City of Bandon Coos County, Oregon

WATER MANAGEMENT AND CONSERVATION PLAN

OCTOBER 2003





The Dyer Partnership Engineers & Planners, Inc.

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Water Management and Conservation Plan

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1.1 Brief Community Description

Bandon is a small, seaside community on the Southern Oregon Coast. A scenic coastal setting overlooking the Pacific Ocean and Coquille River mouth make it a popular tourist destination. It has a temperate climate and is in close proximity to state parks, rivers, lakes and forests. The City's economic base includes motels, resorts, restaurants and gift shops. The Port of Bandon and associated fishery industries also provide an important economic base. Bandon has a substantial base of retired population. Its summer population swells with summer residents. Bandon is located on at the junction of Highway 101 and 42S. It is 22 miles south of Coos Bay and 84 miles west of Roseburg on Highway 42 and 42S.

Fish processing, part time residential population increases and tourist activities during the summer portion of the year increase water demand. Surrounding Bandon, is a large cranberry growing industry dating from the 1920's. The cranberry farmers also require a great deal of water during the summer. Unfortunately, this time period corresponds with seasonal low flow conditions in Bandon's only current water sources, Geiger Creek and Ferry Creek which also must supply water to numerous cranberry growers.

Bandon's attractiveness has caused a steady increase in population regardless of State or National economic conditions. Therefore, within the next 20 years, as documented by the Water Master Plan Update, Bandon may begin to experience water shortages if no action is taken.

1.2 Purpose of WMCP and Basis in Division 86

This is the first Water Management and Conservation Plan developed for the City of Bandon. A progress report is anticipated to be submitted to the Oregon Water Resources Department (WRD) within five years (by 2008). The report will include a description of Bandon's progress toward implementing water conservation measures and other actions called for in this plan.

The water management and conservation plan (WMCP) is developed by a water supplier. The plan describes the water system and its long term needs, identifies its sources of water and explains how the water supplier will manage and conserve those supplies to meet present and future needs.

The requirements for completing these plans are tied to the revised rules surrounding water permit extensions as described under OAR 690-315 which apply to all suppliers serving over 1,000 persons to complete a WMCP in association with water permit extensions. OAR 690-086 details the requirement of WMCP's.

Oregon municipal water suppliers are permitted to "grow into" their water rights over a long period of time. Previously, the Oregon Water Resources Department issued five year permit extensions until such time as a community perfected a particular right and a certificate of water

right was issued. The rules have been updated and eliminate the five year permit renewing extensions. Water right extension will now require that the supplier prepare a WMCP which will allow the extension to be made for as long as a 50 year period. However the supplier will be required to gain WRD approval for any expansion of the use of water under an extended permit based on demonstration of the need in the next 20 years. That is, a portion of the water right known as "green light" water. Additional use of water beyond this amount will require a WMCP update.

Water conservation is viewed as a critical element in the State's water supply inventory. Conservation actions must be considered as an alternative to increased development of water.. All water suppliers must implement a core group of water conservation measures.

1.3 Previous Studies and Information

The following studies, reports and other sources of information have been used in the compilation of the Water Management and Conservation Plan.

- City of Bandon Water Master Plan Update, 2003, The Dyer Partnership.
- City of Bandon 1991 Comprehensive Plan, (with Amendments re: Public Facilities)
- Comprehensive Water System Master Plan, December 1992, HGE Engineers and Planners
- Coos County Water Management Plan, 1990, CH₂M Hill
- Ferry Creek Project Evaluation Under PL84-984, April 1990, Tucson Myers & Associates
- South Bandon Refinement Plan, Infrastructure Element, June 1997, Dyer Partnership, Inc.
- Wastewater System Master Plan, June 2002, Dyer Partnership, Inc.
- Bandon Water System Improvements Construction Drawings, November 1998, Lee Engineering, Inc.
- Municipal Water Management In Oregon Coastal Communities: Surmounting the "Conservation Paradox", September 2000, Coastal Oregon Marine Experiment Station Oregon State University.
- Seawater Desalination in California, October 1993, California Coastal Commission, Susan E. Pantell, Principal Author.
- Bandon Water System Improvements Construction Drawings, November 1998, Lee Engineering, Inc.
- Department of Environmental Quality. May 2000. Source Water Assessment Report: City of Bandon. PWS 4100074.

- Department of Environmental Quality. May 2000. Source Water Assessment Brochure: 2/14/03 City of Bandon. PWS 500074
- DEQ Water Sampling Project, Project Number: OR-98-09.5-319 DEQ Contract No. :096-011/2/03, City of Bandon Water Resource Committee
- Source Water Protection Plan, September 17, 2003, City of Bandon Water Resource Committee
- Water Meter and Billing records from 1998 to 2003.
- Water Plant Records from 1998 to 2003.
- Annual Water Use Records for Geiger and Ferry Creeks 1998 to 2003.

1.4 Organization of this Document

This document complies with the requirements for development of a Water Management and Conversation Plan. This plan contains four main elements as required by the referenced ORS sections:

- Chapter 2 ORS 690-086-0140 Municipal Water Supplier Description
- Chapter 3 ORS 690-086-0150 Municipal Water Conservation Element.
- Chapter 4 ORS 690-086-0160 Municipal Water Curtailment Element
- Chapter 5 ORS 690-086-0170 Municipal Water Supply Element.

Within each chapter subsection, the specific reporting requirements under the statue are first referenced in italics. The remainder of chapter subsection provides the required information.

1.5 Authorization

The City of Bandon contracted with The Dyer Partnership, Engineers & Planners, Inc. on January 1, 2003 to prepare this <u>Water Management and Conservation Plan</u> in conjunction with the <u>Water Master Plan Update</u>. Included in the contract was a Scope of Engineering Services on which this Plan is based.

1.6 Acknowledgments

This plan is the result of contribution made by a number of individuals and agencies. We wish to acknowledge the efforts of Matt Winkel, City Manager: Richard Anderson, Public Works Director; Gene Davidson, Water Treatment Plant Supervisor; Jason Locke, Community Development Director, Lanny Boston, Fire Chief; Beverly Lanier, Administrative Assistant and the staff of the City of Bandon.

We also wish to thank the members of the Water Resources Committee for their guidance, fact review and editing assistance during the preparation of this report: The members are: Larry Roberts, Chairman; James Shivley, Vice Chairman; and committee members: Zita Ingham, Tim Arnold, Carol Doty, David Kauffman, Michael Scalici, Wayne Scherer, Patricia Soltys and Scott Vierck.



Municipal Water Suppliers Description

Municipal Water Supplier Description



(OAR 690-86-140)

2.1 Supplier's Source

Requirement: A description of the supplier's source(s) of water; including diversion, storage and regulation facilities; exchange agreements; intergovernmental cooperation agreements; and water supply or delivery contracts;

The City of Bandon normally provides water to its service area by withdrawal from diversion points located at both the Geiger Creek reservoir and the Ferry Creek reservoir. Ferry Creek basin has an area of 1130 acres (1.75 square miles) above its diversion point. Geiger Creek basin has an area of 1290 acres (2.0 square miles) above its impoundment diversion point.

The City has held water right permits for the impoundments and diversion since 1961. The water surface elevation of the Ferry Creek impoundment is approximately 65 ft and for the Geiger Creek impoundment is about 60 ft. The reservoir permits do not convey storage rights to the City. This means that the City may not exceed its water rights withdrawal rates from stored volume, nor withhold water from downstream users in excess of its actual usage or withdraw in amounts which do not allow passage of water to senior water rights. Both impoundment locations are just above the natural confluence of the two creeks and the site is jointly occupied by the Bandon Fish Hatchery. Withdrawal of water from the impoundments is operated in cooperation with the Hatchery through an interconnected withdrawal piping system supplying both the hatchery and the city. The inlets to both water supply withdrawal locations are at the inside toe of the respective dams. The City also holds a senior water right located on Geiger Creek upstream of the impoundment with a priority date of 1916, but has no piping from the permitted diversion location. In April, 2000, a water right transfer was issued by the Water Resources Department for Bandon, which allows the City to use an alternative withdrawal location downstream of the Ferry and Geiger Creek confluence for all three water permits. including the upstream Geiger Creek water right. This change was partially made to allow withdrawal of the Hatchery's required water prior to the City's withdrawal during low flow periods. The hatchery use is non-consumptive and is therefore available to the City after use by the hatchery, thereby avoiding conflict with the hatchery's more senior water right. Pumping from this withdrawal location is only performed during low flow periods. Both impoundments have a combined storage volume of 2.5 million gallons, in the absence of siltation. Ferry Creek impoundment was restored to near its original volume in 2000 by dredging. Geiger Creek impoundment is reported to have partial siltation, but due to steep terrain on either side of the pond, does lend itself to dredging for silt removal. Measurement of flows is accomplished by using readings from the Bandon Water Treatment Plant for raw water withdrawal. The fish hatchery and the Bandon Water Plant assume that 25% of the withdrawal is from Geiger Creek and 75% is from Ferry Creek. The withdrawal piping is interconnected with the hatchery raw water feed piping and is maintained, operated and recorded by Bandon Fish Hatchery personnel.

A pump station with a floor elevation of 51.8 ft has suction piping connected to the impoundment water withdrawal piping system. This pump facility is called the "Lower Pump Station" and transmits raw source water to a third impoundment called the "Middle Pond". This impoundment is identified on U.S.G.S. maps as "Bandon Reservoir". It has a surface elevation of about 124 ft and is located 590 ft northeast of the lower pump station and about 800 feet southwest from the City's water treatment plant. Adjacent to the Middle Pond is the Middle Pump Station with a floor elevation of 128.8 ft. Raw water is pumped from the middle pond to the Clarifier unit at the water treatment plant with a surface elevation of 188.0 ft. An aerial photo is included as Figure 2.1.1 which shows the water treatment plant site, middle pond, Fish Hatchery and the Ferry Creek and Geiger Creek Reservoirs.

