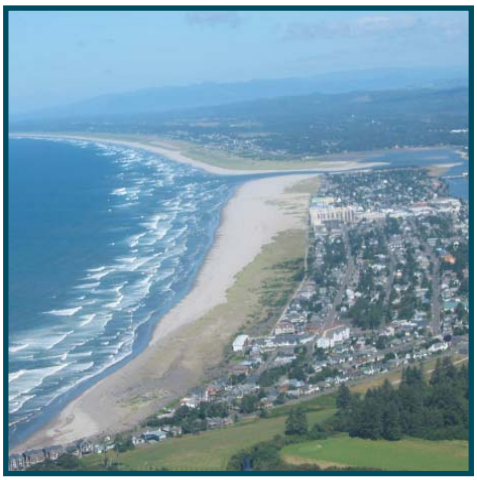
NW Coastal Water Supply Task Force

Phase 1 – Water Supply Project



MSA
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May 2009

PHASE 1 – WATER SUPPLY PROJECT

FOR

NW COASTAL WATER SUPPLY TASK FORCE

MAY 2009

EXPIRES 6/30/10

Preparation of this report was funded in part from Oregon Lottery proceeds with a technical assistance award from the Water/Wastewater Financing Program administered by the State of Oregon Economic and Community Development Department.

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08-0999.401

EXECUTIVE SUMMARY

Authorization

On November 13, 2008, the consulting engineering firm of Murray, Smith & Associates, Inc. (MSA) was authorized by the NW Coastal Water Supply Task Force, acting through the City of Seaside, to prepare Phase 1 of this water supply plan.

Purpose

The purpose of this plan is to collaboratively prepare an assessment of current and future water needs, existing available resources and water supply alternatives to meet future needs within the task force partners' water service areas. The task force partners include the cities of Astoria, Warrenton, Gearhart and Seaside as well as the Youngs River Lewis & Clark Water District.

Study Area

The study area for this planning analysis includes the water service areas for each of the task force partners. A regional map with service areas shown is included as Appendix A.

Population Estimates

Estimates of the existing and proposed population within the task force study area were developed through a review of planning data provided by task force partners, Clatsop County population data and Portland State University Population Research Center (PRC) population estimates. The PRC develops estimates of the population within all Oregon cities' limits on July 1st of each year. These estimates are based on U.S. Census Bureau census counts developed and published every ten years. Annual estimates are developed by the PRC through analysis of supplemental demographical data.

Existing Population

The task force partners currently provide potable water to approximately 35,726 people. Table ES-1 summarizes existing, 2008 populations for each task force partner.

Population Forecasts

Population forecasts for each task force partner have been developed and summarized in Table ES-2. Forecasts are presented in five-year increments from 2015 to 2030 and ten-year increments from 2030 to 2050.

Table ES-1
Existing Population Summary

Task Force Partner	Existing Population
Astoria	11,645
Gearhart	1,220
Seaside	13,011
Warrenton	7,350
Youngs River Lewis & Clark Water District	2,500
Total	**34,161**

Table ES-2
Population Forecast Summary

Year	Astoria	Gearhart	Seaside	Warrenton	YRLCWD	TOTAL
2015	12,796	1,200	14,574	8,024	2,643	37,646
2020	13,430	1,254	16,015	8,508	2,751	40,354
2025	13,993	1,312	17,659	8,800	2,863	43,009
2030	14,586	1,373	19,560	9,106	2,979	45,972
2040	15,888	1,541	23,999	10,316	3,226	53,305
2050	17,317	1,729	29,444	11,740	3,494	62,026

Water Demand Estimates

Water demand estimates were developed from a review of historical water consumption records provided by each of the task force partners and population forecasts presented earlier in this section. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), million gallons per day (mgd) or gallons per minute (gpm). Demands are also related to per capita use as gallons per capita per day (gpcd).

Existing Water Demands

The existing water use data summarized in Table ES-3 is an estimate of all water usage (residential, commercial, industrial and institutional) for each task force partner for the year given in parentheses. For each task force partner, the latest available water demand data was used. This usage data has been applied to the historical population for that year to determine a per capita water usage for each partner's water system. The per capita water demands presented in Table ES-3 are based on total system usage and include commercial and industrial water usage. Based on the most recent historical water usage patterns the task force study area's average daily demand is approximately 6.8 mgd with an average daily per capita consumption for each task force partner ranging from approximately 104 to 293 gpcd.

