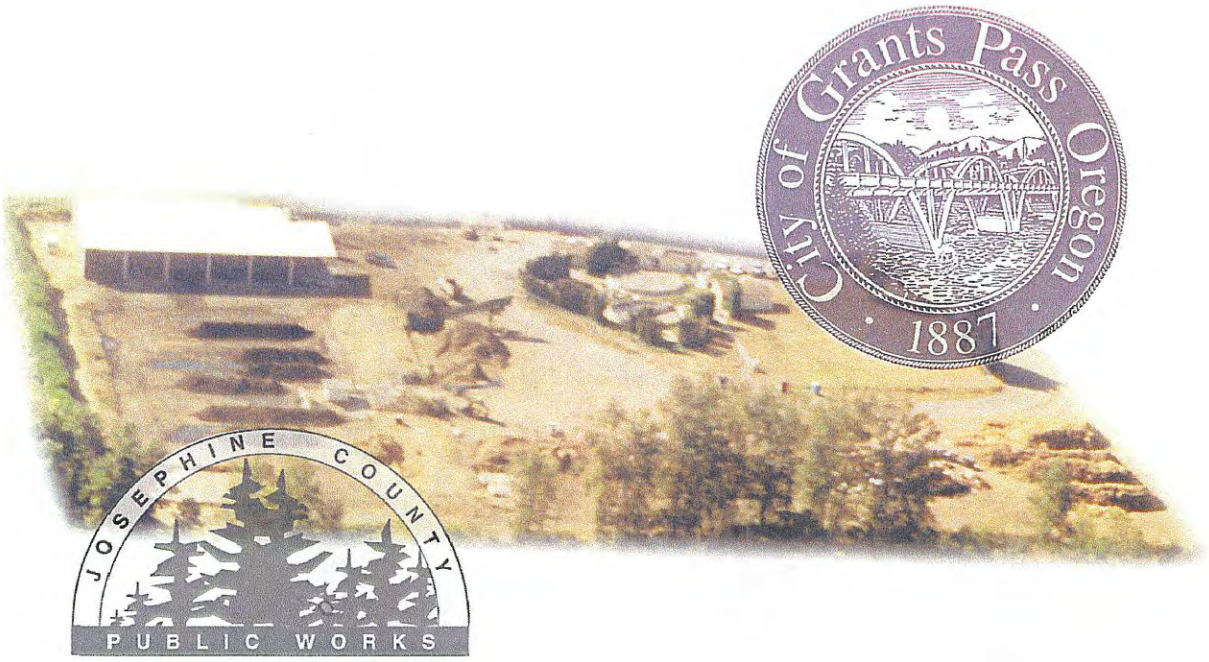
Executive Summary

Redwood Sanitary Sewer Service District
Josephine County, Oregon



Parametrix, Inc.

EXECUTIVE SUMMARY

BACKGROUND

In the late 1960s, the Josephine County Board of Commissioners formed the Redwood Sanitary Sewer Service District (District) in an area 4.8 miles southwest of Grants Pass, Oregon. In 1977-1978, the District constructed a wastewater collection system and treatment plant in the service area. Since then, only minor additions or modifications to both the collection system and/or treatment plant have been made, with exception of a biosolids composting operation that was added to the plant in 1988.

In 1994, Parametrix completed a Wastewater Facilities Plan for the District. The Plan recommended that the plant be upgraded and expanded. However, this action was never implemented due to litigation to shut down the biosolids composting operation at the plant in 1994 and the Oregon Department of Environmental Quality (ODEQ) taking no action to approve the Facilities Plan.

Because the litigation on the composting operation has now resulted in a judgment requiring the compost closure, the existing Facilities Plan is no longer valid. Now the cost of upgrading/expanding the Redwood Wastewater Treatment Plant (Redwood WWTP) has changed. The cost of a new biosolids facility must be added. This means that it now appears that the preferred treatment alternative may no longer be to upgrade/expand the Redwood WWTP, but rather convey wastewater to the Grants Pass Water Restoration Plant (WRP) for treatment. The purpose of this report is to re-evaluate the cost of both of these alternatives.

