

- There appeared to be no permanent social or political changes taking place in the towns.

- Other than new schools and temporary residential development in the form of mobile home and trailer courts, there was little change in the permanent physical appearance of the towns.

- Nonlocal family size was slightly smaller than state average. Construction Worker Survey produced calculations of population influx that are useful for planning future projects and impact mitigation.

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Arthur A. Harnisch, Chief, Economic and Social Evaluation Section	Regional Economist
William R. Burton	Regional Economist
Margaret A. Hadaway	Sociologist
David R. Orcutt	Economist

APPENDIX A

CONSTRUCTION WORKER DATA

APPENDIX A - CONSTRUCTION WORKER DATA

Introduction

This appendix provides data on the methodology, distribution, and return rates of data cards, and keypunch coding, variable names, and value labels used in the survey conducted at Chief Joseph Dam, Washington.

Methodology

A brief survey data card (figure A-1) similar to one successfully used by another Federal agency was distributed with paychecks by contractors to their employees on 2 and 3 December 1977. The survey was designed to measure basic characteristics of construction workers, including the extent to which nonlocal workers (those who had not lived within the project area prior to employment on the project) were accompanied by their families.

Distribution of the work force between local and nonlocal workers, housing type and residential location, occupation, age, marital status, family size, and previous employment status of the work force were also examined. Workers were informed of the importance and future use of the data to be collected. Participation, however, was voluntary. The overall response rate of 82 percent was very good compared to most voluntary surveys. Cards were collected by the contractors and mailed to the Seattle District Office for coding and keypunching. Tabulations were carried out using the Statistical Package for the Social Sciences (SPSS). Data on survey distribution and return, as well as a list of keypunch codes, variable names, and value labels are presented in tables A-1 and A-2.

Comparison with Other Construction Worker Surveys

Recent research on construction worker populations carried out by Mountain West Research, Inc. (Tempe, Arizona), provides an interesting comparison with results achieved in the survey of Chief Joseph Dam construction workers. In December 1975, Mountain West published results of a comprehensive study carried out on 14 energy projects in seven western states. 1/ The study was made for the Old West Regional Commission. Total sample size was 3,168 workers. A survey similar to that carried out at Chief Joseph Dam was also conducted by Mountain West on 12 Bureau of Reclamation water resource

1/Construction Worker Profile, Final Report, prepared by Mountain West Research, Inc., for the Old West Regional Commission, Washington, D.C. (December 1975).

TABLE A-1

CONSTRUCTION WORKER SURVEY DATA CARD DISTRIBUTION AND RETURN

CHIEF JOSEPH DAM ADDITIONAL UNITS

Worker Group	Cards Distributed	Cards Returned	Response Rate
Corps of Engineers	69	61	88.4%
Contractor Personnel			
Contractor A	244	224	91.8
Contractor B	170	106	62.4
Contractor C	24	24	100.0
TOTAL CONTRACTOR	438	354	80.8
GRAND TOTAL	507	415	81.9%

1 WHAT IS YOUR OCCUPATION (job title)? _____

2 WHAT IS YOUR LOCAL PLACE OF RESIDENCE? _____ (town or place)

(NOTE Your local place of residence is the place from which you commute daily to your job and may not be your permanent address or the address at which your family is located).

3 IN WHAT KIND OF HOUSING UNIT DO YOU LIVE AT YOUR LOCAL PLACE OF RESIDENCE? (Circle One)
single family house | apartment or townhouse | mobile home | travel trailer or camper | sleeping room

4 a IS THIS WHERE YOU LIVED BEFORE YOU STARTED WORKING ON THIS PROJECT? (Circle One) YES NO

b IF NO, WHERE DID YOU LIVE PREVIOUSLY? _____ (town) _____ (state)

6 WHEN DID YOU FIRST START WORKING ON THIS PROJECT? _____ (month) _____ (year)

6 a DURING THE SIX WEEKS PRIOR TO THE TIME YOU BEGAN WORK ON THIS PROJECT WERE YOU UNEMPLOYED AT ANY TIME? (Circle One) YES NO

b IF YES, FOR ABOUT HOW MANY WORK DAYS WERE YOU UNEMPLOYED DURING THE SIX WEEK PERIOD? _____ days

7 WHAT IS YOUR AGE? _____ years

8 WHAT IS YOUR MARITAL STATUS? (Circle One) MARRIED SINGLE WIDOWED SEPARATED DIVORCED

IF YOU DO NOT HAVE A WIFE OR CHILDREN, PLEASE DO NOT ANSWER ANY FURTHER QUESTIONS THANK YOU

9 a IF YOU DO HAVE A WIFE AND/OR CHILDREN, DO THEY LIVE WITH YOU AT THE LOCAL PLACE OF RESIDENCE INDICATED IN QUESTION 2 ABOVE? (Circle One) YES NO

b IF NO, WHERE DO YOUR WIFE AND/OR CHILDREN LIVE? _____ (town) _____ (state)

10 HOW MANY CHILDREN AGE 18 OR UNDER DO YOU HAVE? _____ children

THANK YOU VERY MUCH FOR YOUR COOPERATION

P 1 2 3 4 5

FIGURE A-1. CONSTRUCTION WORKER SURVEY DATA CARD, CHIEF JOSEPH DAM ADDITIONAL UNITS.

