NORTHWESTERN TERRITORIES, INC.

Engineers ■ Land Surveyors ■ Planners
Construction Coordination ■ Materials Testing

MASTER WATER PLAN FOR THE PROPOSED BEAVER WATER SYSTEM

Beaver, Washington

Prepared For

WASHINGTON WATER SUPPLY

Prepared By

NORTHWESTERN TERRITORIES, INC.

September 1993

717 SOUTH PEABODY, PORT ANGELES, WA 98362 (206) 452-8491 1-800-654-5545 FAX 452-8498

AN INDEPENDENTLY OWNED AFFILIATE OF BECKER INVESTIGATIVE ENGINEERING CORP.

RECEIVED
'93 NOV 15 A11:23
DEPARTMENT OF LAW
S.W. REGIONAL OFF

11/10/93

Hi Marie

This is the info. on the Beaver Water system I have. I hope you will contact homeowners in the area regarding their wells as Sally says she is very busy.

Thank you,
Theresa Santman
327-3599

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MASTER WATER PLAN FOR THE PROPOSED BEAVER WATER SYSTEM

I. DESCRIPTION OF PROPOSED WATER SYSTEM

GENERAL

The proposed Beaver Water System is located in Beaver, Washington, near Lake Pleasant, in western Clallam County. (See Figure 1.) The project will be constructed in phases as the demand for water service increases.

The purpose of this Master Plan is to outline the proposed improvements required to construct a public water system located in Beaver, Washington. The report presents conceptual design, recommended construction phasing, alternatives and the associated cost estimates. The Master Plan will also provide a basis for review by the Washington State Department of Health, Clallam County Environmental Health Division, and local residents.

PROPOSED SERVICE AREA

The proposed water system is ultimately planned to serve the consumers in the Lake Pleasant area. This will ultimately include portions of Sections 25, 26, 27, and 34, 35, and 36, Township 30 North, Range 13 West, W.M., and portions of Sections 30 and 31, Township 30 North, Range 12 West, W.M., all in Clallam County, Washington. (See Figure 1.)

Topography within the proposed service area consists of rolling hills with elevations ranging between 400 and 500 feet. The elevation of Lake Pleasant is approximately 390 feet. The western service area is primarily at elevations of 400 to 450 feet, while the eastern service area, near East Lake Pleasant Road is at elevation 500. To the north of Lake Pleasant, a steep hill rises to elevations of more than 1,200 feet.

The land use zoning adjacent to Lake Pleasant is primarily residential with areas of forestry and industrial use. Outlying areas are primarily commercial forestry use. The residential zoning includes C4, QR1 and RR2. C4 allows one home per 9,000 square feet; QR1 allows one home per 1/2 acre; and RR2 allows one home per 2.4 acres. (See Figure 2.)