The study area's combined maximum day demand is approximately 11.3 mgd with individual partners' maximum day per capita consumption ranging from 197 to 473 gpcd.

Table ES-3
Existing Water Use Summary

Task Force Partner	Historical Water Demand			
	Average Day Demand (ADD)		Maximum Day Demand (MDD)	
	mgd	gpcd	mgd	gpcd
Astoria (2008)[1]	2.3	199	3.8	325
Gearhart (2007)[2]	0.3	245	0.5	422
Seaside (2004)[3]	1.8	149	3.0	249
Warrenton (2008)[4]	2.2	293	3.5	473
YRLCWD (2000)[5]	0.2	104	0.5	197
Existing Total Demand	**6.8**	**-**	**11.3**	**-**

Water Demand Projections

Projections of future water demands were developed from each task force partner's historical per capita water usage presented in Table ES-3 and population forecasts presented in Table ES-2. Projected average and maximum day water demands are developed by multiplying the estimated historical per capita water usage by the anticipated population for each task force partner for the given year. Anticipated water demands for each task force partner are summarized in Table ES-4 and Table ES-5.

Table ES-4
Projected Average Daily Demand Summary

Year	Average Daily Demand (ADD) (mgd)					
	Astoria	Gearhart	Seaside	Warrenton	YRLCWD	Total ADD
2015	2.5	0.3	2.2	2.3	0.3	**7.6**
2020	2.7	0.3	2.4	2.5	0.3	**8.1**
2025	2.8	0.3	2.6	2.6	0.3	**8.6**
2030	2.9	0.3	2.9	2.7	0.3	**9.1**
2040	3.2	0.4	3.6	3.0	0.3	**10.5**
2050	3.4	0.4	4.4	3.4	0.4	**12.1**

Table ES-5
Projected Maximum Day Demand Summary

Year	Maximum Day Demand (MDD) (mgd)					
	Astoria	Gearhart	Seaside	Warrenton	YRLCWD	Total MDD
2015	4.2	0.5	3.6	3.8	0.5	**12.6**
2020	4.4	0.5	4.0	4.0	0.5	**13.4**
2025	4.5	0.6	4.4	4.2	0.6	**14.2**
2030	4.7	0.6	4.9	4.3	0.6	**15.1**
2040	5.2	0.7	6.0	4.9	0.6	**17.3**
2050	5.6	0.7	7.3	5.6	0.7	**19.9**

Existing Water Supply Source Facilities

The existing water supply sources and capacity summaries for each task force partner are presented in Tables ES-6 and ES-7. A water supply system's ability to deliver water to customers is controlled by the supply system component or facility with the smallest capacity, referred to herein as delivery capacity.

Table ES-6
Existing Water Supply Sources

Source Description	Estimated Drought Capacity (mgd)	Water Right Capacity (mgd)	Water Treatment / Delivery Capacity (mgd)
Astoria			
Bear Creek Diversion	NA	9.70	4.20
Raw water storage reservoirs			
Cedar Creek Diversion		1.29	
Seaside			
South Fork Necanicum River Diversion	0.26	5.17	4.00
Main Stem Necanicum River Intake	1.16	4.52	
Warrenton			
Lewis & Clark River Intake	3.70	16.16	6.00
South Fork Lewis & Clark River Intake			
Heckard Creek Intake		1.29	
Youngs River Lewis & Clark Water District			
South Fork Barney Creek Intake	NA	3.88	0.40
North Fork Barney Creek Intake			

Table ES-7
Raw Water Storage Summary

Reservoir Description	Capacity (mg)	Water Right Capacity (mg)
Astoria		
Bear Creek Reservoir	220	220
Middle Lake	50	
Wickiup Lake	100	162
Seaside		
Peterson Point Reservoir	50	55
Warrenton		
Raw Water Storage Reservoir	17	NA

Projected Water Needs

Future regional water supply needs are determined by examining conditions of lowest water availability and greatest water demand. In the North Coast region this worst case occurs during the warm, dry summer months when low streamflows, which supply the majority of drinking water in the region, occur concurrently with higher demand from increased tourist populations and water needs for irrigation.