SERVICE AREA

The current limits of the Redwood Sanitary Sewer Service District's service area encompass an area of approximately 3,480 acres, or 5.4 square miles. The service area lies generally south of the Rogue River, westerly of Allen Creek, northerly of the South Highline Canal of the Grants Pass Irrigation District, and easterly of Rounds Avenue. The service area also includes the Rogue Community College Campus, which lies south of this general area.

The estimated population served by the Redwood wastewater collection system, as of October 1998, is 4,905. The average number of persons per equivalent residential unit (ERU) in the District is 2.42. To estimate future wastewater loads and flows, projections of the population in the service area of the District were developed through a planning period ending in 2020. An annual growth rate of 3.1 percent per year was used based on a consensus between the County and the City of Grants Pass. This resulted in a service area population of 9,600 in 2020.

COLLECTION SYSTEM

The collection system serving the District consists of approximately 16.2 miles of sewers, ranging in size from 8 to 27 inches in diameter. The system experiences very high wastewater flow in the winter. Infiltration and inflow appear to be excessive. The District has agreed to address annual budget allocations for collection system I/I correction as a part of a Sewer System Master Plan to be completed by the District in 2001-02. In the meantime, it is recommended that the District budget $25,000 annually to address infiltration and inflow correction.

TREATMENT PLANT

The Redwood WWTP is located near the intersection of Leonard Road and Rounds Avenue in Josephine County. It is comprised of numerous unit treatment processes, a control/laboratory building, blower/sludge pumping building, and biosolids composting operation.

In 1994, a capacity analysis indicated that the Redwood WWTP's design capacity is 0.6 million gallons per day (mgd) with a peak flow capacity of 1.44 mgd. Because these design flows have been exceeded on occasion, continued operation of the plant requires it be upgraded/expanded.

FUTURE TREATMENT REQUIREMENTS

Based on 2020 population estimates, future wastewater flow and load estimates were developed; these are shown in Table ES-1 and Table ES-2, respectively. Also shown in these tables are flow and load conditions that currently exist at the plant.

Table ES-1
Wastewater Flow Projections, Year 2020

	1996/1998		2020	
	Actual (mgd)	1998 Actual (Gal/cap-day)	Design (mgd)	1998-2020 (Gal/cap-day)
Summer, Max. Month	0.54	120	1.01	100
Winter, Max. Month	1.16	240	1.77	130
Summer Max. Week	0.58	126	1.10	110
Winter Max. Week	1.20	254	1.90	150
Summer, Peak Day	0.76	157	1.43	140
Winter, Peak Day	1.48	364	2.77	275
Summer Average	0.49	99	0.89	85
Winter Average	0.63	129	1.22	125
Annual Average	0.56	114	1.05	105

Table ES-2 Redwood WWTP BOD and TSS Load (lbs/day)		
	1996-1998 Actual	2020 Projection
BOD		
Summer, Max. 30-day average	1,122	2,400
Winter, Max. 30-day average	1,589	3,100
Annual average	843	2,070
TSS		
Summer, Max. 30-day average	1,398	2,340
Winter, Max. 30-day average	1,116	2,500
Annual Average	879	1,980

To properly evaluate upgrading/expanding the existing Redwood WWTP, an analysis of the facility's wastewater discharge permit limits was also made. Since the Redwood WWTP was built in 1978, wastewater discharge requirements have become more strict, particularly in the Rogue River that is used for salmon spawning and domestic water supply.

The level of treatment required for future wastewater flows and loadings was evaluated based on three different requirements:

- Treatment requirements contained in OAR 340-41-375.
- Treatment requirements contained in OAR 340-41-026.
- Treatment requirements based on receiving water quality criteria for the Rogue River.

These regulations would limit the BOD and TSS limits for the Redwood WWTP as shown in Table ES-3 and Table ES-4.