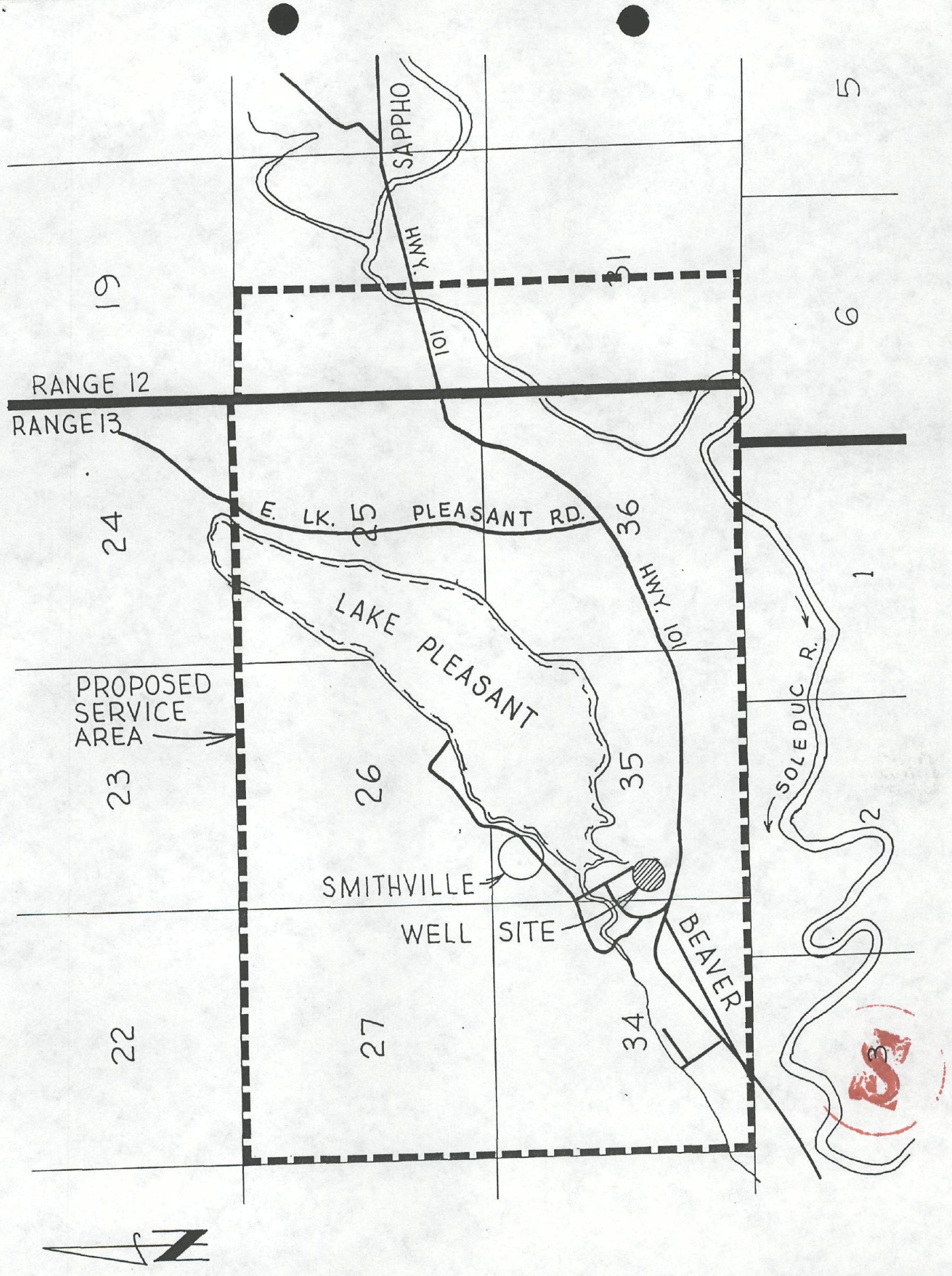

FIGURE 1 VICINITY MAP & SERVICE AREA MAP

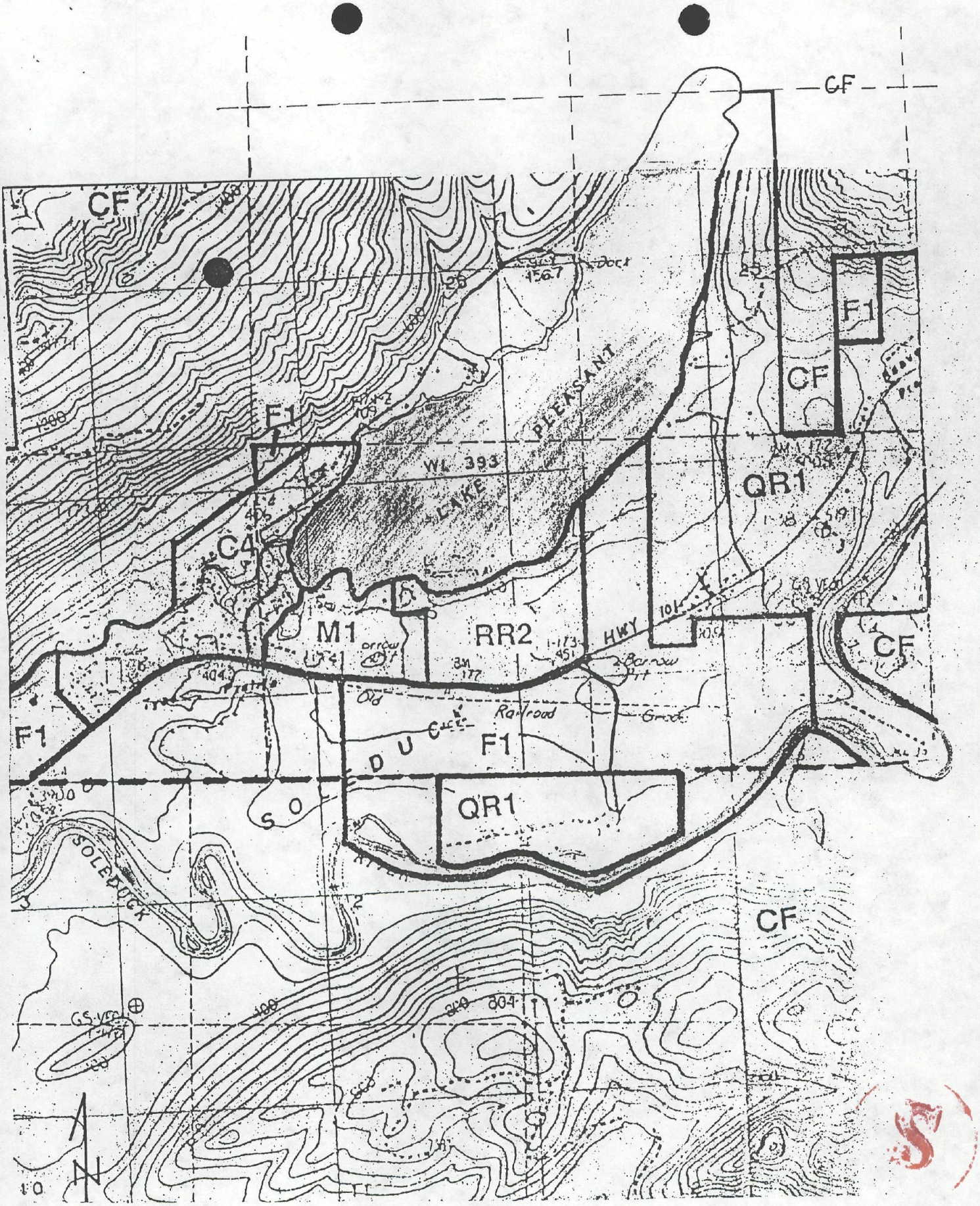

FIGURE 2 LAND USE MAP

EXISTING WATER SYSTEMS

At least two small water systems exist within the proposed service area. The Smithville Water System serves the former Lake Pleasant Resort, and a small system serves approximately 15 homes in the East Lake Pleasant Road area. Both systems have source limitations, especially in late summer and drought years. Several individual water systems with wells or surface water sources also exist within the proposed service area with questionable water quality. A shingle mill with an individual well is also within the proposed service area.

SUMMARY OF PROPOSED WATER SYSTEM

Existing facilities consist of an existing well drilled in October of 1992 in the Northwest Quarter of the Southwest Quarter of Section 35. (See Figure 3 for location.) Additionally, a waterline is currently being installed across Lake Creek on the new County bridge that is under construction. It is anticipated that the waterline will be connected to the well as the system develops.

The existing well was drilled by Louie's Well Drilling of Sequim. The well is 178 feet deep and the estimated yield is 50 to 60 gallons per minute. (See Appendix B for well log.) The well is scheduled to be pumped and tested in the winter of 1993. An application for water rights was submitted in March of 1993. (See Appendix C.) The application requested a water right in the amount of 100 gpm. In addition, the application requested that a temporary permit be issued for the testing of the well and supply to the Smithville area to serve the former Lake Pleasant Resort. The Smithville system has a history of poor water availability and quality. This has been documented by the Clallam County Environmental Health Division. The proposed Beaver Water System would provide a safe drinking water source.