Two different measurements of water demand are used to forecast supply needs. The first measure is maximum day demand (MDD), previously presented in Section 2, which is the maximum water demand over a single 24-hour period within a given year. MDD generally occurs in the summer months and drinking water systems are normally designed with capacities sufficient to meet these demands. Projected MDD for each of the task force partners' service areas was summarized in Table ES-5.

Peak Season Supply and Demand

The second measure is peak season demand (PSD) which is the total water demand over the 122 days of the peak season, typically from June 1st to September 30th. PSD influences the size of raw water storage facilities because a water system must have adequate reserves to provide water to treatment and transmission systems when streamflows are consistently insufficient to meet MDD. PSDs are determined in this study using multipliers of average day demand (ADD) spread over the 122 days of the peak season. These multipliers are established through a review of historical usage patterns, previous water system planning efforts and water use characteristics of similar communities. ADD for each task force partner was summarized in Table ES-4. Calculated PSDs are summarized in Table ES-8 based on multipliers ranging from 1.1 to 1.5.

Table ES-8
Peak Season Demand Summary

Year	Peak Season Demand (million gallons (mg))					
	Astoria	Gearhart	Seaside	Warrenton	YRLCWD	TOTAL
2008	336.7	53.1	241.6	327.9	35.6	**994.8**
2015	372.6	53.7	291.9	357.9	40.1	**1,116.3**
2020	391.1	56.2	320.8	379.5	41.7	**1,189.3**
2025	407.5	58.8	353.7	392.6	43.4	**1,256.0**
2030	424.7	61.5	391.8	406.2	45.2	**1,329.5**
2040	462.6	69.0	480.7	460.2	49.0	**1,521.5**
2050	504.2	77.4	589.8	523.7	53.0	**1,748.2**

Existing PSDs, drought surface and groundwater capacities and existing raw water storage are summarized in Table ES-9. Total PSD for all task force members in 2050 is approximately 1.75 billion gallons; existing raw water storage reservoirs and drought capacities of peak season supplies provide a total capacity of 1.66 billion gallons, leaving a 2050 peak season deficit of approximately 90 mg.

Table ES-9
Peak Season Supply and Demand Summary

Task Force Partner	2050 PSD (mg)	Existing Drought Supply Capacity (mg)	Existing Storage (mg)	2050 Peak Season Deficit (mg)	2050 Peak Season Surplus (mg)
Astoria	504.2	201.0	270.0	33.2	
Gearhart	77.4	23.2	-	54.2	
Seaside	589.8	173.2	50.0	366.6	
Warrenton	523.7	451.4	17.0	55.3	
YRLCWD	53.0	473.4	-	-	420.4
TOTAL	**1,748.1**	**1,322.2**	**337.0**	**509.3**	**420.4**
			2050 Regional Storage Need (mg)		**88.9**

Water Loss

Water loss is the difference between the measured water used by the system and the amount of water paid for by customers plus unmetered authorized water use such as that used for public park watering. The majority of un-accounted for water loss happens through leaks in the transmission and distribution systems or storage reservoirs. Division 86 of Oregon Administrative Rule (OAR) 690 requires that water providers record water loss in their

supply systems. Providers with water losses in excess of 10 percent are required to develop a leak detection and reduction program. Limited data is available to evaluate water loss among the task force partners but based on available data, it appears that water losses exceed this 10 percent threshold for task force members.

Water Conservation Options

Due to relatively high water loss percentages throughout the region, likely the greatest contribution to water conservation will be through identification and repair of existing system leaks. During task force meetings, City of Warrenton staff identified a finished water storage reservoir as a major source of water loss that they are currently working to repair. The City of Astoria's 1996 Water Supply Study identified a large amount of water loss through the Wickiup Lake storage reservoir. Repair of this 100 mg reservoir could increase the City's raw water storage yield significantly. The City of Seaside recently discovered and repaired a large transmission main leak which has reduced system water loss by an estimated 600,000 gallons per day.