Table ES-3 Anticipated Future BOD and TSS Effluent Limitations Based on OAR 340-41-375							
	Flow (mgd)	Effluent Concentration (mg/L)			Mass Discharge (lbs/day)		
		Monthly	Weekly	Daily	Monthly	Weekly	Daily
Permit Limits Based On Effluent Quality							
Summer, MMDWF	1.06[1]	10	15	—	88	132	176
Winter, MMWWF	1.79[2]	30	45	—	450	675	900

(1) Monthly dry weather flow with 5-year recurrence - MMDWF.
(2) Monthly wet weather flow with 5-year recurrence - MMWWF.

Table ES-4
Anticipated Future BOD and TSS Effluent Limitations
Based on OAR 340-41-026

	Maximum Monthly Flow (mgd)	Effluent Concentration (mg/L)			Mass Discharge (lbs/day)		
		Monthly	Weekly	Daily	Monthly	Weekly	Daily
Permit Limits Based On Effluent Quality							
Summer, Dry Weather	1.06[1]	9	14	18	80	120	160
Winter, Wet Weather	1.79[2]	8	12	16	120	180	240

(1) Monthly dry weather flow with 5-year recurrence - MMDWF.
(2) Monthly wet weather flow with 5-year recurrence - MMWWF.

Since the mass discharge limitations based on OAR 340-41-026 are less than those based on OAR 340-41-375, the stricter limits would normally apply. The District could, however, request ODEQ to allow discharge limits based on the OAR 340-41-375 requirements.

Increases have been accepted by ODEQ, provided that:

(1) No other alternatives exist except to lower water quality.

(2) This action is necessary and justifiable for economic or social development benefits and outweighs the environmental costs of lowered water quality.

(3) All water quality standards will be met and beneficial uses protected.

The District would need to formally apply to ODEQ for a permit modification to increase the mass discharge limits to those based on OAR 340-41-375.

In addition to upgrading the plant to meet the projected flow, load, and new BOD and TSS limits, the Redwood WWTP would also need to be modified to achieve ammonia removal and eliminate effluent chlorine discharge.

TREATMENT ALTERNATIVES

To evaluate the best method for meeting the District's wastewater treatment needs to the year 2020, twelve alternatives were analyzed. These alternatives were separated into three groups, the first and second of which use the Redwood WWTP for treatment. The third group uses the City of Grants Pass WRP for treatment.

- Alternatives 1, 2, and 3 would provide secondary treatment at the existing Redwood WWTP with some ammonia removal. These alternatives would meet the effluent limitations of OAR 340-41-375 and would require a special discharge load limit to the Rogue River by ODEQ. These alternatives included:

  - Construct a new contact stabilization with anoxic selectors process
  - Construct a new sequencing batch reactor (SBR) process
  - Add a trickling filter and modify the existing process

- Alternatives 4 and 5 would provide tertiary treatment at the existing Redwood WWTP and would not require a special discharge load limit to the Rogue River. These two alternatives would meet the effluent limitations of OAR 340-41-026. These alternatives included:

  - ▸ Construct a new anoxic selector process with effluent filtration
  - ▸ Construct a new SBR process with effluent filtration

These five alternatives were the most cost-effective ways to upgrade/expand the Redwood WWTP.

An important consideration when evaluating these treatment alternatives was biosolids treatment. Biosolids are a byproduct of wastewater treatment; they are generated by the process during removal of pollutants from the wastewater. The biosolids generated at the existing Redwood WWTP are currently aerobically digested then further treated in the composting operation.

Because of litigation against the composting operation, however, the District must close operation of the composting facility this year. Therefore, an alternative biosolids treatment method must be included with each of the treatment alternatives using the Redwood WWTP. Because the Grants Pass WRP currently uses anaerobic digesters, this alternative was selected.

Adding new anaerobic digesters to each of the five Redwood WWTP treatment alternatives, however, added significant cost to each of these alternatives. The estimated probable cost of each of these alternatives are shown in Table ES-5.