The proposed water system will be constructed in phases. In the first phase, the existing well will receive a temporary water right permit and then be pump tested and developed to provide source capacity for a small pressure system installed to serve sixteen connections. It may be possible for this work to be carried out at the same time as the water right application is being processed. Typically, a water right takes two years to reach the permit stage.

After a water right has been secured and an adequate number of customers committed, the second phase can begin. Several alternatives have been studied to determine the most feasible system over the long run. Each of these alternatives could, in turn, be constructed in phases as consumer needs develop. A list of some alternatives is given below and each is described in detail in the Improvements Section.

Alt. 1 Pump to a high level reservoir, capable of providing adequate pressure to the entire service area.

Alt. 2 Pump to a mid-level reservoir, capable of providing adequate pressure to the western service area, but requiring a booster pump system to provide adequate pressure to the East Lake Pleasant Road area.

Alt. 3 Pump to a low level reservoir and provide pressure to the system with a booster pump system.

We recommend that the reservoir be constructed of reinforced concrete. Concrete reservoirs require very little maintenance and cost about the same as other types of tanks.

WATER SYSTEM OWNERSHIP AND OPERATION

The proposed water system will be privately owned and operated by Washington Water Supply, Inc. Washington Water Supply employs several certified water system managers and is regulated by the Washington State Utilities and Transportation Commission. The contact person at Washington Water Supply is John Poppe, 12608 East Marginal Way South, Seattle, WA 98168, phone (206) 439-0344.