Water Management and Conservation Plans (WMCPs) include evaluations of individual water system use characteristics and recommend long-term conservation measures which may include system leak correction, updating water service metering, improved water use monitoring and public education about water use efficiency. Requirements for WMCPs are outlined in Division 86 of OAR 690. Although WMCPs are only required when prescribed by OWRD as a condition of a water use permit or permit extension or other order of the Oregon Water Resources Commission, a WMCP for each task force partner could identify the most effective measures for water conservation in each system.

Water Supply Alternatives

A wide range of water supply alternatives were evaluated as potential regional supply sources. Each of these thirteen alternatives is briefly summarized as follows:

- *Alternative No. 1 - Youngs River raw water storage:* Develop a raw water storage impoundment on the Youngs River under existing storage permit R2568 held by the City of Astoria. Due to land acquisition issues it may be necessary to amend the existing right to move the reservoir to a new location to be determined in a potential siting study although there is currently limited precedence for such an amendment. New transmission and treatment facilities would also be required as part of this project.

- *Alternative No. 2 - Youngs River intake with treatment at YRLCWD treatment plant:* Develop river intake facilities on the Youngs River under existing water right permit S7257 held by the City of Astoria. Apply for an amendment to the permit allowing water use region wide. A transmission main and pump station would be required as part of this project to transmit water approximately 2,500 feet from the river up to the existing YRLCWD water treatment plant. The City of Astoria owns property at the point of

diversion on the Youngs River which could potentially serve as a site for pumping facilities. Based on MDD projections for the YRLCWD, treatment capacity at the existing plant must be expanded by 2025 if it is to serve as a regional supply facility.

- *Alternative No. 3 - Develop existing Big Creek water right:* Construct river intake, pump station, power supply facilities and approximately 5 miles of transmission piping to develop the City of Astoria's existing water right permit S3945 on Big Creek. Apply for an amendment to the permit allowing water use region wide. The transmission main piping would have to cross varied and rough terrain.

- *Alternative No. 4 - Share supply from Astoria's existing storage impoundments:* Construct expanded treatment facilities and transmission piping from Astoria's existing water supply system across the Youngs and Lewis & Clark Rivers connecting YRLCWD and Warrenton's distribution systems to Astoria. Gearhart and Seaside would be supplied through Gearhart's existing intertie with the City of Warrenton. Apply for an amendment to Astoria's existing water rights allowing water use region wide. By 2040, excess supply in Astoria's existing storage impoundments is projected to be consumed by local demand and thus not available for regional supply beyond that point in time. Leaks in the Wickiup Lake reservoir could also be repaired to fully use available storage in this facility.

- *Alternative No. 5 - Storage of excess winter supply from Gearhart wellfield:* Develop a raw water storage reservoir to capture excess winter capacity in Gearhart's wellfield. New water treatment and transmission facilities would also be needed. The wellfield is currently under development and thus the ultimate winter season production yields may vary from those presented above, which are based on the City's existing groundwater rights.

- *Alternative No. 6 - Additional winter raw water storage in Seaside:* Develop a raw water storage reservoir to capture excess winter capacity in the Necanicum River. Further study is needed to determine the ideal location and siting for this reservoir. Additional transmission piping may also be needed as well as acquiring additional water rights to store the captured water.

- *Alternative No. 7 - Develop existing Brandis Creek water right:* Construct intake facilities on Brandis Creek southeast of Seaside. Connect to existing transmission main from the South Fork diversion. Apply for an amendment to the permit allowing water use region wide.

- *Alternative No. 8 - Replace and upsize Warrenton's transmission main and build new raw water storage:* Replace and upsize raw water transmission main from river intakes to WTP to fully capture existing water right capacity during the winter months when streamflows are high. Store this captured water in a new raw water storage reservoir. In addition to requiring transmission connections to YRLCWD and Astoria and new

treatment facilities, this alternative would also require new water rights for water storage, amendment to existing water rights to allow water use region wide and a siting study to identify a suitable location for the new storage facility.

- *Alternative No. 9 - Use excess capacity in Warrenton's existing system:* A portion of the City's existing raw water storage capacity could be shared as a regional supply without hindering the City's ability to supply its existing and forecasted future customers during peak demand times. Construction of additional treatment facilities and transmission connections to Astoria and YRLCWD would also be required as part of this alternative as well as amending existing water rights to allow water use region wide.