Table ES-5
Treatment Alternatives 1 through 5
Estimate of Probable Costs (costs in $1,000s)

Wastewater Process	Alt. 1 Contact Stabilization	Alt. 2 SBR	Alt. 3 Trickling Filter	Alt. 4 Complex Mix Anox Select Filter	Alt. 5 SBR Filter
Biofilters	--	--	$719	--	--
Aeration Basin	$1,239	--	--	$1,742	--
Secondary Clarifier	$513	--	$513	$513	--
SBR Basin	--	$1,717	--	--	$1,585
Blower Building	$129	--	--	$129	$123
Primary Sedimentation	--	--	$586	--	--
Package Filtration	--	--	$409	$409	$409
Effluent EQ	--	$95	--	--	$95
Influent Pump Stn Mods	$113	$148	$115	$113	$148
Headworks Mods	$121	$161	$56	$121	$161
UV Disinfection	$315	$315	$315	$315	$315
Site/Civil	$72	$72	$72	$72	$72
Yard Pipe	$72	$72	$72	$108	$108
Electrical	$433	$433	$503	$559	$475
Subtotal	**$3,008**	**$3,014**	**$3,356**	**$4,082**	**$3,491**

Table ES-5 (cont.) Treatment Alternatives 1 through 5 Estimate of Probable Costs (costs in $1,000s)					
Wastewater Process	Alt. 1 Contact Stabilization	Alt. 2 SBR	Alt. 3 Trickling Filter	Alt. 4 Complex Mix Anox Select Filter	Alt. 5 SBR Filter
Biosolids Process	$2,590	$2,590	$2,590	$2,590	$2,590
Contingency, 30%	$1,679	$1,681	$1,784	$2,002	$1,824
Subtotal Construction	**$7,278**	**$7,285**	**$7,730**	**$8,673**	**$7,906**
Engineering and Admin, 22%	$1,601	$1,603	$1,701	$1,908	$1,739
Total Project Cost[1]	**$8,880**	**$8,890**	**$9,430**	**$10,580**	**$9,650**

(1) Rounded to three significant figures.

An estimate of the annual operation and maintenance (O&M) cost of each of these alternatives is shown in Table ES-6, together with the annual O&M of the existing plant.

Table ES-6 Treatment Alternatives 1 through 5 Annual O&M Costs						
	Existing Plant	Alt. 1 Contact Stabilization	Alt. 2 SBR	Alt. 3 Biofilter	Alt. 4 Comp Mix Effluent Filter	Alt. 5 SBR with Effluent Filter
Salary and Wages	$55,500	$73,800	$73,800	$73,800	$84,300	$84,300
Employee Benefits	$18,949	$25,250	$25,250	$25,250	$28,850	$28,850
Supply and Material	$24,808	$27,808	$26,400	$29,800	$31,500	$31,000
Services	$55,835	$77,235	$76,800	$80,500	$82,500	$81,500
Interfund and Inter Gov.	$123,254	$136,700	$135,500	$144,000	$146,000	$145,000
Capital Replace/ Improvements	$39,870	$49,370	$49,370	$51,400	$55,400	$55,400
Subtotal	**$318,216**	**$390,163**	**$387,120**	**$404,750**	**$428,550**	**$426,050**
Anaerobic Digestion	$193,760	$193,760	$193,760	$193,760	$193,760	$193,760
Total O&M Cost[1]	**$512,000**	**$584,000**	**$581,000**	**$599,000**	**$622,000**	**$620,000**

(1) Rounded to three significant figures.

- Alternatives 6 through 12 provide for pumping and transmission facilities to convey all the wastewater to the Grants Pass WRP for treatment. This group of alternatives evaluated conveying wastewater to Grants Pass instead of upgrading the existing Redwood WWTP. The Grants Pass WRP has adequate treatment

capacity available. Each of the conveyance alternatives considered a different sewer force main route between the existing Redwood WWTP and the Grants Pass WRP. These are described as follows:

Alternative 6: Dual 12-inch force mains would be bored under the Rogue River just north of Redwood WWTP, then the force mains would follow the right-of-way of Lower River Road and Western Lane to the Grants Pass WRP.

Alternative 7: A 6-inch force main would be placed in an existing sewer interceptor easement between Redwood WWTP and pump station RI-25. From there dual 12-inch mains would be bored under the Rogue River. From the Lathrop boat landing, the force mains would follow the right-of-way of Lower River Road and Western Lane to the Grants Pass WRP.