II. SYSTEM ANALYSIS

DESIGN CRITERIA

Each phase of the proposed water system will be designed in accordance with the Washington State Department of Health Sizing Guidelines. This standard has guidelines for source, storage and pumping requirements. In addition, fire flow should be provided according to the Clallam County Fire Flow Policy. This policy requires 1,000 gpm for 30 minutes for residential systems.

Construction standards shall meet the requirements of the American Public Works Association (APWA), as well as the Washington State Department of Health (WSDOH).

PRELIMINARY CALCULATIONS

Minimum Source Required:

16 Connections
16 conn. X 800 gpd/conn. = 12,800 gpd = 8.9 gpm

99 Connections
99 conn. X 800 gpd/conn. = 79,200 gpd = 55 gpm

Minimum Standby & Equalization Storage Required:

16 Connections, one 60 gpm source
16 conn. X 600 gpd/conn. + (45 gpm - 60 gpm) X 150 min = 9,600 gal.

16 Connections, two 50 gpm source
(16 conn. X 600 gpd/conn. - 50 gpm X 1,440 min/day) + (45 gpm - 100 gpm) X 150 min. = 0 gallons

99 Connections, one 60 gpm source
99 conn. X 600 gpd/conn. + (152 gpm - 60 gpm) X 150 min = 73,200 gallons

99 Connections, two 50 gpm sources
(99 conn. X 600 gpd/conn. 50 gpm X 1440 min/day) + (152 gpm - 100 gpm) X 150 min = 7,800 gallons

Fireflow Storage Required:

1,000 gpm X 30 min. = 30,000 gallons

III. IMPROVEMENTS

PUMP TESTING OF EXISTING WELL

We recommend that the existing well be pump tested at a rate of 30 gpm for about 2 hours or until stabilization occurs. This will provide pumping level data at lower flows. After stabilization occurs, the pump test will be stepped up to 50 to 60 gpm and pumped at this rate for an additional 24 hours. The Department of Ecology's guidelines must be followed throughout the pump test. This includes monitoring of neighboring wells and sampling for bacteriological, inorganic chemical, VOC and radionuclide analysis.

If the water quality is satisfactory, no treatment will be necessary. Some wells in the area have high iron content. However, until testing is performed, we cannot determine if treatment will be necessary.

PHASE I - 16 CONNECTIONS

All systems with over 9 connections must either provide standby storage or provide a second source of adequate supply. Systems with 9 or less connections do not require any standby storage under Department of Health rules.

After the pump test has been completed, a small pressure system could be developed to serve 10 connections for the Smithville area plus 6 extra connections for a total of 16 connections. This system would include development of a source(s), installation of pressure tank(s), water mains, and storage if required. Reservoir storage would be required if only the one well is used. However, it would be possible to eliminate the need for storage if a second well was drilled with adequate capacity.

The State Department of Health requires standby storage in the amount of 600 gallons per day per connection for systems with a single source for 10 to 99 connections. For 16 connections, this amounts to 9,600 gallons for standby storage alone. The Maximum Instantaneous Demand (MID) for 16 connections is 45 gpm. If a 45 gpm pump is installed, no equalization storage will be required, and the total storage required would be 9,600 gallons. If a smaller pump is installed, some additional equalization storage must be added.

For systems with multiple sources and 10 to 99 connections, the standby storage may be reduced depending upon the production of the well with the smallest pumping rate. If a second well were drilled, and a pump installed with a capacity of at least 10 gpm, no standby storage would be required. No equalization storage would be required if the combined capacity of the two well pumps was at least 45 gpm. We recommend that a second well be drilled to avoid building a 9,600 gallon reservoir during Phase I. The second well would also significantly reduce the amount reservoir storage required in Phase II.

A new water main would need to be constructed from the well to the proposed services. This water main should be 8 to 12 inches in diameter to provide the capacity for future phases and upgrades. In addition, a parallel 3-inch line should be installed for a reservoir feed line. The reservoir feed line allows water to be piped into the top of the reservoir, allowing circulation of the water. See Figure 3 for approximate location of proposed water-lines.

The estimated cost for Phase I construction is $137,000. (See Cost Estimates in Appendix A.)

PHASE II - 99 CONNECTIONS

The proposed water system is ultimately planned for a total of 99 connections. This should be adequate to serve the service area for many years. With 99 connections, standby storage requirements are less than for systems with 100 or more connections.