TABLE A-2

CONSTRUCTION WORKER SURVEY KEYPUNCH CODE, VARIABLE AND VALUE IDENTIFICATION LIST

CHIEF JOSEPH DAM ADDITIONAL UNITS

Variable Number	Column Numbers	Question Number	Variable Description and Code
P	1-2		NAME OF EMPLOYER: 51 = Resident Engineer's Office 52 = Kiewit Standard 53 = Groves-Granite 54 = General Electric 55 = Other
1	4-5	1	RESPONDENT'S OCCUPATION: 1 = Supervisor, Superintendent 2 = Foreman 3 = Engineer 4 = Surveyor 5 = Ironworker, Rod Bender, Rod Buster 6 = Cement Mason, Cement Finisher 7 = Millwright 8 = Boilermaker 9 = Pipefitter, Steamfitter 10 = Electrician 11 = Painter 12 = Carpenter 13 = Plumber 14 = Mechanic 15 = Sheet Metal Worker 16 = Bricklayer 17 = Welder, Mechanic-Welder 18 = Laborer, Rigger 19 = Helper 20 = Winterization 21 = Operative, Operating Engineer 22 = Oiler 23 = Teamster, Truckdriver 24 = Warehouseman, Teamster-Warehouseman 25 = Safety, First Aid 26 = Office Personnel - Assistant to Resident Engineer, Administrative Officer, Clerk, Typist, Secretary, Stenographer, Dictating Machine Transcriber

TABLE A-2 (con.)

Variable Number	Column Numbers	Question Number	Variable Description and Code
			27 = Other - Refrigeration Operator, Vibrator, Sawman, Construction Inspection (including Construction Representative), Engineering Technician (including Engineering Aid), Metals Technicians, Army Personnel, Geologist.
			28 = Heavy Equipment
			29 = Driller
			30 = Miner
			98 = No Response
2	7-9	2	RESPONDENT'S LOCAL ADDRESS, ALL PROJECTS:
			750 = Brewster
			751 = Bridgeport
			752 = Bridgeport Bar
			753 = Chelan
			754 = City of Coulee Dam
			755 = Coulee City
			756 = Electric City
			757 = Entiat
			758 = Ephrata
			759 = Grand Coulee
			760 = Mansfield
			761 = Okanogan
			762 = Omak
			763 = Pateros
			764 = Soap Lake
			765 = Tonasket
			766 = Twisp
			767 = Wilbur
			768 = Inside 50 Miles
			769 = Outside 50 Miles But Within Washington State
			998 = No Response
3	11	3	RESPONDENT'S HOUSING:
			1 = Single Family House
			2 = Apartment or Townhouse
			3 = Mobile Home
			4 = Travel Trailer or Camper
			5 = Sleeping Room
			9 = No Response

TABLE A-2 (con.)

Variable Number	Column Numbers	Question Number	Variable Description and Code
4	13-15	4	RESPONDENT'S PREVIOUS ADDRESS: 998 = No Response 999 = Same as local address; i.e., local resident. Previous address coded same as variable No. 2. See list for variable No. 2, then continue with: 770 = Seattle-Tacoma-Everett Area 771 = Spokane Area 772 = Wenatchee 773 = Tri-Cities 774 = Walla Walla 775 = Montana 776 = Idaho 777 = Oregon 778 = California 779 = Alaska 780 = Wyoming 781 = Other State 782 = Other Country
5	17-19	5	NUMBER OF MONTHS RESPONDENT HAS BEEN ON JOB (Codes are actual number of months on job; i.e.,:) 1 = December 1977 2 = November 1977 3 = October 1977 4 = September 1977 5 = August 1977 6 = July 1977 7 = June 1977 8 = May 1977 9 = April 1977 10 = March 1977 11 = February 1977 12 = January 1977 13 = December 1976 14 = November 1976 15 = October 1976 16 = September 1976 17 = August 1976 18 = July 1976 19 = June 1976 20 = May 1976 21 = April 1976

TABLE A-2 (con.)

Variable Number	Column Numbers	Question Number	Variable Description and Code
5	17-19	5	NUMBER OF MONTHS RESPONDENT HAS BEEN ON JOB (con.): 22 = March 1976 23 = February 1976 24 = January 1976 25 = December 1975 26 = November 1975 27 = October 1975 28 = September 1975 29 = August 1975 30 = July 1975 31 = June 1975 32 = May 1975 33 = April 1975 34 = March 1975 35 = February 1975 36 = January 1975 37 = December 1974 38 = November 1974 39 = October 1974 40 = September 1974 41 = August 1974 42 = July 1974 43 = June 1974 44 = May 1974 45 = April 1974 46 = March 1974 47 = February 1974 48 = January 1974 49 = December 1973 50 = November 1973 51 = October 1973 52 = September 1973 53 = August 1973 54 = July 1973 55 = June 1973 56 = May 1973 57 = April 1973 58 = March 1973 59 = February 1973 60 = January 1973 998 = No Response

TABLE A-2 (con.)