Alternative 8: The force main would be placed in the existing sewer interceptor easement between Redwood WWTP and the proposed location of the pedestrian bridge near the Grants Pass WRP. A 6-inch main would be installed to pump station RI-25, then dual 12-inch mains go from there to the Grants Pass WRP. The force mains would be attached to the pedestrian bridge.

Alternative 9: A 6-inch force main would be placed in the existing sewer interceptor easement between Redwood WWTP and pump station RI-25. From there dual 12-inch force mains would follow the right-of-way of Leonard Road and Redwood Avenue to the pedestrian bridge, then to the Grants Pass WRP.

Alternative 10: A 6-inch force main would be placed in the right-of-way of Leonard Road up to pump station RI-25. From there dual 12-inch mains would be bored under the Rogue River and follow the right-of-way of Lower River Road and Western Lane to the Grants Pass WRP.

Alternative 11: A 6-inch force main would be placed in the right-of-way of Leonard Road up to pump station RI-25. From there dual 12-inch force mains would be placed in the existing sewer interceptor easement to the pedestrian bridge, and then to the Grants Pass WRP.

Alternative 12: A 6-inch force main would be placed in the right-of-way of Leonard Road up to pump station RI-25. From there dual 12-inch force mains would follow the right-of-way of Leonard Road and Redwood Avenue to the pedestrian bridge, then to the Grants Pass WRP.

The estimated probable cost of each of these alternatives are shown in Table ES-7, together with their associated force main length and number of anticipated easements required.

Table ES-7
Treatment Alternatives 6 through 12
Estimate of Probable Cost

Treatment Alternative	Pipeline Length	# Ease.	Pipeline	Pump Station	Contingency 30%	Engineering & Admin. 25%	Total[1]
6	26,500	1	$3,240,000	$1,182,000	$1,326,600	$1,105,500	$6,850,000
7	24,000	48	$2,960,000	$1,284,000	$1,273,000	$1,061,000	$6,580,000
8	27,000	77	$2,780,000	$1,284,000	$1,219,200	$1,016,000	$6,300,000
9	29,300	47	$3,000,000	$1,284,000	$1,285,200	$1,071,000	$6,640,000
10	28,600	3	$2,930,000	$1,284,000	$1,264,200	$1,053,500	$6,530,000
11	31,100	32	$3,080,000	$1,284,000	$1,309,200	$1,091,000	$6,700,000
12	33,400	1	$3,230,000	$1,284,000	$1,354,200	$1,128,500	$6,700,000

(1) Rounded to three significant figures.

Also, an estimate of the annual O&M cost of each of these alternatives is shown in Table ES-8 (O&M costs for these alternatives are similar).

Table ES-8
Treatment Alternatives 6 through 12
Annual O&M Costs

Conveyance O&M	Annual Cost
Salary and Wages	$18,000
Employee Benefits	$6,300
Chemicals and Material	$50,000
Power	$11,000
Collection System	$15,000
Subtotal:	**$100,300**
Portion of Grants Pass WWTP O&M	**Annual Cost**
WWTP O&M Cost	$88,500
Billing Services	$22,000
Customer Service	$20,000
Subtotal:	**$130,500**
Grand Total:	**$230,800**

PREFERRED ALTERNATIVE SELECTION

In order to reduce the complexity of evaluating twelve different treatment alternatives for the District, two preliminary screening processes were initially conducted based on cost and impact to residents adjacent to the conveyance pipeline. Treatment Alternatives 1 through 5 were screened to Alternative 1 – Contact Stabilization and Alternative 4 – Complete Mix/Anoxic Selector/Filter. Treatment Alternatives 6 through 12 were screened to Alternative 7 – Easement/Lower River Road and two refinements of Alternative 9, Alternative 9A – Easement/Leonard Road and Alternative 9B – Easement/South River Road. With these last three alternatives, to ensure that the minimum and maximum wastewater flows were properly handled, a dual 12-inch-diameter force main system was included. Two of these alternatives (9A and 9B) included attaching a force main to the proposed pedestrian bridge over the Rogue River near the Grants Pass WRP. Alternative 7 included boring a force main under the Rogue River.