To serve 99 connections, it is recommended that two 50 gpm sources be developed. The second source could be developed during Phase I as described above. The second source will greatly reduce the standby storage and improve the reliability of the system. A 99 connection system with two 50 gpm well sources would not require any standby storage. However, 8,700 gallons would be required for equalization storage in addition to 30,000 gallons for fire flow storage for a total of 38,700 gallons.

A single 60 gpm source would require standby storage of 59,400 gallons, equalization storage of 14,700 gallons and fire flow storage of 30,000 gallons for a total of 104,100 gallons. This illustrates the advantage of multiple sources. Sixty gpm is about the maximum capacity of any 4-inch submersible pump operating at about 350 feet of head.

Several alternatives are possible to serve the large area that is proposed. Three alternatives were studied for a 99 connection system at Beaver and are described below.

Alternate 1 - High Level Reservoir

This alternative provides the simplest operation for the system, but involves construction of a reservoir on a relatively steep site. It is assumed that two 50 gpm sources will be available, thus requiring a 40,000 gallon reservoir. To serve the entire service area, the reservoir crest must be located at about elevation 600 feet. Pressures within the system would vary between 40 psi at East Lake Pleasant Road and 80 psi near the Lake.

The East Lake Pleasant Road area is located about 2 miles from the proposed reservoir site on Tyee Hill. To provide service to this area from one high level reservoir would require a significant amount of 8 to 12-inch water main. Full fire flow may not be available in the east service area under Alternate 1 due to excessive head loss in the 2 miles of pipe. However, at least 500 gpm would be available.

Although this alternative is simplest, it does require construction of a reservoir on steep terrain. A detailed reconnaissance of the proposed reservoir site should be performed before any one of the alternatives is selected. This information will help determine how difficult it will be to build a road to the site and excavate for the reservoir. The road will need to be accessible for concrete trucks.

The reservoir site could possibly be constructed on land managed by Eldon Officer of Smithville. As we understand it, Mr. Officer is in the process of purchasing the land from Mr. Merl Watson. It will be necessary to come to an agreement with the owner of the property for a reservoir and waterline easement. The reservoir easement should be 50 to 60 feet square, and the waterline easements should be about 20 feet wide. Easements, road crossings, and right of way permits will also be required for the remaining waterline.

The estimated construction costs for Alternate 1 are $250,100.

Alternative 2 - Mid-Level Reservoir with Booster Pump Station

This alternative allows the reservoir to be constructed lower on the hill on ground that is less steep, but will not provide adequate pressure to the eastern service area. The reservoir crest should be located at about elevation 550 feet. A booster system station would be required to serve the homes in the area of East Lake Pleasant Road. This would involve at least two booster pumps and a pressure tank located within a tank house. It would be difficult to provide the 1,000 gpm fire flow with the booster pump station.

This alternative could also be phased in. Alternative 2A could include the reservoir on Tyee Hill, 8-inch water mains, and the booster pump station for the eastern service area. Alternative 2B could include a second tank on Beaver Hill located at about elevation 600 feet and distribution piping. The Alternative 2A booster system could then pump directly to this tank which would provide service to the East Lake Pleasant Road area. (See Figure 3). This Alternative would provide fireflow to the entire service area.

The estimated cost for Alternative 2 is $363,500.

Alternative 3 - Low Level Reservoir with Booster Pump Station

This alternative involves construction of a 40,000 gallon ground level reservoir with booster pump station and a large pressure tank(s) near the existing well. (See Figure 3.) The advantages to this alternative are reduced amount of watermain and the ease of access to reservoir site.

The disadvantages include reliance on electrical power and pumps, added costs for booster pumps and large pressure tanks, increased maintenance, and excessive costs to provide fireflow. One thousand gpm fire flow would be difficult to provide to the entire service area under this scenario. It may also be necessary to install an emergency generator to provide power to the pumps during outages.

Due to the frequent power outages in the Beaver area, this alternative should be chosen only if a high level reservoir site cannot be securred.

Estimated cost of construction for Alternative 3 is $216,000.