The middle pond is a valuable component of the Bandon water supply system. It allows for some gravity settlement of the raw water prior to treatment. More significantly, backwash and drainage water from operations at the water plant is drained into the middle pond (after settlement in the plant's backwash ponds located at the water plant site). This avoids the loss of backwash and plant drainage water which normally occurs at most treatment plants and is particularly important during source low flow periods .

2.2 Service Area and Population

Requirement: A delineation of the current service areas and an estimate of the population served and a description of the methodology(is) used to make the estimate

The service area for the City of Bandon includes the City of Bandon and areas within the Urban Growth Boundary.

The full time population of Bandon within the city limits is estimated to currently be 2985. The full time service population outside of the city limits is estimated to be 196. During the summer peak service period an additional "vacation rental or second home" population of 280 is estimated inside the city limits and 9 outside the city limits. Furthermore, the transient population inside the city limits (motels, RV parks, etc.) is estimated to be 730 persons per day during the summer peak season and 256 per day during the winter off-peak season.

The methodology used to make these estimates is described in further detail in the Water Master Plan Update, June 2003, Dyer Partnership. The method consists of using the 2000 U.S. census¹ to determine full time population, average full time residential occupancy rates and number of "secondary homes". An occupancy rate of 2.2 persons per home was calculated. Part-time population was estimated by multiplying the number of secondary homes by 2.2 persons. Using water billing records for outside users, the outside full time and part-time population was estimated based on a survey conducted in 2002 for preparation of the Wastewater Master Plan. The survey had a participation rate of 50%. The survey asked owners of motels, hotels, RV parks and "bed-and breakfast" establishments how many rooms or spaces they had, and the occupancy of those rooms or spaces for both winter and summer season. By extrapolation of survey data, the transient population was estimated for the City of Bandon.

¹U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File, Table PL1,.



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2.3 Existing System Reliability

Requirement: An assessment of the adequacy and reliability of the existing water supply considering potential limitations on continued or expanded use under existing water rights resulting from existing and potential future restrictions on the community's water supply;

The water supply sources of Ferry Creek and Geiger Creek are described in Section 1 above. These sources are generally adequate and reliable at the present time. However, it is apparent that in the 20 to 25 year future, water shortages are likely to occur during the summer season due to low flow. Water rights transfers have been effected so that a conflict between the City and the fish hatchery need not occur, but the fact remains that there are a total of 1.6 CFS of prior water rights on lower Geiger Creek, non withstanding the hatchery's use and a low flow of 0.9 CFS as reported in the 1992 Water Master Plan (date unknown). Under the arrangement of the water rights diversion transfer executed in 2000, the City could remove 0.45 CFS (if it was actually present in the upper reach of Geiger Creek) but would have no other claim.

Water rights withdrawal location transfers have been executed and pump equipment installed so that a conflict between the City and the fish hatchery need not occur. The City is now able to withdraw water below the hatchery discharge. This also has the consequence, for the City, of being able to use water that Ferry Creek water rights holders above the hatchery and senior to the City but junior to the hatchery (totaling 0.65 CFS) are not be able to withdraw, because the hatchery's senior right water up to 3 CFS must be allowed to and through the hatchery. Once it has passed them, there is no way for these upstream users to withdraw the water. However, there is still a 0.5 CFS claim with priority senior to the City's below the alternative City withdrawal location on Ferry Creek. The lowest flow in Ferry Creek (above the confluence with Geiger Creek) was 1.3 CFS as reported in the 1992 Water Master Plan (date unknown).

Other information available includes the Tucson Myers report of April 1990. Data Correlation of Ferry Creek with Pony Creek for a location at the confluence of Geiger and Ferry Creek and appears to include both creeks. Data was compiled from 1950 to 1980 and the value for flow exceeded 99 out of 100 years was computed. The lowest flow month was determined to be for September at 1.06 mgd or 1.64 CFS. Another report was prepared by CH2M Hill in July of 1993 for Coos County based on assumed run off values and predicted rain fall. This report predicted much lower flows than the Tucson Myers report. However CH2M Hill acknowledged in the report that the mathematical basis of their estimate does not match observed flow. The explanation was that "springs" add to the volume. Basing the flows on observed Pony Creek flows Therefore, for purposes of this report 1.3 CFS will be assumed to be the 1/100 low flow value for Ferry Creek. The net result of the withdrawal arrangement, estimated low flow and water rights constraints, is that 0.8 CFS would be available to the City from Ferry Creek during estimated low flow.

Senior water rights on lower Geiger Creek, not withstanding the hatchery's use, total 1.6 CFS, with an estimated low flow above the confluence of 0.9 CFS. Under the arrangement of the City's water rights diversion transfer executed in 2000, the City could remove 0.45 CFS (if it was actually present in the upper reach of Geiger Creek) but would have no other direct claim. In any case, the net result after hatchery use is that 0.9 CFS would be usable by the City during low flow.

Therefore, the total water supply available to the City in Ferry and Geiger Creeks could be as low as 1.70 CFS during a dry month. This supply would consist of water that had passed through the hatchery fish pens from both Ferry and Geiger Creeks and was diverted by the City from downstream of the confluence of the two creeks by means of the alternative lower pump station.

The current water use projections as developed in the Water Master Plan Update indicated a 1.70 CFS (MDD) for 2003 increasing to 2.41 CFS (MDD) by 2023. The single day demand exceeding the supply stream could be met by tank storage and impoundment reservoir storage for a few days. In 2023, this is a deficient of 0.71 CFS or 0.459 million gallons per day. The current tank storage is 3 million gallons and raw water impoundment storage is 2.5 million gallons. On a maximum month basis in 2023, the City is only projected to require 1.44 CFS from an estimated minimum available source of 1.70 CFS. This demand assumes no unexpected increases (or decreases) in projected demand patterns. Therefore, the existing raw water supply source from Ferry and Geiger Creeks is anticipated to provide adequate water during the maximum demand month. However, during some period of days in a dry period, the City may have to curtail water use for a several days.

Concerning water source reliability, a Source Water Assessment was recently completed in May, 2000 by the Department of Environmental Quality. This assessment was completed for Bandon's drinking water protection area in order to identify the surface areas that supply water to the City of Bandon's public water system intake and to inventory the potential contaminant sources that may impact the water supply.

The Source Water Assessment delineated the drinking water protection area and determined that it is primarily dominated by forest and agricultural land uses interspersed with areas of residential use. A total of 27 potential contaminant sources were identified in the watershed. The potential contaminant sources consisted of roadways, bridges, excavation locations, utilities stations and transmission lines, forest clear cuts, cranberry bogs, and residential housing development.

Risk associated with the roadways was considered moderate due to low volume of traffic. The greatest concern was associated with cranberry bogs due to the potential use of pesticides and herbicides, which may be washed into the impoundments as run-off. Residential development was considered to be a low to moderate risk due to septic tank leach ate. A transformer storage and maintenance facility located in the watershed was considered a high risk due to concern regarding spills, leaks, or improper handling chemicals and other materials including PCBs during transportation, use, storage and disposal which may impact the drinking water.

A subsequent Water Sampling Project in 2002 and a Drinking Water Protection Plan, recently completed by the Bandon Water Resources Committee, further addresses contaminants and risks as well as plans to prevent both. The Drinking Water Protection Plan determined that several areas of concern in the Source Water Assessment were not substantiated. Trace amounts of herbicides were detected in a small percentage of raw water samples, in trace amounts well below action limits. No trace of these herbicides was detected following treatment.

It is clear that additional water supply is required for the City's future but that it will not be supplied from Ferry or Geiger Creek flows due to volume limitations during dry periods of the year.

2.4 Water Use

Requirement: A quantification of the water delivered by the water supplier that identifies current and available historic average annual water use, peak seasonal use, and average and peak day use;

Water use for average annual demand (ADD), maximum month average demand (MMD), maximum day demand in the year (MDD) as well as peak hour demand are listed below in Table 2.4.1 (Table 3.3.3 extracted from the Water Master Plan Update). The demands for the study period 2000 to 2002 are based on City records. The projections are based upon an annual growth rate of 1.76% annual.

| | Bandon I | Projection of | Peak Deman | d Rates (Gal | x 1,000) | |
|--------|--------------------------------|---------------|------------|--------------|----------|--------|
| Factor | Yr 2000-2002 Sty. Period | 2003 | 2008 | 2013 | 2018 | 2023 |
| ADD | 442.8 | 458.5 | 500.3 | 545.9 | 595.7 | 650.0 |
| MMD | 633.2 | 655.7 | 715.4 | 780.7 | 851.8 | 929.5 |
| MDD | 1062.7 | 1100.4 | 1200.7 | 1310.2 | 1429.6 | 1559.9 |
| PHD | 1800.0 | 1866.1 | 2036.22 | 2221.8 | 2424.5 | 2645.5 |

Table 2.4.1

2.5 Water Rights

Requirement: A tabular list of water rights held by the municipal water supplier that includes the following information:

(a) Application, permit, transfer, and certificate numbers (as applicable);

(b) Priority date(s);

(c) Source(s) of water;

(d) Type(s) of beneficial uses specified in the right;

(e) Maximum instantaneous and annual quantity of water allowed under each right;

(f) Maximum instantaneous and annual quantity of water diverted under each right to date;

(g) Average monthly and daily diversions under each right for the previous year, and if available for the previous five years;

(h) Currently authorized date for completion of development under each right; and (i) Identification of any stream flow-dependent species listed by a state or federal agency as sensitive, threatened or endangered that are present in the source, any listing of the source as water quality limited and the water quality parameters for which the source was listed, and any designation of the source as being in a critical ground water area.

| Water Rights | | | | | | | | |
|--------------|------|-----------------------|-----------|-----------|------------------|-----|----------------|---------|
| a | b | c | d | e | f | g | h | i |
| C9754 | 1910 | Spring Br. #3 | Municipal | 2.0/63.1 | 2.0/15.8 Est. | 0 | Not applicable | Unknown |
| P3011 | 1916 | Upper Geiger Creek | Municipal | 5.0/157.7 | 0/0 | 0 | Not applicable | No |
| P27232 | 1961 | Lower Geiger Creek | Municipal | 3.0/94.6 | 0.78/15.3 | .17 | Not applicable | No |
| P27233 | 1961 | Ferry Creek | Municipal | 3.0/94.6 | 2.32/5.1 | .51 | Not applicable | No |

Table 2.5.1 Water Rights

Col. a = Permit Number

Col. b = Priority Date

Col. c = Water Source

Col. d = Type of Use

Col. e = Max Water Right. Instantaneous cubic feet per second / 1 Million cubic feet per year

Col. f = Max. Use to Date Instantaneous cubic feet per second / 1 Million cubic feet per year

Col. g = Ave. Month cubic feet per second use in previous year.