Variable Number	Column Numbers	Question Number	Variable Description and Code
6	21	6A	RESPONDENT'S EMPLOYMENT STATUS JUST PRIOR TO STARTING PRESENT JOB: 1 = Unemployed 0 = Employed 9 = No Response
7	22-23	6B	NUMBER OF DAYS UNEMPLOYED IN THE 6-WEEK PERIOD PRIOR TO STARTING PRESENT JOB (maximum = 36 days) (codes are actual number of days): 98 = No Response
8	25-26	7	RESPONDENT'S AGE (codes are actual age): 98 = No Response
9	28	8	RESPONDENT'S MARITAL STATUS: 1 = Married 2 = Single 3 = Widowed 4 = Separated 5 = Divorced 9 = No Response
10	30-32	9	RESPONDENT'S FAMILY'S ADDRESS: 998 = No Response 999 = Lives With Respondent (If family does not live with respondent, coded same as questions Nos. 2 and 4.)
11	34-35	10	NUMBER OF CHILDREN AGE 18 OR UNDER IN RESPONDENT'S FAMILY (codes are actual number of children): 98 = No Response
12	50-51-52		CARD IDENTIFICATION (codes are 1 through N): N = Number of Respondents per Employer

projects in October 1977.[1/] Total sample size was 693 workers. Results of these studies are compared with Chief Joseph Dam survey results in table A-3. Three significant differences in the results were readily apparent.

The first is the high response rate achieved in the Chief Joseph survey, about 30 percent greater than either Mountain West survey. This is probably due to the fact that the Chief Joseph survey covered only one project with few contractors while the Mountain West surveys covered several projects with many contractors in different states. A large survey area and large number of contractors make data more difficult to collect.

The second difference is that since the Chief Joseph survey covered one sizeable project, trends obtained were probably more reliable than if the sample size had been as small as many of the projects surveyed by Mountain West. Only five of those projects surveyed were larger than or equal to the Chief Joseph project in number of cards distributed. The highest response rate obtained among these five was 64 percent.

The third significant difference is in the larger percentage of local labor found at Chief Joseph. The project apparently utilized the sizeable pool of skilled labor already in the project area, much of which was surplus from completed work on Grand Coulee Dam. The majority of the work forces surveyed by Mountain West were made up of nonlocal labor. Analysis of the determinants of local/nonlocal composition of the work force was carried out by Mountain West, but the data did not support any meaningful conclusions.

In general, however, the results of the three surveys are remarkably similar. With a few exceptions, the data obtained on personal distribution, marital status, average family size, number of nonlocal married workers with family present, population influx per 100 nonlocal workers, housing distribution, and prior employment status all exhibit trends important to the development of a construction worker profile.

1/Construction Worker Survey, Final Report, prepared by Mountain West Research, Inc., for the U.S. Bureau of Reclamation, Denver, Colorado (October 1977).

Harnisch, Arthur A.
Chief Joseph Dam, Columbia River, Washington ; Community impact report update III : conditions at peak impact / by Arthur A. Harnisch. -- Ft. Belvoir, Va. : U.S. Army Engineer Institute for Water Resources ; Springfield, Va. : available from National Technical Information Service, 1978.

50p. : ill. (IWR contract report ; 78-R2)

Appendix (p. A1-A9): Construction worker data.

1. Dams - Social aspects - Washington (State). 2. Community development. 3. Chief Joseph Dam. I. United States. Army. Corps of Engineers. Seattle District. II. Title. III. Series: United States. Institute for Water Resources : IWR Contract report ; 78-R2.

HD1694 .A42U584 no. 78-R2

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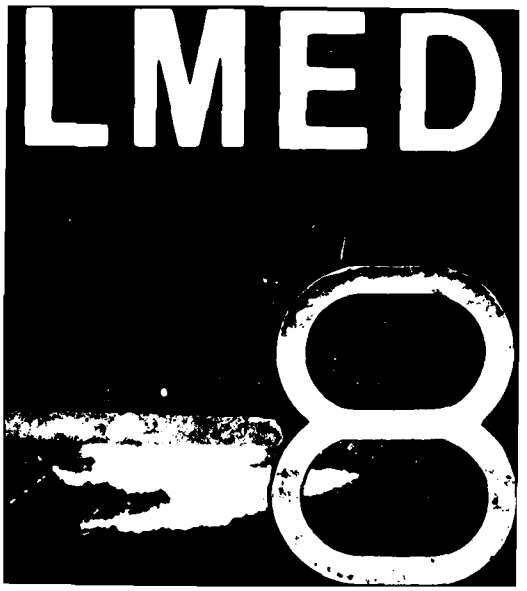
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