IV. COSTS OF IMPROVEMENTS

Phase I Preliminary Cost Estimate

Item	Description	Unit	Unit Cost	Qty	Total
1.	LAND	LS		1	12 000
2.	WELL CONSTRUCTION	LS	6600	2	13 200
3.	WELL PUMP TESTING	LS	1000	2	2 000
4.	WATER QUALITY TESTING	LS	500	2	1 000
5.	WELL PUMP & CONTROLS	LS	2500	2	5 000
6.	PUMP HOUSE	LS	3000	1	3 000
7.	PUMP HOUSE PIPING	LS	500	1	500
8.	PRESSURE TANK	LS	10,000	1	10 000
9.	SINGLE PHASE POWER	LS	2 500	1	2 500
10.	10" DISTRIBUTION PIPE	LF	$ 12	2200	26 400
11.	3" TRANSMISSION PIPE	LF	$ 5	1800	9 000
12.	BRIDGE CROSSING	LS	5000	5000	5 000
13.	SERVICE CONNECTIONS	LS	450	16	7 200
			SUBTOTAL		96 800
			TAX @ 7.8%		7 500
			15% CONTINGENCY		15 700
			PRELIMINARY ENGINEERING		4 000
			PHASE I ENGINEERING		3 000
			WWS ADMINISTRATION		10,000
			GRAND TOTAL		$ 137,000

Phase II Preliminary Cost Estimate

Alternative Number 1

Item	Description	Unit	Unit Cost	Qty	Total
1	Reservoir site access & road	LS	5000	1	5 000
2	40,000 gallon Reservoir	LS	40,000	1	40 000
3	Reservoir Piping	LS	2000	1	2 000
4	3" TRANSMISSION PIPE	LF	$5	1600	8 000
5	10" DISTRIBUTION PIPE	LF	$12	9500	114 000
6	Service Connections	EA.	450	20	9 000
7.	EASEMENTS AS REQ'D.	LS	10000	—	10 000
			SUB TOTAL		188 000
			TAX @ 7.8%		14 700
			15% CONTINGENCY		30 400
			PHASE II ENGINEERING		12 000
			WWS ADMINISTRATION		5 000
			GRAND TOTAL		250,100

Phase II Preliminary Cost Estimate

Alternative Number 3

Item	Description	Unit	Unit Cost	Qty	Total
1.	40,000 gallon Ground Level Reservoir	LS	30,000	1	30,000
2.	Reservoir Piping	LS	2000	1	2000
3	3" TRANSMISSION PIPE	LF	$5	100	500
4.	10" DISTRIBUTION PIPE	LF	$12	8000	96 000
5.	PUMP STATION STRUCTURE	LS	4000	1	4 000
6.	BOOSTER SERVICE PUMPS	EA	2500	3	7500
7.	THREE PHASE POWER	LS	3000	1	3000
8.	PRESSURE TANK	LS	SALVAGE FROM PHASE I		
9.	Service Connections	Ea	450	20	9 000
10.	Easements as req'd.	LS	10,000	-	10 000
11.	FIRE PUMP(S)	LS	5000		5 000
12.	DIESEL GENERATOR	LS	4000		4 000
			SUBTOTAL		171 000
			TAX @ 7.8%		13300
			15% CONTINGENCY		27 700
			PHASE II ENGINEERING		12 000
			WWS ADMINISTRATION		5000
			GRAND TOTAL		229,000

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 204000
Water Right Permit No.

(1) OWNER: Name POPPE JOHN Address LAKE PLEASANT & 101 BEAVER, WA 98305-

(2) LOCATION OF WELL: County CLALLAM - NW 1/4 SW 1/4 Sec 35 T 30 N., R 13 WM
(2a) STREET ADDRESS OF WELL (or nearest address) SAME

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 180 ft. Depth of completed well 178 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 01 ft. to 168 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: YES
Manufacturer's Name COOK
Type SLOTTED Model No.
Diam. 5 slot size 25 from 168 ft. to 178 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off NONE

(7) PUMP: Manufacturer's Name
Type NONE H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 111 ft. below top of well Date 10/15/92
Artesian Pressure lbs. per square inch Date
Artesian water controlled by NOT ARTESIAN

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 60 gal/min. w/ stem set at 100 ft. for 1+ hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

MATERIAL	FROM	TO
TOPSOIL	0	2
BROWN CLAY AND GRAVEL	2	24
BROWN SAND&GRAV	24	119
BROWN SAND&GRAV WATER BEARING	119	162
GRAY CLAY	162	165
GRAY SAND AND GRAVEL WATER BEARING	165	178
GRAY CLAY	178	

Work started 10/14/92 Completed 10/15/92

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME LOUIE'S WELL DRILLING,INC
(Person, firm, or corporation) (Type or print)

ADDRESS 363 S BARR RD PORTANGELES

[SIGNED] Bob Gillis License No. 0868

Contractor's
Registration No. LOUIEWD137PW Date 10/16/92

approx.