Col. h = Date for completion of Development

Col. i = Stream dependant species or limitation

2.6 Customer Profile

Requirement: A description of customers served including other water suppliers and the estimated numbers; general water use characteristics of residences, commercial and industrial facilities, and any other uses; and a comparison of the quantities of water used in each sector with the quantities reported in the water supplier's previously submitted water management and conservation plan and progress reports;

The City of Bandon provides drinking water to residential, institutional, commercial, industrial and municipal customers within the City's water service area. A portion of the City's water serves transient facilities such as RV parks, vacation rentals and motels. The City is estimated to have 1706 water service accounts distributed between various user as summarized below in Table 2.6.1

| Account | No. of Services | Gal. X 1,000 Average Year Use | Gal. Ave. Day Use per Service | Typical EDU Per Svc. | EDU's/ Class | % of Total Use |
|---------------------------|--------------------|-------------------------------------|--|----------------------------|-----------------|----------------------|
| Residential-Inside | 1250 | 71053.33 | 155.7 | 1.00 | 1250 | 44.0 |
| Residential-Outside | 87 | 4685.33 | 147.0 | 0.94 | 82 | 2.9 |
| Commercial-Inside | 325 | 60947.67 | 513.8 | 3.30 | 1072 | 37.7 |
| Commercial-Outside | 18 | 3207.33 | 498.2 | 3.20 | 56 | 2.0 |
| City Use -Charged | 24 | 5768.00 | 656.9 | 4.22 | 101 | 3.6 |
| City Used No Charge | 2 | 182.00 | 249.3 | 1.60 | 3 | 0.1 |
| Metered Totals | 1706 | 145,843.667 | | | 2566 | 90.2 |
| Loss | 1 | 15,775.333 | 43,220.1 | 277.59 | 278 | 9.8 |
| Consumption Totals | | 161,619.000 | | | 2844 | 100.0 |

| Table | 2.6.1- | Existing | Service | Profile |
|-------|--------|----------|---------|---------|
| | | 2000-20 | 02 | |

Residential Accounts. Inside Residential water customers in Bandon make up about 73 % of total accounts. Outside Residential users average about 5 %. Total residential users therefore comprise 78 % of the account base. The average per household occupancy is 2.2 persons per home. Residential water use in the City of Bandon is not unlike that seen in may coastal communities. Due to the typically wet climate and cool temperature, water use for outdoor recreation and landscape irrigation is generally less than that of communities in more arid regions

Commercial Accounts. Commercial accounts with the City consist of a variety of customer types. Hotels, motels and other establishment catering to the summertime and holiday tourist market constitute a significant portion of the commercial base. Inside commercial accounts make up 19 % of total accounts. Outside commercial users comprise 1 % of total accounts.

Comparison with Other Oregon Cities

The U.S. Department of the Interior documented the per capita water use for Oregon in the 1995 U.S. Geological Survey - Circular 1200. The water use pattern of Bandon is compared with the goals of an interagency team made up of personnel from the DEQ, Oregon Economic and Community Development Department (OECDD), Oregon Health Division (OHD), the Oregon Department of Water Resources (WRD), the USDA-Rural Utilities Service, Rural Community Assistance Corporation, and the Department of Land Conservation and Development. The interagency team developed target design numbers based on the USGS study and their experience with Oregon communities. The team has adopted a maximum ADD of 235 gpcd, a MDD of 588 gpcd (2.5 times the ADD), and a PHD of 1,175 gpcd (5 times the ADD).

Bandon currently is estimated to have a full time population of 2985 in the City limits and 196 outside the City limits in the service area. Therefore, the service area population is 3181. Total water consumption, including losses is estimated to be 161,619 gallons per year averaged over the past three-year study period. Therefore Bandon's' per capital consumption rate is 139.2 gpcd including domestic, commercial, industrial, and public use and loss. This is well below the target value of 235 gpcd noted above. Bandon's MDD factor was 2.40 compared with the target factor of 2.5 and the PHD factor was estimated to be a maximum of 2.78 compared with the target value of 5. These use characteristic comparison factors are summarized below in Table 2.6.2.

| Use Characteristics | Bandon | Oregon Cities |
|----------------------------|------------|---------------|
| Average Use per day | 139.2 gpcd | 235 gpcd |
| Domestic Use | 46.9 % | 53 % |
| Commercial Use | 39.7.0% | 14 % |
| Industrial Use | | 17 % |
| Public Use & Loss | 13.5% | 16 % |
| MDD factor | 2.40 | 2.5 |
| PHD factor | 4.07 | 5.0 |

 Table 2.6.2

 Comparison of Bandon Water Use Characteristics with Other Oregon Cities

2.7 Interconnections

Requirement: Identification and description of interconnections with other municipal supply systems;

There are no interconnections with other municipal supply systems. Due to the distance between communities in this area of the Southern Oregon Coast, none are expected in the future.

2.8 System Schematic

Requirement: A schematic of the system that shows the sources of water, storage facilities, treatment facilities, major transmission and distribution lines, pump stations, interconnections with other municipal supply systems, and the existing and planned future service area;

Figure 2.8.1, on the following page, provides a schematic drawing of the system showing the elements required in item (8) above.



2.9 System Leakage

Requirement: A quantification and description of system leakage that includes any available information regarding the locations of significant losses.

Water plant production, raw water consumption and metered water use records were examined for the past five year period. (1998-2002). The difference between finished water metered leaving the water production and storage facilities and water metered for sale averages 8.26 %. Due to the new condition of the plant, raw water pumping system and raw water transmission lines, an assumption is made that there is no more than a 1.5 % loss at the treatment plant. Therefore, total losses are estimated to be 9.76%. No significant losses are identified.



Municipal Water Conservation Element

Municipal Water Conservation Element



(OAR 690-86-150)

3.1 Progress of Conservation Measures

Requirement: A progress report on the conservation measures scheduled for implementation in a water management and conservation plan previously approved by the Department, if any;

A previous water management and conservation plan has not been previously developed. This report will establish the base line for future water conservation reporting.

3.2 Water Use Measurement and Reporting

Requirement: A description of the water supplier's water use measurement and reporting program and a statement that the program complies with the measurement standards in OAR chapter 690, division 85, that a time extension or waiver has been granted, or that the standards are not applicable; By December 31 of each year, any governmental entity holding water rights shall submit to the Department a report detailing monthly water use under the rights for each point of diversion. Reporting shall be for the previous water year (October 1 to September 30).

As part of the auditing process, the City must account for all water diverted from each source. This is typically accomplished through a metering device at or near the point of diversion. OAR 690-085-0015 requires that, "Where practical, water use shall be measured at each point of diversion." However, the rule also states that:

"...measurements may be taken at a reasonable distance from the point of diversion if the following conditions are met:

- a) The measured flow shall be corrected to reflect the flow at the point of diversion. The correction will be based on periodic flow measurements at the point of diversion taken in conjunction with flow measurements at the usual measuring point;
- b) If the measured flow includes flow contributions from more than one point of diversion, the measured flow shall be proportioned to reflect the flow at each point of diversion using the method prescribed subsection (a) of this section;
- c) A description of the correction method shall be submitted with the annual report the first time it is used and any time it is changed, or once every five years, whichever is shorter."

If the point of diversion is relatively close to the water treatment plant, it is common for many communities to use a single influent meter at the water plant to measure the amount of water that is diverted.

In the case of Bandon, raw water flow is measured at the treatment plant influent by a magnetic flow meter. The balance between the Geiger Creek and Ferry Creek diversions is controlled by the Fish Hatchery. The Hatchery maintains a balance so that flow from Ferry and Geiger Creek reservoir produce equal overflow at their primary spillways. It has been assumed in the past that 1/4 of the total raw water flow is from Geiger Creek and 3/4 from Ferry Creek. There are no flow measurement devices located in the withdrawal piping system from the reservoirs. Neither is the main lower pump station metered, although the alterative Ferry Creek pump station below the confluence of the two Creeks is equipped with a flow meter. It is recommended that the main lower pump station be equipped with a flow meter so that water pumped to the middle pond may be measured. This would also provide a more accurate raw water diversion measurement, because the current reported raw water diversion values are too high. They include backwash and drainage water, which is returned to the water plant by way of the middle pond. The actual raw water diversion values from Ferry and Geiger Creek are expected to nearly match the finished water plant effluent values (within 1.5% to account for evaporation and minor loss from the Back Wash and Middle Ponds.). Table 3.2.1 below, summarizes the reported and estimated true water diverted from the City's two active sources converted to gallons x 1000.