- *Alternative No. 10 - Expand YRLCWD's Barney Creek supply:* A portion of the District's existing Barney Creek water supply capacity could be shared as a regional supply during peak demand times pending verification of peak season streamflow and amendment of water rights to allow water use region wide. Construction of additional treatment and transmission connections to Astoria and Warrenton would also be required as part of this alternative.

- *Alternative No. 11 - Development of regional surface water rights and raw water storage:* Based on water availability data from OWRD, capacity is available for new surface water rights during the winter months in both the Klaskanine and Necanicum Rivers. Development of this available water to serve MDD needs would require the construction of raw water storage reservoirs, treatment facilities and extensive transmission mains in addition to applications for water rights for both the consumption and storage of diverted surface water.

- *Alternative No. 12 - Groundwater supply development:* Explore potential groundwater supplies in two areas; in the Clatsop Plains Aquifer near Gearhart's existing wellfield and southwest of Seaside near Tillamook Head.

- *Alternative No. 13 - Desalination:* Develop a desalination plant along the coastal areas of Clatsop County which could provide a consistent and adequate supply of water for the region regardless of season or streamflow conditions. Desalination plants are costly to construct and maintain due to frequent filter replacement for reverse osmosis plants and high energy use for thermal distillation. Construction of a desalination plant would also require extensive transmission facilities and would likely have a lengthy permitting process due to environmental concerns.

Evaluation Criteria for Regional Water Supply Alternatives

Three broad criteria are used to evaluate the planning-level supply alternatives presented in this section; water right acquisition and water availability, permitting and regulatory compliance, and relative project cost. Each of these criteria is assigned a value between 1 and 5 for each of the water supply alternatives discussed in this section, with 1 being the

most difficult or costly and 5 being the simplest or most economical. Those alternatives with the highest total scores in this table are considered to be the most feasible alternatives for regional supply based on the available data from each of the task force partners, OWRD water availability and water right data.

Alternative Evaluation Findings

All supply alternatives and their respective scores are summarized in Table ES-10. The total scores reflect each alternative's score for the associated screening criteria. A full discussion of the screening criteria and scoring process is presented in Section 5.

Table ES-10
Regional Supply Alternatives Evaluation Matrix

Regional Supply Alternative No.		Water Right Acquisition and Water Availability	Permitting and Regulatory Compliance	Relative Project Cost	Fatal Flaw (Peak Season Supply Availability)	TOTAL
1	Youngs River raw water storage	1	2	3		**6**
2	Youngs River intake with treatment at YRLCWD treatment plant	3	3	4		**10**
3	Develop existing Big Creek water right in Astoria	3	3	1		**7**
4	Share supply from Astoria's existing storage impoundments	3	5	3	Yes	**11**
5	Storage of excess winter supply from Gearhart's wellfield	1	2	4		**7**
6	Additional winter raw water storage in Seaside	1	2	3		**6**
7	Develop existing Brandis Creek water right in Seaside	3	4	4	Yes	**11**
8	Replace and upsize Warrenton transmission main and build new raw water storage	1	2	3		**6**
9	Use excess capacity in Warrenton's existing system	3	4	4		**11**
10	Expand YRLCWD's Barney Creek water rights	3	5	3		**11**
11	Develop dedicated regional surface water rights and raw water storage- Klaskanine and Necanicum Rivers	1	2	1		**4**
12	Groundwater supply development	1	2	1		**4**
13	Desalination	1	1	1		**3**

Table ES-10 identifies Alternatives Nos. 2, 9 and 10 as the water supply alternatives with the three highest total scores. These three alternatives appear to be the best conceptual level options for consideration as water supply sources based on the criteria described above as

well as available data from each of the task force members and OWRD. Alternative No. 2 uses Astoria's existing surface water rights and the nearby YRLCWD water treatment plant to supply water from the Youngs River. Alternative No. 9 uses estimated excess supply capacity in the City of Warrenton's water system including existing surface water rights and treatment facilities. Alternative No. 10 uses estimated excess capacity in the YRLCWD's existing water system.

Fatal Flaw Summary

Based on a review and evaluation of the alternatives it was determined that Alternatives Nos. 4 and 7 had fatal flaws and should not be considered as potential regional supply sources. According to peak season demand projections, Astoria's existing storage impoundments are approaching full allocation to local supply during the summer months. Seaside's Brandis Creek water right is unlikely to contribute a significant amount of water to regional supply particularly during the summer months when the City's primary source, the South Fork of the Necanicum River to which Brandis Creek is a tributary, is fully allocated to local needs.