Based on preliminary design criteria and estimated O&M costs, present worth cost estimates for these five remaining treatment alternatives were developed and are shown in Table ES-9.

Table ES-9
Treatment Alternatives 1, 4, 7, 9A, and 9B
Present Worth Cost Estimates (in $1,000s)

	Treatment Alternatives		Conveyance Alternatives		
	Alternative 1 Contact Stabilization	Alternative 4 Complex Mix Effluent Filter	Alternative 7 Easement/ Lower River Road	Alternative 9A Easement/ Leonard Road	Alternative 9B Easement/ South River Road
Subtotal Construction	$7,280	$8,670	$5,520	$5,600	$5,510
Engineering and Admin.	$1,600	$1,910	$1,060	$1,160	$1,150
Total Project Cost	**$8,880**	**$10,580**	**$6,580**	**$6,760**	**$6,660**
Present Worth O&M Cost[1]	$6,870	$7,320	$2,710	$2,710	$2,710
Total Present Worth	**$15,750**	**$17,900**	**$9,280**	**$9,470**	**$9,370**

(1) Present worth based on 6 percent interest for 22 years.

For each of the conveyance alternatives, the City of Grants Pass omitted charging the District a connection charge or System Development Charge (SDC) for treatment at the City's plant. However, even if the City had charged a fee, it would not change the least cost alternative.

As an example, if the City were to charge District customers the SDC currently collected by the District for new developments ($1,966 per ERU), approximately four million dollars would be added to the capital and present worth cost of each conveyance alternative. For Alternatives 7, 9A, and 9B the present worth cost would be $13.28, $13.47, and $13.37 million, respectively. In comparison, the present worth cost of Treatment Alternatives 1 and 4 are $15.75 and $17.9 million, respectively, which are considerably greater. Still, the least cost would be any of the conveyance alternatives.

The next step in the evaluation of these alternatives was to develop a matrix of selection criteria. To help determine the preferred alternative, a list of 22 selection criteria were chosen and then grouped into four categories: Cost Issues, Environmental Issues, Community Issues, and Operation Issues. Two Josephine County representatives, six City of Grants Pass representatives, and the City's attorney made up the committee that ranked each alternative for each of the selection criteria. Through consensus of the participants, the two alternatives (Alternatives 7 and 9B) were then selected as the best alternatives.

These two alternatives were then presented to the Grants Pass City Council, acting as the governing Board for the District, to make their preferred alternative selection. After careful deliberation, the Council selected Treatment Alternative 9B – Easement/South River Road as the preferred alternative.

PREFERRED ALTERNATIVE

The preferred Treatment Alternative 9B – Easement/South River Road consists of the following components which are shown in Figure 1:

- Retrofit the Redwood WWTP influent pump station (RI-0) into a 0.4 mgd capacity submersible pump station and construct a 6-inch force main to RI-25 which would follow the existing interceptor easement route.

- Construct a new pump station north of Darneille Lane (near manhole RI-25) with a capacity of 4.2 mgd and dual 12-inch force mains which would follow South River Road then Leonard Road to the intersection of Leonard Road and Dowell Road. From there, the force mains would generally follow the existing interceptor easement route to the south end of the proposed new pedestrian bridge.

- Attach a single 14-inch force main to the proposed Rogue River pedestrian bridge to be located north of the Josephine County Fairgrounds.

- Construct dual 12-inch force mains from the north end of the proposed pedestrian bridge to the Grants Pass WRP.

To construct this alternative, the total project cost is estimated at $6.7 million. A project schedule to implement this treatment alternative was developed and is shown on Figure 2. The new pump stations and force mains could be operational by mid-October 2000. This is also the projected completion date for the new pedestrian bridge.

FINANCING PLAN

Various project funding scenarios were evaluated to determine the best way for the District to finance this $6.7 million project. After reviewing several scenarios, a preferred alternative was selected. This alternative is to fund the project with approximately $5.4 million of State Revolving Fund (SRF) loan money and approximately $1.3 million of available cash from the District. The District has an additional $0.7 million cash that will be needed for project reserves. With this funding approach, no sewer rates or system development charge increases would be necessary in the District in the next several years.