 Table 3.2.1

 Summary of Reported and Estimated Annual Water Diversion From Each Source (2000 –2002)

| Year | Geiger Creek Annual Diversion (Gal. X 1000) | Ferry Creek Annual Diversion (Gal. X 1000) | Total Raw Water Diverted (Gal. x 1000) | | |
|------|---|--|--|--|--|
| | 45,087 (Rpt.) | 135,262 (Rpt.) | 180,349 (Rpt.) | | |
| 2000 | 42,211 (Est.) | 126,634 (Est.) | 168,845 (Est.) | | |
| | 41,923 (Rpt.) | 125,769 (Rpt.) | 167,692 (Rpt.) | | |
| 2001 | 37,531 (Est.) | 112,593 (Est.) | 150,125 (Est.) | | |
| | 46.672 (Rpt.) | 140,015 (Rpt.) | 186,687 (Rpt.) | | |
| 2002 | 41,472 (Est.) | 124,416 (Est.) | 165,888 (Est.) | | |

3.3 Other Conservation Measures

Requirement: A description of other conservation measures, if any, currently implemented by the water supplier, including any measures required under water supply contracts;

As described elsewhere in this plan, Bandon currently implements two significant water conservation measures. The first is the re-use of water treatment plant backwash and tank drainage water by discharge to the backwash ponds which drain to the Middle Raw Water Pond, with subsequent recovery as raw plant water. The second is the WRD permitted alternative withdrawal of raw water below the fish hatchery during low flow periods. This allows the hatchery to use its senior right "once through" water requirement and then for the City to withdraw the same water for its requirements.

3.4 Bench Mark Schedule

Requirement: A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:

3.4.1 Water Audit

Requirement: An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses;

The City of Bandon currently maintains detailed and computerized water use records for all users, including City users which are not charged (such as fire hydrant flushing). These metered water uses are compared with raw water and plant production records on a monthly basis to check for leakage. Un-metered authorized uses do not occur. Unauthorized uses would be in the form of water theft from fire hydrants. Community police and public works personnel routinely watch for such criminal activity. No additional actions are required.

3.4.2 Unmetered Services

Requirement: If the system is not fully metered, a program to install meters on all un-metered water service connections. The program shall start immediately after the plan is approved and shall identify the number of meters to be installed each year with full metering completed within five years of approval of the water management and conservation plan;

The Bandon Water System is fully metered. No additional actions are required

3.4.3 Meter Test and Maintenance Program

Requirement: A meter testing and maintenance program;

Bandon currently has in place provisions for the continuing replacement of all existing meters with new, accurate, and consistent electronic water meters Modern meters are capable of nearly 100 percent accuracy. The new meters offer automated-meter-reading (AMR) systems capable of significantly increasing the efficiency of the reading and billing process. It has been demonstrated that older style meters, when aged, tend to report lower water use than actual, thus reducing water utility revenues. City records indicate that new style AMR type meters have been used for replacement of existing meters since early 1999. In the past seven years approximately 455 meters have been installed or replaced. Of this number 35% are estimated to be new services and the remaining 65% to be replacements. The current number of meters in service is about 1750. This leaves an estimated 1345 meters in service older than 7 years. It is proposed that the City institute a program to replace and/or service all meters on a seven year cycle. This goal would require 250 meters per year to be initially replaced or serviced. Testing of the AMR meters in the future will determine if this replacement /service cycle needs to be continued.

A program to increase the replacement rate of mechanical meters has been developed in the Water Master Plan Update as a Priority III project. It would have an estimated annual cost of \$56,697 per year. Due to the City's very low leakage and "under read" situation, it is recommended that the City continue with its current policy of replacement as required until 2013, at which time, the meter replacement and testing program should be fully developed.

3.4.4 Rate Structure

Requirement: A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections;

The City of Bandon bills customers, in part, on the quantity of water metered at the service connections. Customers have a base fee to cover per account charges such as reading and billing and a volumetric charge per 1000 gallons of use.

3.4.5 Leak Detection Program

Requirement: If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier

The City of Bandon has a three year average (2000 to 2002) unaccounted water loss rate of 9.7%. Of this amount, less than 8.5% is estimated to occur in the distribution system. There is no formal leakage detection plan currently in place. Should leakage increase, the City would initially use visual inspection along water line routes to locate leaks. In areas east of the Pacific Ocean (due to ocean noise), sonic leak detection equipment could be employed.

3.4.6 Low Water Use Landscaping Education Program

Requirement: A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers; Note education materials available for school events, mailing, etc.

Included in the appendix of this Plan are educational materials available for school events in conjunction with the water use efficiency benchmark goal discussed in Section 3.6.2. Furthermore, the Drinking Water Protection Plan, ready for adoption by the City, also proposes education programs and materials for water quality and quantity maintenance.

3.5 Leak Reduction - Resource Issues Triggered

Requirement: If the municipal water supplier proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), a description of the specific activities, along with a schedule that establishes fiveyear benchmarks, for implementation of a system-wide leak repair or line replacement program to reduce system leakage to no more than 15 percent or sufficient information to demonstrate that system leakage currently is no more than 15 percent.

OAR 690-086-0140(5)(i) addresses identification of any stream flow-dependent species listed by a state or federal agency as sensitive, threatened or endangered that are present in the source, any listing of the source as water quality limited and the water quality parameters for which the source was listed, and any designation of the source as being in a critical ground water area. The current sources of City water, Ferry and Geiger Creeks, are both impounded with the Bandon Fish Hatchery located at the toes of the impoundments. Above the hatchery where water is normally withdrawn, there are no known anadromous species of fish or any other known threatened or endangered species. During low stream flow periods, in order to avoid conflict with the hatchery's water rights and needs of the hatchery fish, the City established a WRD permitted alternative location below the hatchery in Ferry Creek in the year 2000. This is a major conservation accomplishment, in that the hatchery water use is non-consumptive and the water is able to be used "twice" under the two separate water use permits. The City of Bandon is not believed to currently divert water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i).

In the future, Bandon may wish to re-develop the certificated 2 CFS Simpson Creek water right and 20 5/8 acre-foot impoundment which was last used in the 1950's. This project is uncertain at this time due to concerns regarding water quality and quantity. While the resumption of use has been identified in the Water Master Plan Update, it is listed as a Priority IV project and not likely to be considered in the next 5 year period. It is likely that Simpson Creek could have OAR 690-086-0140(5)(i) issues associated with it.

In any case, Bandon's leakage rate is well below 15% as demonstrated by the information in Table 3.4.7.1 below:

| Year | Est. True Raw Diversion X 1,000 Gal. | Raw Plant Influent X 1,000 Gal. | Est. Plant Influent X 1,000 Gal. | Finished Plant Water X 1,000 Gal. | Metered Water Delivered X 1,000 Gal. | Distribution System Loss X 1,000 Gal. | Plant Loss % | Distribution Loss % | Total Loss % |
|------|--|---|--|---|--|--|--------------------|---------------------------|--------------------|
| 2000 | 168,845 | 181,759 | 2,495 | 166,350 | 152,692 | 13,658 | 1.50% | 8.21% | 9.71% |
| 2001 | 150,125 | 167,691 | 2,218 | 147,906 | 135,438 | 12,468 | 1.50% | 8.43% | 9.93% |
| 2002 | 165,888 | 186,988 | 2,451 | 163,436 | 149,401 | 14,035 | 1.50% | 8.59% | 10.09% |
| Ave. | 161,619 | 178,813 | 2,388 | 159,231 | 145,844 | 13,387 | 1.50% | 8.41% | 9.76% |

Table 3.4.7.1Overall System Losses

Total raw water diverted for the City averaged approximately 162 million gallons per year during the. period 2000 to 2002. Unaccounted water in the City's distribution system averages around 13 million gallons per year or 36,700 gallons per day; losses on this order are minor and not economical to reduce. No additional actions are required

3.6 Efficiency Measures - Resource Issues or Population Size Triggered

Requirement: If the municipal water supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the municipal water supplier serves a population greater than 7,500, a description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following measures; or documentation showing that implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste:

As noted in <u>Section 3.5 - Leak Reduction - Resource Issues Triggered</u> above, it is not believed that the current water supply source is resource issue impacted in accordance with OAR 690-086-0140(5)(i). The current population of Bandon is estimated to be 2, 975 which is less than 7,500 persons. Therefore, Bandon is not believed to be subject to the above requirements. However, future use of the Simpson Creek Water Source may trigger this requirement.

3.6.1 System Wide Leak Repair Program

Requirement: A system-wide leak repair program or line replacement to reduce system leakage to 15 percent, and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent.

Bandon's leakage is 9.7%. See Section 3.5 for discussion of this issue. No additional actions are considered economically feasible.

3.6.2 Technical and Financial Assistance to Customers

Requirement: Technical and financial assistance programs to encourage and aid residential, commercial and industrial customers in implementation of conservation measures

On request, residential, commercial and institutional users will be provided with information informing them of water conservation measures. Periodically, grade school children in Bandon are taken to the water treatment plant for field trips. Water conservation materials as shown in the appendix of this plan, will be made available for use in these school programs.

3.6.3 Financed Retrofitting of Fixtures

Requirement: Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation

Bandon's water usage is already very low. Furthermore, the City's water rates are much lower than the average Oregon community. The City water operation does not generate sufficient revenue to subsidize low use water fixtures. Furthermore, Bandon's current water use characteristics reflect existing conservative use when compared to other Oregon Cities as shown in Table 3.6.3.1 below

| Use Characteristics | Bandon | Oregon Cities |
|---------------------|------------|---------------|
| Average Use per day | 139.2 gpcd | 235 gpcd |
| Domestic Use | 46.9 % | 53 % |
| Commercial Use | 39.7.0% | 14 % |
| Industrial Use | | 17 % |
| Public Use & Loss | 13.5% | 16 % |
| MDD factor | 2.40 | 2.5 |
| PHD factor | 2.78 | 5.0 |

| | | 1 able 3.6.3.1 | | |
|----------------------|---------------------|----------------------------|--------------|----------------------|
| Comparison of | Bandon Water | Use Characteristics | with Other (| Oregon Cities |

3.6.4 Financial Inducements to Conservation

Requirement: Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation

Bandon has had relatively low water rates historically. This is due in part to the City ordinance which requires rate increases to be approved by a vote of the people. Concurrent with the preparation of this report, the Water Master Plan Update has been prepared. In that document, fire flow deficiencies have been identified along with a number of capital improvement projects.