Regional and Sub-Regional Alternatives

The cost of building transmission facilities to convey water from source alternatives to demand centers has a significant impact on the relative cost scoring of each alternative. Thus in the short-term, sharing of existing supplies as suggested, for example, in Alternative No. 9 from the City of Warrenton may be more cost effective because of the City's existing infrastructure and existing intertie with the City of Gearhart. However, in the long-term Warrenton's existing system will be unable to supply the total regional treatment and storage deficits as presented in Section 4. This suggests that since Alternative No. 9 may have capacity to meet all of the needs of some, but not all of the partners, it may be considered as a sub-regional, rather than a fully regional supply alternative. Following this reasoning, Alternative No. 6, raw water storage in Seaside and Alternative No. 10, expansion of YRLCWD Barney Creek supply would also be considered sub-regional alternatives. Section 7 presents recommendations for further evaluation of supply alternatives as regional or sub-regional.

Environmental and Regulatory Issues and Permits

Development of water supply facilities, particularly raw water storage reservoirs, involves complying with environmental and land use regulations to successfully plan, permit and complete the project. Key regulatory interests for potential water supply projects are described in Section 5. They include the federal, state and local governmental entities that would review and make recommendations or issue permits for the prospective project. A preliminary summary of anticipated governmental interest and permits is presented in Table ES-11.

Table ES-11
Regulatory Interests

Agency/Government Entity	Jurisdiction/Interest	Required Approval/Permit
U.S. Federal Interest		
US Army Corps of Engineers (COE)	Wetlands	Clean Water Act (CWA) Sect. 404 Permit- Removal/Fill
US Fish & Wildlife Service (FWS)	Fish and wildlife (ESA, etc.)	ESA Sect. 7; Issues Biological Opinion.
Bureau of Land Management (BLM)	BLM lands	Special Use Permit (for projects on BLM land)
Bureau of Reclamation	Flood control, irrigation, & hydropower.	Depends on their involvement in the project.
National Oceanic and Atmospheric (NOAA - Fisheries)	ESA - Anadromous fish Administration - Fisheries	ESA Sect. 7 (issues Biological Opinion).
Environmental Protection Agency (EPA)	Environmental impacts (w/major fed. actions)	EA/EIS cooperating agency
Federal Energy Regulatory Commission (FERC)	Federal Power Act	License nonfederal hydropower projects and grant exemptions
US Forest Service (USFS)	Nat. forest land & roads	USFS roadway relocations
Oregon State Interests		
Division of State Lands (DSL)	Wetlands	Removal-Fill Permit (joint permit w/COE)
Dept. of Fish & Wildlife (ODFW)	State fish and wildlife	Fish passage
Water Resources Dept. (OWRD)	Water rights, dam and well construction, and safety	Plan review, reservoir & transfer permits for water rights.
Dept. of Environmental Quality (DEQ)	Water quality	CWA Sect. 401/ water quality certification
Dept. of Human Services Public Health Division (DHS)	Drinking water	Plan review & water quality
Dept. of Transportation (ODOT)	Water facilities in the state right-of-way	Permit to occupy a state highway
Dept. of Geology & Mineral Industries (DOGAMI)	Mining permit for quarry development	Plan review for quarry development
Local Interests		
Clatsop County Land Use Planning	County lands & zoning	Conditional Use Permit
Clatsop County Roads	County roads	May vary
Watershed councils	Local watershed for alternative considered	

Governance Alternatives

Each of the task force partners has existing legal and governance structures in place as a municipal water provider. Five alternative governance vehicles are presented below for consideration as potential organizational frameworks. These five alternatives with their respective Oregon Revised Statute (ORS) chapters are as follows:

- Intergovernmental Agreement – Oregon Revised Statues (ORS) 190
- People's Utility District – ORS 261
- Domestic Water Supply District – ORS 264
- Regional Service District (Similar to Metro created under ORS 268) – New ORS created by Legislature
- Joint Water Authority – ORS 450