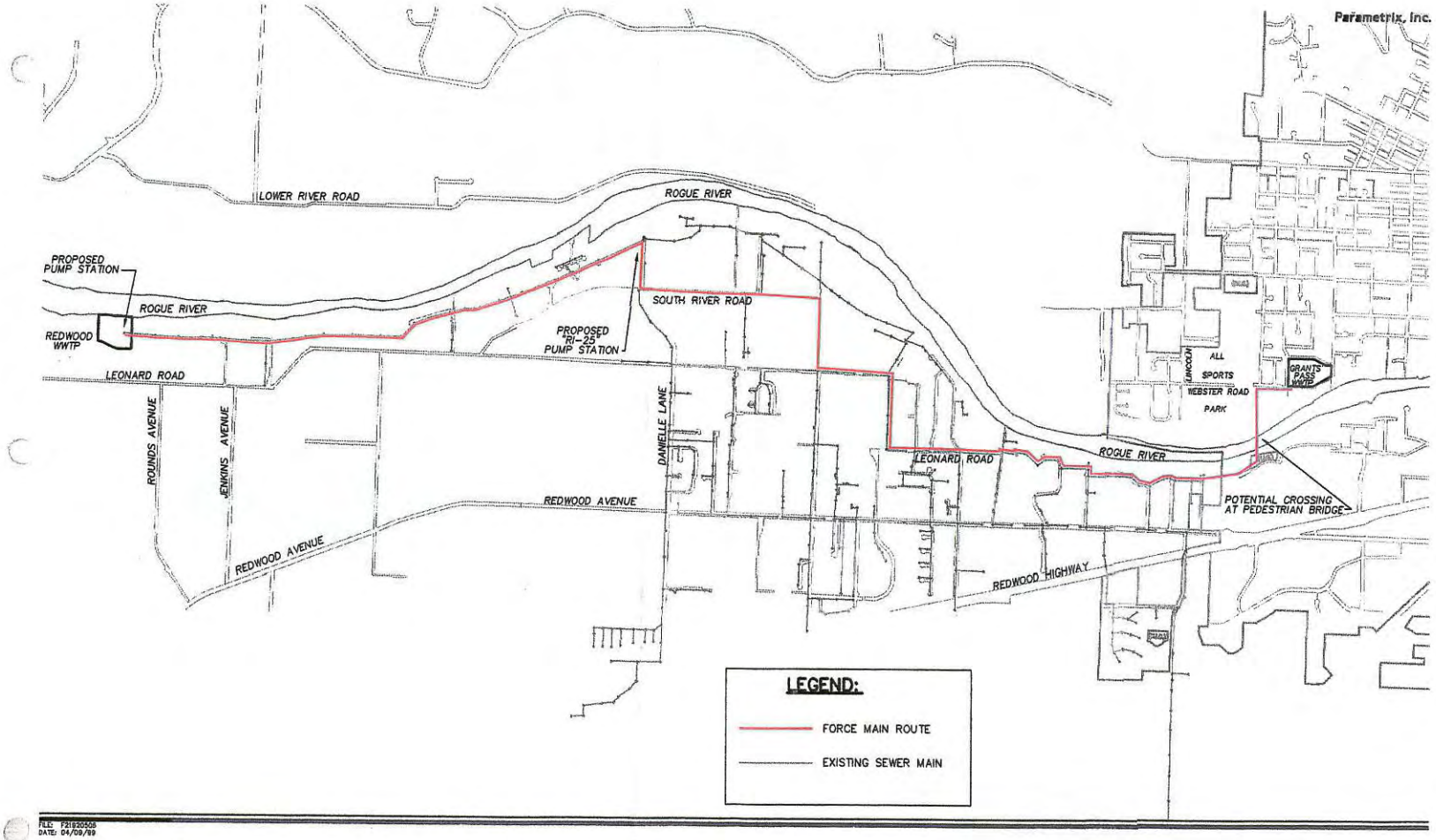
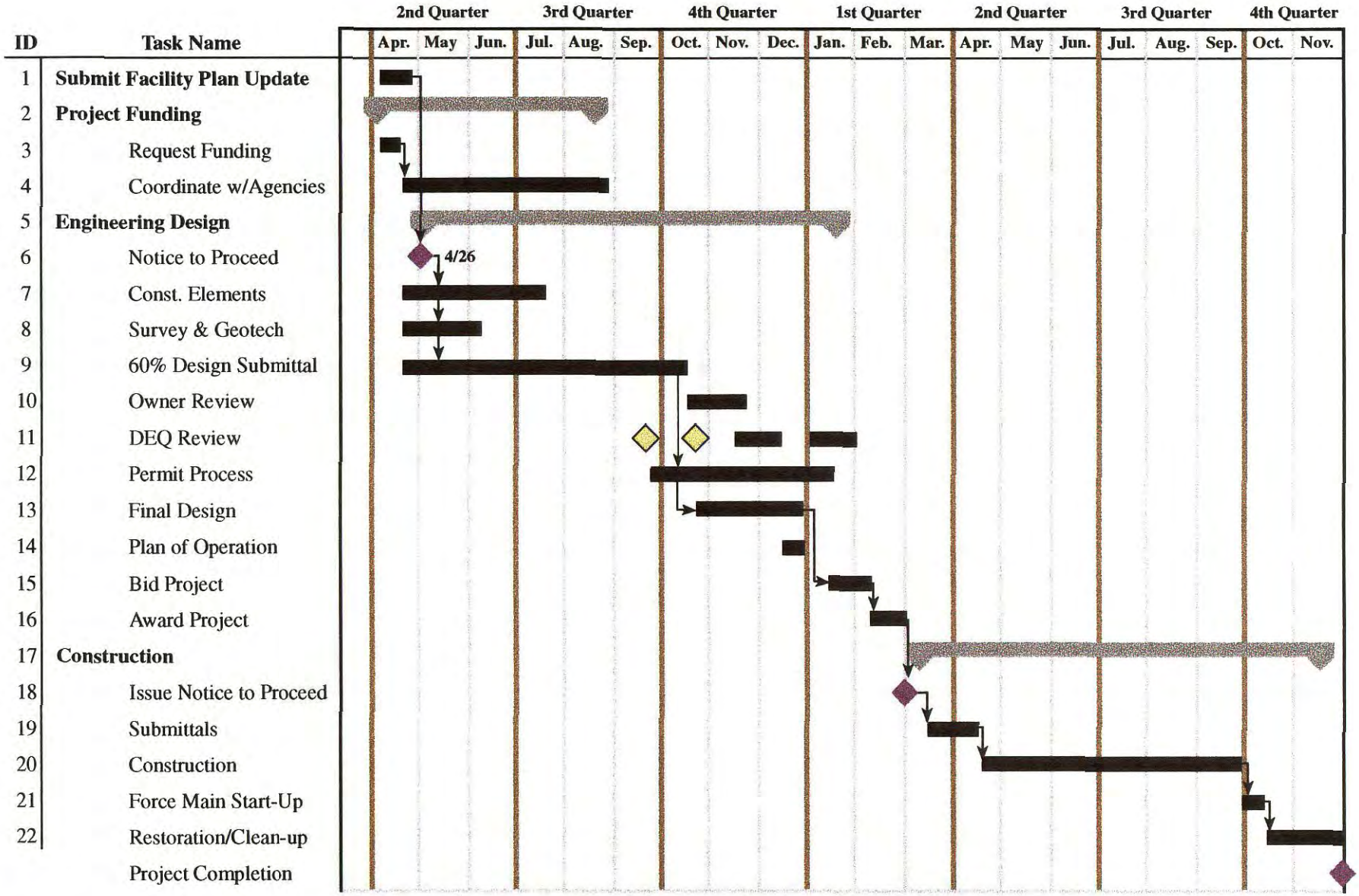


Figure 1
Preferred Treatment Alternative
Redwood Sanitary Sewer Service District
Josephine County, Oregon



Redwood Waste Water Treatment Plant
#27-2192-05 02/99

Figure 2
Project Implement Schedule
Preferred Treatment Alternative