Rate increases have been recommended to pay for the ranked capital improvement projects. If a rate increase is passed, this will have some effect towards reducing the use of water further. However, it is not anticipated that this reduction will be as significant as it might be in other communicates, because the current consumption of water is thought to be near its inelastic demand amount now.

3.6.5 Reuse and Recycle

Requirement: Water reuse, recycling, and non-potable water opportunities

Under current Oregon regulations, recycling of household gray water is not permitted. As previously noted however, the water treatment plant has very little consumptive use and its backwash and process drainage water is recovered. No other reuse or recycle actions are anticipated in the near or mid-term future.

3.6.6 Other Conservation Measures

Requirement: Any other conservation measures identified by the water supplier that would improve water use efficiency.

No other conservation measures have been identified that would improve water use efficiency.



Water Curtailment Element

Section

(OAR 690-86-160)

4.1 Definition of Water Curtailment Element

A water curtailment element is defined as a short term, mandatory program intended to drastically reduce water consumption, usually due to an emergency, catastrophic event, or serious water shortage. According to OAR 690-86-160, a water provider is to develop a water curtailment element with planning criteria, specific operating guidelines, and the enforcement measures that may be required in the event of a serious emergency or water shortage.

Most water systems have critical components, which if damaged or destroyed, could cripple or prevent delivery of potable water to its consumers. Such a crisis could last from a few hours to many days. As part of a comprehensive water management and conservation plan, a curtailment element would provide the City with the planning and information necessary for managing a "short term" supply deficiency crisis.

Due to drought conditions, equipment failure, or other water system problems, the City's water supply may become significantly and seriously depleted. The deficiency, which could last from weeks to months, could be serious enough that there is not enough water to provide for the needs of the community. Being prepared for curtailment situations will allow a water provider to survive serious "long-term" supply-deficiencies.

The City previously adopted a resolution describing a Water Emergency Plan. While the plan provided the City with the beginnings of a curtailment element, the resolution did not contain all of the elements required by OAR 690-86-160.

The following sections provide information required by OAR 690-86-160 for water curtailment elements. The City may wish to develop a comprehensive emergency plan for all City operations. A curtailment element can be used as the water supply element of such a comprehensive emergency plan.

4.2 Supply Deficiencies

Requirement: A description of the type, frequency and magnitude of supply deficiencies within the past 10 years and current capacity limitation. The description shall include an assessment of the ability of the water supplier to maintain delivery during long-term drought or other source shortages caused by a natural disaster, source contamination, legal restrictions on water use, or other circumstances;

4.2.1 Historical Deficiencies

The City of Bandon's water system has not had a history of major water supply deficiencies due to source deficiencies. Water supply problems which have resulted in a struggle to satisfy the

daily water demands were generally caused by problems at the old treatment plant which was replaced in 2000. At that time, there were problems associated with the start-up of the new water treatment facilities.

However, minimum available source flows which occur during dry summer months have created concern. Over the past ten years, the City Council has not declared a water emergency. However, provision of an alternative withdrawal location below the Bandon Hatchery to avoid conflict with the hatcheries demand was a result of concern over possible shortages. Due to the steady growth of Bandon and the historical low flows possible in Ferry and Geiger Creeks, it is anticipated that the City may experience a water supply emergency in the future unless additional water supply is developed

4.2.2 Existing Capacity Limitations

The capacity limitations of the Bandon raw water supply were detailed in Section 2 of this Plan. As noted, the water supply sources of Ferry Creek and Geiger are generally adequate and reliable at the present time. However, it is apparent that in the future, water shortages are likely to occur during the summer season due to low flow. Water rights transfers have been effected so that a conflict between the City and the fish hatchery need not occur. Even so, the total water supply available to the City in Ferry and Geiger Creeks could be as low as 1.70 CFS during a dry month. This supply would consist of water that has passed through the hatchery fish pens from both Ferry and Geiger Creeks and is diverted by the City from downstream of the confluence of the two creeks by means of the City's alternative lower pump station

The current water use projections as developed in the Water Master Plan Update indicated a 1.70 CFS maximum day demand (MDD) for 2003 increasing to 2.41 CFS (MDD) by 2023. The single day demand exceeding the supply stream could be met by tank storage and impoundment reservoir storage for a few days. In 2023, this would be a projected deficit of 0.71 CFS or 0.459 million gallons per day. The current tank storage is 3 million gallons and raw water impoundment storage is 2.5 million gallons. On a maximum month basis in 2023, the City is only projected to require 1.44 CFS from an estimated minimum available source of 1.70 CFS. This demand assumes no unexpected increases (or decreases) in projected demand patterns. Therefore, the existing raw water supply source from Ferry and Geiger Creeks is anticipated to provide adequate water during the maximum demand month. However, during some period of days in a dry period, the City may have to curtail water use for a several days

It is clear that additional water supply is required for the City's future and that it will not be supplied from Ferry or Geiger Creek flows. The City is endeavoring to develop or participate in new summertime stored water sources to offset their raw water needs when stream flows in the primary sources are not adequate. Bandon will also take serious steps to maintain its existing low lost water rate and develop appropriate water conservation measures within the community.

4.3 Stages of Alert

Requirement: A list of three or more stages of alert for potential shortage or water service difficulties. The stages shall range from a potential or mild alert, increasing through a serious situation to a critical emergency;

The following are provided as four stages of alert for the City of Bandon's Water Curtailment Plan:

Alert Stage No 1: Water Alert Status

This level-of-alert serves primarily as a tool to inform the public that a potential problem exists. The problem may not yet warrant mandatory water conservation, but does suggest voluntary conservation. If the public is aware of potential problems, they will be more likely to accept and abide by more serious requirements should the alert status be increased.

A Stage No. 1 alert could be declared if a water shortage or equipment failure poses a potential threat to the ability of the water system to meet customer demands. Indicators include a moderate decrease of flows in Ferry or Geiger Creeks along with regional forecasts that predict drought or low stream flows in the watershed. Other indicators include moderate decreases in reservoir levels (below one-half total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner. National indices are referenced to provide further support for requiring specific curtailment actions.

It may be appropriate to declare this alert stage at the beginning or during major construction or maintenance of existing water system components. A possible scenario would include taking one reservoir temporarily off-line to paint or clean it or perform some minor maintenance.

Alert Stage No 2: Water Warning Status

This level-of-alert serves as the first level of action for the City to enact mandatory water use requirements within the system. This level would include all planned activities requiring temporary conservation including construction and maintenance activities as well as preparing for expected drought conditions.

A Stage No. 2 alert could be declared if a water shortage or equipment failure poses a serious threat to the ability of the water system to meet the demands of its customers. Indicators may include a significant decrease in the Ferry or Geiger Creek flows along with regional forecasts that low stream flows are expected to drop further. Other indicators may include a significant decrease in Ferry or Geiger Creek reservoir levels (below three-quarter total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner.

It may be appropriate to declare this alert stage if a component within the water system breaks down or is taken off-line for an extended period of time. This would include major repairs or renovations within the water treatment plant, major renovation of a reservoir, or another major improvement project.

Scenarios that would require this level-of-alert would typically be those that could be planned and prepared for. This alert stage could be instituted as a follow up status to Level 1 after the public

has been informed of potential problems and given an opportunity to carry out voluntary conservation activities.

Alert Stage No 3: Water Emergency Status

This level-of-alert serves to raise the alert status from a warning to an emergency status. A wider range of water use activities is affected. This is the most restrictive level of mandatory water conservation activities carrying the highest penalties to enforce the curtailment status.

A Stage No. 3 Alert could be declared if a water shortage or equipment failure poses a severe and immediate threat to the ability of the water system to meet the demands of its customers. Indicators may include an eminent loss of a portion or total source of supply. Other indicators could include a chemical spill in a water supply, severe equipment failure, and other severe water supply issues.

Scenarios that would result in a declaration of a water emergency would be of an unplanned nature. This may include natural disasters such as earthquakes or landslides, acts of terrorism or sabotage, complete failure of water system components, and other emergency conditions. A few specific scenarios are listed below:

- · Landslide that destroys, intakes, and/or raw water supply piping,
- Collapse or failure of a storage reservoir,
- Severe source contamination by pesticide, chemical spill, sabotage, etc.,
- Landslide that destroys treated water line from water plant to City system or the raw water intake system, and
- Extreme drought conditions resulting in the near inability to obtain raw water for basic service.

Alert Stage No 4: Critical Water Supply Status

This level-of-alert serves to assist the water system in supplying the minimum amount of water to the consumers to sustain life. This level differs from level three in that the decision of how much water to use may be taken away from the consumer and would probably include rationing of drinking water. This extreme level-of-alert is reserved for extreme water supply problems.

A Stage No. 4 Alert would be declared if the ability to deliver water was disrupted for greater than 24 hours or the ability to produce finished water was disrupted for a period longer than 3 days with less than a 3 day storage reserve.

4.4 Pre-Determined levels of Shortage

Requirement: A description of pre-determined levels of severity of shortage or water service difficulties that will trigger the curtailment actions under each stage of alert to provide the greatest assurance of maintaining potable supplies for human consumption;

Predetermined levels of severity and descriptions of specific scenarios that will invoke a predefined level of water curtailment alert are listed below. These items represent "triggers" that will initiate a specific alert stage in the plan.

It is appropriate to have a number of issues that serve as potential triggers for a phase of a curtailment plan. The plan is organized so that one, two, or combinations of triggers will initiate specific actions from the community. This approach to curtailment triggers allows more evidence to be gathered to suggest an appropriate response and provides the City with more flexibility to manage the water system during difficult water shortages and crisis. The following includes indicators for each level-of-alert.

Stream flows. Currently the City relies on its two primary water sources – Ferry and Geiger Creeks – for all its water needs. Low seasonal stream flows have resulted in past concern. As was discussed in Sections 2 and 3, records indicate that water available to Bandon may be as low as 1.7 CFS from Ferry and Geiger Creek flows. The City should establish a Stage No. 1 curtailment trigger of 2.5 CFS combined flow. 2.5 CFS would be in excess of the low stream flows but serve as a warning of impending deficiency. An appropriate level for Stage No. 2 alert would be 2.0 CFS and for Stage No. 3, a flow of 1.7 CFS and below.