The following attributes were considered as part of the evaluation of each governance alternative:

- Statutory authority
- Formation and security of boundaries
- Voting
- Ownership
- Operations and maintenance
- System expansion
- Latecomers
- Capital financing
- Financial risk sharing
- Resource planning
- System management and reliability
- Applicable laws
- Dissolution

The key attributes of the alternatives are summarized as follows:

1. Only ORS 190 (Intergovernmental Agreement) allows appointment of the governing body by the members forming the new agency. All others require election of the board members by the public.
2. All of the potential governing entities, except those created under ORS 190, can issue general obligation bonds or levy property taxes.
3. All governing entities can issue revenue bonds, however ORS 190 entities must have permission from each member agency who are responsible for the bonds.
4. The ORS 190 organization provides the least inherent liability protection for the participants, since they remain directly responsible for the organization through the intergovernmental agreement.
5. Only the ORS 190 organization allows the participants or organizers to define specific limitations on the powers of the agency, including limitations on the use of eminent domain, operation of distribution systems, etc. The other agencies would be autonomous agencies, whose powers are limited only by the underlying statutes creating them.

6. Taking in new members or expanding the territory served requires a public vote for all except the ORS 190 and ORS 450 entities.

Conclusions and Recommendations

The conclusions presented below summarize the findings of this report and present recommendations for the next steps in the regional planning process.

1. Additional data is needed to confirm existing conditions and to provide refined information for future long-term water supply decisions.
2. The overall population of the task force partners is expected to almost double in the next fifty years.
3. Existing maximum day water demands are estimated at approximately 11.3 mgd for all the task force partners. This number is projected to reach approximately 19.9 mgd by the year 2050
4. The task force partners each have existing water rights from a variety of sources. These water rights and their associated water resources have varying degrees of accessibility and availability.
5. Water needs can be viewed as seasonal with water availability being high in the winter, and low in the summer, when water demands tend to be higher. This finding resulted in the development of water supply alternatives that include capturing and storing available winter water for treatment and use in the summer season.
6. A wide variety of water supply options were evaluated ranging from developing new groundwater and surface water resources to desalination of seawater. Thirteen conceptual level alternatives were developed, scored and screened for fatal flaws.
7. Based on the conceptual level evaluation completed in Section 5 the highest scoring options include consideration of development and use of existing surface water rights in Clatsop County.
8. Five governance alternatives were presented for consideration ranging from the use of individual intergovernmental agreements to the formation of a single regional water supply entity.
9. A number of actions can be taken by the task force partners as a group and individually to better meet the region's near-term and long-term water supply needs.

The following recommendations are presented in order of general priority. It is recommended that certain elements be completed prior to beginning Phase 2 of this regional water supply study and are noted as such:

1. Apply for extensions of expired water right permits from OWRD ***(All Partners)***
2. Confirm actual rates of un-accounted for water and implement leak detection and water loss reduction programs as needed to reduce water losses ***(All Partners)***
3. Review and enact regional or individual conservation activities and practices ***(All Partners)***
4. Document on-going groundwater production and yield results to better determine the long-term yield of the Clatsop Plains Aquifer ***(City of Gearhart)***
5. Complete a cost of service evaluation to establish equitable water cost for intra-regional supply sharing ***(All Partners – Complete prior to Phase 2)***
6. Establish mutual aid agreements between task force partners where existing infrastructure allows emergency water supply sharing ***(All Partners – Complete prior to Phase 2)***
7. Perform streamflow monitoring on Bear Creek to better determine actual seasonal streamflow characteristics ***(City of Astoria)***
8. Repair known leaks in the Wickiup Lake raw water storage reservoir ***(City of Astoria)***
9. Confirm that operation of the Warrenton 17 mg raw water storage reservoir complies with OWRD water right requirements for regional water storage ***(City of Warrenton)***
10. Perform streamflow monitoring on Barney Creek at the existing intakes to better determine actual seasonal streamflow characteristics ***(Youngs River Lewis & Clark Water District)***
11. Formulate a detailed regional water supply strategy by further refining the water supply alternatives presented in Section 5. It is recommended that this strategy include developing a short list of prioritized, preferred options for further action and should include consideration of sub-regional and regional alternatives ***(All Partners – Phase 2 Work Element)***