Palmer Index (PI). The Palmer index is a widely used scale for measuring drought conditions. The PI is based on long-term records of temperature and precipitation and is tabulated by the US National Weather Service on a weekly basis. PI calculations are made for 350 climate divisions in the United States and posted on the NOAA and National Weather Service websites.

Normal weather has an index of zero in all seasons in any climactic region; droughts have negative index values while wet periods have positive values. Consecutive negative values from week to week can provide initial warning of an impending drought. Long-term negative values can assist the City in determining the severity of the drought condition.

In terms of a water curtailment plan, the area of interest is the negative or drought index regime. Conveniently, the negative PI regime is divided into three drought levels; moderate drought (-2 to -3), severe drought (-3 to -4), and extreme drought (-4 and lower). The City should use the three tiers of the negative PI as triggers for the first three levels of the curtailment plan.

For the purposes of curtailment triggers, the ranges of interest are for values less than -2. An appropriate division is as follows:

| -2 to -3 | = Stage 1 Curtailment |
|--------------|-----------------------|
| -3 to -4 | = Stage 2 Curtailment |
| Less than -4 | = Stage 3 Curtailment |

FIGURE 4.4.1 Drought Severity Index by Division



Using a multiple trigger curtailment plan, the PI can provide valuable information for the determination of the severity of a water supply crisis even though the PI is not necessarily supply specific. The PI is updated weekly and is easily accessible at the following website: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Surface Water Supply Index (SWSI). The SWSI is similar to the Palmer Index in that it is an index that describes the current state of water resources in a given area. Calculated monthly by the National Resource Conservation Service (NRCS) for the major river basins within the state of Oregon, the SWSI can be used to identify which river basins are above, below, or at the normal surface water supplies. Figure 4.4.2 shows the SWSI for the various basins in the state of Oregon for the month of August, 2003. Based on this information, water supplies are still normal in the Bandon area.



FIGURE 4.4.2 SURFACE WATER SUPPLY INDEX

For the purposes of curtailment triggers, the ranges of interest are between -1.5 and -4. An appropriate division is as follows:

| -1.5 to -2.5 | = Stage 1 Curtailment |
|---------------|-----------------------|
| -2.5 to -3.25 | = Stage 2 Curtailment |
| -3.25 to -4.0 | = Stage 3 Curtailment |

The SWSI for Oregon is updated monthly and can be viewed and downloaded at the following website: http://www.or.nrcs.usda.gov/Snow/watersupply/swsi.html

In addition to monthly SWSI data, significant historical data is available on the website to indicate the frequency and reoccurrence intervals expected for the various levels of curtailment. Figure 4.4.3 summarizes the history of the SWSI in the South Coast basin since 1974. The history of the SWSI suggests the sensitivity the area has to annual rainfall and the impact it has on surface water availability. In other words, the SWSI "bounces around" in relation to varying precipitation levels.

The figure suggests that, based on the above-recommended criteria, the City would have experienced Level 3 curtailment conditions only once over the past 25 years while Level 1 curtailment may have been experienced on six occasions.

FIGURE 4.4.3 HISTORY OF THE SWSI IN THE SOUTH COAST BASIN SINCE 1974



SOUTH COAST BASIN #2 - HISTORICAL SWSI -5 MONTH AVERAGES

Combining information from the Palmer Index and the SWSI will provide valuable insight to both the "big picture" and the local conditions based on readily available and accepted information.

System Manager Assessment. Few will know more about the viability and condition of a water supply than the operators and managers of the water system. If the operators and/or system managers consider it necessary to invoke Level 1 curtailment actions, the ordinance should provide them with that ability. Specifically, the chief water treatment plant operator, the public works director or the City Manager independently should have the authority to invoke Stage 1 curtailment actions. This "trigger" is important for such items as maintenance or construction on a critical system component, knowledge of raw water deficiencies other than volume, or other situations requiring specific curtailment actions.

A Stage No. 2 or 3 alert will have an economic impact on the City of Bandon. It is strongly recommended that the decision to activate a Stage No. 2 alert include a consensus of two out of three of the system manager group consisting of the City Manager, chief water plant operator and public works director or persons acting with their designated authority.

A Stage No. 4 alert will require consensus of all three persons comprising the system manager group.

4.5 Standby Water Use Curtailment Actions

Requirement: A list of specific standby water use curtailment actions for each stage of alert ranging from notice to the public of a potential alert, increasing through limiting nonessential water use, to rationing and/or loss of service at the critical alert stage.

Each level-of-alert includes a description of conservation measures appropriate to that level. These measures provide guidelines and required actions, define acceptable and prohibited water usage, and describe the penalties for not abiding by the declaration of water curtailment.

The fire department must be kept informed of all Stage of Alert conditions. In addition, press releases should be provided to the local radio and television station and the local daily free newspaper, the Coffee Break, for each stage of alert condition.

Table 4.5.1, following, describes stand-by water use curtailment actions for each level-of-alert. Suggested Public notice texts are provided in Table 4.5.2,

| Alert Stage | Stage Activation | Action Measures |
|--------------------------------------|---|---|
| No. 1 Water Alert | PI (-2 to -3) and/or SWSI (-1.5 to -2.5) and/or Ferry Creek and Geiger Creek combined available flow below 2.5 cfs and/or Staff assessment. | Water status sign will indicate Water Alert Stage No. 1. Call for voluntary reduction in all water use; mandatory for watering. Prohibit outside watering only between 9 p.m. to 7 a.m. Restrict outside watering for even addresses on even numbered days & odd addresses on odd numbered days. No outside watering on Sundays. Prohibit water wasted down gutters or streets & wash down of paved surfaces, streets, & structures. Water use for wash down of paved surfaces & structures only for health & safety purposes. Public outreach promoting conservation. Implement watering citations. Cease sale of water to users not currently on the system. Prohibit new hook-ups to the City's water system. Prohibit water to be used by Fire Department for drills or truck washing. |
| No. 2 Water Warning | PI (-3 to -4) and/or SWSI (-2.5 to -3.25) and/or Ferry Creek and Geiger Creek combined available flow below 2.0 cfs and/or Staff assessment. | Water status sign will indicate Water Warning Stage No. 2. All Stage No. 1 prohibited activities are also forbidden under Stage No. 2. Curtailment citations and penalties remain in-place. Continue public outreach to community. Watering of any lawn, landscaping bushes, shrubs & trees is prohibited. Watering of any vegetable or flower garden or fruit tree is restricted to watering by hand using either a hose with self-closing nozzle, a container (e.g. bucket), or a drip irrigation system. Prohibit washing of any vehicle, except a commercial fixed washing facility. Prohibit water for the use of scenic/ recreational fountains, ponds & lakes except required to support fish. Prohibit use of water in any air conditioner or air-cooling mechanism, except at a commercial business. Prohibit adding water to any swimming pool. |
| No. 3 Water Emergency | PI (-4 and lower) and/or SWSI (-3.25 to -4.0) and/or Ferry Creek and Geiger Creek combined available flow below 2.0 cfs and/or Staff assessment. | Water status sign will indicate Water Emergency Stage No. 3. All Stage No. 2 prohibited activities are also forbidden under Stage No. 3. Water curtailment penalties remain in place. Continue public outreach to community. 70% of previous month water consumption. Billing for overage usage will notify users that residential customers are allotted 50 gallons/capita (1550 gallons per month/person) based on the number of persons living at each household and that billing penalty and surcharges will be adjusted or removed if 70% of previous month usage results in allocation less than 50 gallons/capita. Aggrieved customer to provide proof of residency for persons claimed for higher allocation to receive refund or penalty adjustment. Commercial & industrial users will be restricted to the 85% volume of water used in prior month or same month in prior year, whichever is greater. Restaurants discontinue routinely offering water to customers unless specifically requested Implement a surcharge pricing structure for water use over the allotted use. Recommend double the consumption rate charge for all an usage over water allocation amount and \$10 base penalty surcharge for residential customers and \$40 for commercial and industrial users. |
| No. 4 Critical Water Supply | Delivery disruption > 24 hrs., forecasted storage < 1 day, and/or Production disruption > 3 days, forecasted storage < 3 days, and/or Staff assessment. | Water status sign will indicate Critical Water Supply Stage No. 4. City may discontinue water service through its normal distribution system. If water remains in the City's finished water tanks, water may be provided in small quantities to residents in their containers either directly from a designated tank or location within the City. If water is not available in the City's finished water tanks, the City would locate a source of potable water & have it delivered to the City. Small quantities of potable water would be provided to residents, at no cost, in their containers. |

 TABLE 4.5.1

 SUMMARY OF RECOMMENDED WATER CURTAILMENT PLAN

PI – Palmer Index, SWSI – Surface Water Supply Index

Table 4.5.2 Suggested Public Notice Texts for Water Alerts

Stage 1 Water Alert

As of ______, until further notice, the City of Bandon has issued a Stage 1 Water Shortage Alert for it customers due to ______. The City requests voluntary reduction of all water use. Outside watering will only be permitted for even addresses on even dates and odd addresses on odd dates with no Sunday watering and no watering between the hours of 9 p.m. and 7 a.m. Washing of paved surfaces is prohibited except for health and safety purposes. Other restrictions apply. Further information is available ______.

Stage 2 Water Warning

As of ______, until further notice, the City of Bandon has issued a Stage 2 Water Shortage Warning Notice for it customers due to ______. The City requests voluntary reduction of all water use. All outside watering is prohibited except for vegetable, flower garden or fruit trees which are restricted to hand watering. Washing vehicles or paved surfaces is prohibited except for health and safety purposes. Water use for scenic ponds, fountains, or lakes is prohibited except as required to support fish. The filling of swimming pools is prohibited. Other restrictions apply. Further information is available _____.

Stage 3 Water Emergency

As of ______, until further notice, the City of Bandon has issued a Stage 3 Water Emergency Notice for it customers due to ______. Penalties and surcharges are in effect for residential water use exceeding 70% of the previous month's usage and for commercial or industrial use exceeding 85% of the previous month's usage or same month's usage in previous year. Outside watering is prohibited except for vegetable, flower garden or fruit trees which are restricted to hand watering. Washing vehicles or paved surfaces is prohibited except for health and safety purposes. Water use for scenic ponds, fountains, or lakes is prohibited except as required to support fish. The filling of swimming pools is prohibited. Other restrictions apply. Further information is available ______.

Stage 4 Critical Water Supply

As of ______, until further notice, the City of Bandon has issued a Stage 4 Critical Water Supply Emergency Notice for it customers due to ______. The City has discontinued water service ______. Crews are attempting to re-establish water service. Upon resumption of service a boil order may be in effect. Drinking water will be provided to customers in quantities of up to ______ gallons in customer's own containers at the following locations: ______. Further information is available ______.

Alert Cancellation or Downgrade

As of ______, the City of Bandon has (cancelled, reduced) the Stage ______ Alert Notice for its customers due to ______. The alert status is currently (normal, Stage X). (Insert current alert description or special instructions such as boil order). Further information is available ______.



Municipal Water Supply Element

Municipal Water Supply Element



(OAR 690-86-170)

5.1 Definition of Municipal Water Supply Element

The Municipal Water Supply Element relates the demand for future additional water with respect to the permits for which extensions are requested. It provides a long-range plan in which the demand forecast is compared to the available supplies. Future additional water sources and plans to utilize them are addressed. The role of water conservation towards supplying a portion of the required water is also addressed.

5.2 Service Area and Population Projection

Requirement: A delineation of the current and future service areas consistent with state land use law that includes available data on population projections and anticipated development consistent with relevant acknowledged comprehensive land use plans and urban service agreements or other relevant growth projections;

5.2.1 Service Area

The current City Limits Boundary comprises the service area for the City of Bandon with the exception of a small percentage of residential and commercial customers located within the Urban Growth Boundary. The City's Urban Growth Boundary (UGB) comprises the future service area for the City of Bandon. Figure 5.2.1.1 shows both the City Limits boundary and the UGB. At the present time there are no plans to seek an increase in the area of the UGB. These service areas are consistent with comprehensive land use policies.

5.2.2 Population Projection

A growth rate of 1.76% per year has been selected for projections used in this Plan and in the Water Master Plan addendum over the next 20 years (to the year 2023), as suggested by the Revised Coos County Population Report for 1997. Growth occurs through infill of existing land in the City limits or through annexation of property in the UGB.

The 2000 population census for the City of Bandon included 2,833 full time residents. Housing units totaled 1535 with 248 units listed as vacant. Of the 248 vacant units, 120 are listed as vacation or seasonal use. Vacation or seasonal use housing therefore accounts for 4.23% of the housing base. This results in an occupancy rate of about 2.2 persons per occupied housing unit. About 24 building permits are issued annually. At 2.2 persons per unit this would give a city population of 2991 which is a close match to the projected 2003 population of 2985 based on the selected 1.76% annual population growth rate



Bandon serves as a second or part-time home for some residents. These residents include retirees that travel in the winter ("snow-birds"), full-time residents of other Oregon locations, and some condominium and transient-rental residents. While these part-time residents are not included as Bandon residents in census counts, they do use water and should be accounted for.

As noted above, there are approximately 120 vacation or seasonal use residential water connections in the City system. Assuming an occupancy rate of 2.2 persons per unit when occupied will add, for the purposes of this study, a peak total of 280 persons living part-time inside the city limits of Bandon in 2003. This peak period is assumed to occur during the summer months. When these persons are present, they are assumed to consume water at the same rate as the permanent population. It is also estimated that the part-time population will grow at the same rate as the full-time population or 1.76 percent.

Outside residential customers averaged 6.9% of inside residential customers in the year 2000. This increased to 7.0% in 2001 and 7.1% in 2002. Outside residential services averaged 90 in 2002. In January 2000 there were 81 outside residential customers. This is a short term growth rate of 3.5%. Based on the assumption of 2.2 persons per service, the outside city limits service population is estimated to currently be 205 persons and 93 services. As is the case for inside city limits population growth, the long term growth rate will be reduced in comparison to recent short term growth rates. A value of 2.0% is recommended.

The full-time and part-time occupation ratios are assumed to be the same as the inside city limits residential population. Therefore, for purposes of this report, 4.23% of outside residential users are assumed to be part-time. This results in an estimate of 9 part-time outside residents for the year 2003.

A significant portion of commercial water use within the City is related to the lodging industry. It is important that the tourist population be approximated to provide a sound basis of water use projection.

A survey of Bandon motels and RV parks was conducted last year (2002) and collected data on the numbers of rooms and spaces, as well as the approximate occupancy rates throughout the year. It was determined that sixteen motels with approximately 385 lodging units and two RV parks having 22 spaces serve the Bandon tourist/transient population. The survey had a 50% return rate. Based on the results, the occupancy rates were extrapolated onto the total number of rooms available to generate population levels. The results of the projection with a 1.76% annual increase are included in Table 5.2.2.1 below:

| Current Population Estimate and Projections | | | | | | | | |
|---|------|------|------|------|------|--|--|--|
| Year | 2003 | 2008 | 2013 | 2018 | 2023 | | | |
| Residential Inside - Full Time | 2985 | 3257 | 3554 | 3878 | 4231 | | | |
| Residential Outside - Full Time | 196 | 216 | 238 | 263 | 290 | | | |
| Residential Inside - Peak additional | 280 | 306 | 333 | 364 | 397 | | | |
| Residential Outside - Peak additional | 9 | 10 | 12 | 13 | 14 | | | |
| Transient - Off Peak | 256 | 279 | 304 | 332 | 362 | | | |
| Transient - Peak Additional | 474 | 517 | 565 | 616 | 670 | | | |
| Total Peak Population | 4200 | 4585 | 5006 | 5466 | 5964 | | | |
| Total Off-Peak Population | 3437 | 3752 | 4096 | 4478 | 4883 | | | |

 Table 5.2.2.1

 Current Population Estimate and Projections

5.3 Schedule of Water Rights Utilization

Requirement: An estimated schedule that identifies when the water supplier expects to fully exercise each of the water rights and water use permits currently held by the supplier.

The peak hours demand for Bandon is projected to be 2.8 CFS in 2023. As may be seen in Table 5.3.1 below, current water rights are adequate for the 20 year future. However, as noted in Chapter 2 of this Plan, water availability rather than water rights is the limiting source constraint for Bandon's future water needs.

| Location | Identification | Right Type | Magnitude | Priority Date |
|------------------|-----------------|------------------|-----------|------------------|
| NE 1/4, SE | Spring Br. #3, | Certificate 9754 | 2.0 CFS | January 24, 1910 |
| 1/4,&NE1/4,NE | Mill Cr #4 | | | |
| 1/4 Sec 29 T29S, | (Simpson Cr.) | | | |
| R14W | | | | |
| NE 1/4,NE 1/4, | Geiger Creek & | Permit 3011 | 5.0 CFS | June 19, 1916 |
| SW 1/4 Sec 4 | Geiger Cr. Res. | | | |
| T29S, R14W | | | | |
| SW 1/4,SE 1/4, | Geiger Creek & | Permit 27232 | 3.0 CFS | March 7, 1961 |
| Sec 28 T28S, | Geiger Cr. Res. | | | |
| R14W | | | | |
| SW 1/4,SE 1/4, | Ferry Creek & | Permit 27233 | 3.0 CFS | March 7, 1961 |
| Sec 29 T28S, | Ferry Cr. Res. | | | |
| R14W | | | | |

Table 5.3.1 Bandon Water Rights

If the peak hour factor for water demand is projected at a growth rate of 1.76% per year, then Table 5.3.2 below provides an estimate of scheduled water rights utilization.

 Table 5.3.2

 Estimated Schedule of Water Rights Perfection

| | Year | 2023 | 2028 | 2033 | 2038 | 2043 | 2048 | 2053 | 2058 | 2063 | 2068 | 2073 |
|------------------|---------|------|--|--------|-------|--------|------|------|------|------|------|------|
| Water Right | PHD CFS | 2.8 | 3.1 | 3.3 | 3.6 | 4.0 | 4.3 | 4.7 | 5.2 | 5.6 | 6.1 | 6.7 |
| Certificate 9754 | 2.0 CFS | | | Previe | ously | exerci | sed | | | | | |
| Permit 3011 | 5.0 CFS | | Not fully exercised in time frame Fully exercised by 2065 | | | | | | | | | |
| Permit 27232 | 3.0 CFS | | | | | | | | | | | |
| Permit 27233 | 3.0 CFS | | Fully exercised by 2026 | | | | | | | | | |

5.4 Water Demand Projections

Requirement: Based on the information provided in section (1) of this rule, an estimate of the water supplier's water demand projections for 10 and 20 years, and at the option of the municipal water supplier, longer periods

Listed below in Table 5.4.1 is the projected water demands for the City of Bandon for the the next 20 years in 5 year increments. The source of this information is from the Water Master Plan Addendum completed in August 2003.

| Factor | Yr 2000-2002 Sty. Period | 2003 | 2008 | 2013 | 2018 | 2023 |
|--------|--------------------------------|------|------|------|------|------|
| ADD | 0.69 | 0.71 | 0.77 | 0.84 | 0.92 | 1.01 |
| MMD | 0.98 | 1.01 | 1.11 | 1.21 | 1.32 | 1.44 |
| MDD | 1.64 | 1.70 | 1.86 | 2.03 | 2.21 | 2.41 |
| PHD | 2.81 | 2.89 | 3.13 | 3.42 | 3.74 | 4.11 |

 Table 5.4.1

 Bandon Projection of Peak Demand Rates (CFS)

ADD= Average Day Demand (yearly average)

MMD=Maximum Month average Day (highest use month - average day)

MDD=Maximum Day Demand (highest use day per year)

PHD=Peak Hour Demand=(highest hourly use per year)

5.5 Comparison of Projected Water Needs with Available Water

Requirement: A comparison of the projected water needs and the sources of water currently available to the municipal water supplier and to any other suppliers to be served considering the reliability of existing sources

As noted in Chapter 2 of this Plan, the total water supply available to the City in Ferry and Geiger Creeks could be as low as 1.70 CFS during a dry month. This supply would consist of water that had passed through the hatchery fish pens fish from both Ferry and Geiger Creeks and was diverted by the City from downstream of the confluence of the two creeks by means of the alternative lower pump station.

The current water use projections as developed in the Water Master Plan Update indicated a 1.70 CFS (MDD) for 2003 increasing to 2.41 CFS (MDD) by 2023. The single day demand exceeding the supply stream could be met by tank storage and impoundment reservoir storage for a few days. In 2023, this is a deficit of 0.71 CFS or 0.459 million gallons per day. The current tank storage is 3 million gallons and raw water impoundment storage is 2.5 million gallons. On a maximum month basis in 2023, the City is only projected to require 1.44 CFS from an estimated minimum available source of 1.70 CFS. This demand assumes no unexpected increases (or decreases) in projected demand patterns. Therefore, the existing raw water supply source from Ferry and Geiger Creeks is anticipated to provide adequate water during the maximum demand month. However, during some period of days in a dry period, the City may have to curtail water use for a several days

5.6 Alternative Sources of Water

Requirement: If any expansion or initial diversion of water allocated under existing permits is necessary to meet the needs shown in section (3) [5.4 Water Demand Projections] of this rule, an analysis of alternative sources of water that considers availability, reliability, feasibility and likely environmental impacts. The analysis shall consider the extent to which the projected water needs can be satisfied through:

(a) Implementation of conservation measures identified under OAR 690-086-0150;
(b) Interconnection with other municipal supply systems and cooperative regional water management; and

(c) Any other conservation measures that would provide water at a cost that is equal to or lower than the cost of other identified sources.

5.6.1 Conservation Measures

The City of Bandon's water consumption and conservation record is already enviable in comparison to many Oregon Communities. Further conservation measures, beyond those already in place, do not appear likely to provide additional water. Rather, the City will concentrate on maintaining its low leakage rate through water audit reviews and careful construction inspection during new construction or repair to pipelines and other water infrastructure. Because of Bandon's proximity to the Pacific Ocean (cool temperatures, fog hydration of landscaping) and a significant portion of the population retired on fixed income, water use is already very low.

5.6.2 Cooperative Regional Water Management

Windhurst Road Reservoir

Windhurst Road Reservoir was recently completed and has been in operation for less than 2 years. It was originally conceived and constructed as a cooperative supply of water for a group of cranberry growers. Due to a market recession and subsequent reduced requirement for irrigation water, the growers decided to sell additional capacity to help offset bond payments and operation costs. The reservoir is owned and operated by a local cranberry owners association. The reservoir is located on the south edge of Bandon and water from it may be released into Geiger Creek without additional infrastructure improvements. The City could withdraw it from their normal water diversion point. The reservoir has a useable storage volume of 405 to 425 acre-feet. At the time of this report, there was still about 100 acre-feet of storage available for yearly lease. The source of this water is Bill Creek, which is a tributary of Bear Creek, which flows into the Coquille River. The reservoir is off line. That is, it is not formed by the impoundment of Bill Creek, but rather by pumping from Bill Creek during the months between November to May. Bill Creek watershed is approximately 7 square miles in area and has very steep sides. Therefore, during run-off events, large amounts of water are present. However, during dry periods of the year, the flow is minimal. The water quality is reported to be of good quality and appears to be suitable as municipal source water. The terms of use by the City as currently proffered by the reservoir owners are for \$500 per acre-foot per year. The reservoir operator's current position is that the City would be responsible for re-sale of the reserved 100 acre-feet of water if the City did not require it. Therefore, the City would have to budget \$50,000 per year, for 100 acre-feet of water and could recover this cost if the stored water was not required, only if the City could find a buyer. Under these conditions, the raw water cost is \$1.53 per thousand gallons. The 100 acrefeett capacity translates to 31.8 million gallons. This quantity of water could be very useful in a drought situation to help supplement or supply raw water through a dry month or two.

It is recommended that the City attempt to negotiate an emergency use arrangement by which other leasers would commit to re-sell water to the City only if required. This arrangement is anticipated to be more cost effective in the long term even if the unit cost of emergency supply water was several times more expensive than \$500 per acre-foot. In a water shortage situation severe enough to warrant use of this source, it is also recommended that the unit cost for the purchased water be added as a surcharge to customer's water bills during declared curtailment stages as a further conservation measure. Let us assume that the City could negotiate an arrangement whereby water was available on emergency demand for \$1000 or even \$1,500 per acre-foot payable only upon demand. The City is not anticipated to require additional water except for a period of days. Furthermore, on the highest demand day of the year in 2023, 2.41 CFS could be required and 1.70 CFS is met from Ferry and Geiger Creeks. Therefore, during a record low flow month, the cost for up to .71 CFS per day (458,853 gpd or .711 acre-foot per day) for 7 days would be \$4,977 to \$7,466. A reserve fund established for this purpose is anticipated to be much less expensive than any infrastructure improvements, which might be constructed.

Johnson Creek Reservoir

The Johnson Creek Reservoir project is in the development stage with the Bandon Cranberry Water District as the sponsoring agency. Most of the project participants are cranberry farmers. Progress has been made regarding permits and environmental studies, but these are not yet complete. The City has committed \$150,000 to be set aside for this project which will address studies, design, permitting and all other costs apportioned to the City up to the sale of construction bonds. Preliminary design estimates provide for a total storage volume of 1,100 acre-feet, of which 200 acre-feet would be for use by the City of Bandon. To deliver water from the reservoir to the City of Bandon would require a pump station able to pump approximately 300 to 350 gallons per minute a distance of 2500 feet to a release point in upper Geiger Creek. The cost of this pump unit and 2500 feet of 8 inch pipe is estimated to be \$50,000 for the station and \$75,000 for the pipe line.

This project still requires the Environmental Wetland delineation to be completed and the in reservoir habituate study to be completed. It appears likely that the fish ladder requirement will be waived based upon planned mitigation activities which include removal of stream blockage about 1/2 mile downstream from the proposed reservoir and fish passage culvert construction on nearby steams. The dam will also include provision of a cone value for aeration of overflow. Hydraulic studies need to be completed to confirm the annual fill nature of the proposed impoundment.

Progress on the reservoir has slowed due to the drop in cranberry prices from about \$70 a unit to \$18 per unit. Cranberry prices are again rising. It is anticipated that the project will again become active in about 2 years. At this time, geo-technical investigations, final design and construction can be expected to take another 2 to 3 years.

The construction cost is estimated to be between \$2 million and \$3 million depending on land purchase costs and the results of the geotechnical investigations, which may dictate sealing near the proposed dam location. Therefore, the City's share to bond is estimated to be (200/1100) x \$3 million or \$546,000. Operation and Maintenance costs in the future are expected to be about \$20/acre-foot per year or \$4,000 per year. 200 acre-feet per year or 65.17 million gallons would supply the required difference between Geiger and Ferry Creek supplies during drought years (1.7 CFS or 1.099 MGD available) and the projected maximum month average day demand of 1.33 MGD well past the year 2053.

5.6.3 Other Conservation Measures

No other water conservation measures have been identified.

5.7 Water to be Diverted Under Existing Permits

Requirement: If any expansion or initial diversion of water allocated under existing permits is necessary to meet the needs shown in section (3)[5.4 Water Demand Projections] of this rule, a quantification of the maximum rate and monthly volume of water to be diverted under each of the permits.

The City of Bandon requests a pumping rate authorization under the permits for Ferry Creek and Geiger Creek to allow for an instantaneous combined rate of 2.80 CFS by the end of the 20 year planning period (yr 2023). At the present time, the water from Simpson Creek is not used but is anticipated to be re-developed within the 20 year planning period. It is requested that pumping authorization for up to 2.0 CFS be authorized for the 20 year planning period for Simpson Creek. It is anticipated that the Spring Creek source would be utilized in the event of an emergency due to equipment failure, natural disaster, sabotage, contamination, or other interruption of the Ferry or Geiger Creek Sources.

5.8 Mitigation Actions

Requirement: For any expansion or initial diversion of water under existing permits, a description of mitigation actions the water supplier is taking to comply with legal requirements including but not limited to the Endangered Species Act, Clean Water Act, Safe Drinking Water Act.

At the present time, the City is not required to undertake any mitigation actions or take any actions to comply with regulations or other requirements. As specific projects are developed, all legal and regulatory requirements will be complied with.

5.9 New or Additional Water Rights

Requirement: If acquisition of new water rights will be necessary within the next 20 years to meet the needs shown in section (3) [5.4 Water Demand Projections] of this rule, an analysis of alternative sources of the additional water that considers availability, reliability, feasibility and likely environmental impacts and a schedule for development of the new sources of water. The analysis shall consider the extent to which the need for new water rights can be eliminated through:

(a) Implementation of conservation measures identified under OAR 690-086-0150;
(b) Interconnection with other municipal supply systems and cooperative regional water management; and

(c) Any other conservation measures that would provide water at a cost that is equal to or lower than the cost of other identified sources.

5.9.1 Conservation Measures

As noted previously in Section 5.6.1, the City of Bandon's water consumption and conservation record is already enviable in comparison to many Oregon Communities. Further conservation measures, beyond those already in place, do not appear likely to provide additional water.

5.9.2 Cooperative Regional Water Management

Under the plans to obtain water from either Windhurst or Johnson Creek reservoirs, water rights with be held by the cranberry growers association rather than by the City of Bandon.

5.9.3 Other Conservation Measures

No other water conservation measures have been identified.