Section 3

Existing System

3.1 HISTORY

Prior to 1948 the storm drain system was part of a combined sewer/storm drain system that discharged directly into the Bay. During overflow conditions, raw sewage would back up and run across the public streets. Plans were started in 1949 to provide a separate sanitary sewer collection and treatment system and by 1954 most of the sanitary sewers were redirected to a sewer treatment facility.

3.2 INVENTORY

Record drawings for the storm drain system are only available for a few sections of the City. The inventory in this plan was based on electronic data provided by the City of Coos Bay in the form of system maps overlaid on topographic data from aerial orthophotos. Where pipe sizes were unlabeled, the size of the adjacent pipe was used. Catch basins and manholes not located in the public right-of-way or on a storm sewer line were not counted. Some discrepancies were noted between information on the electronic infrastructure drawings and actual installations. The City may adjust the inventory as the drawings are updated to maintain a more accurate count.

Piping

The majority of the piping material in the storm water system is concrete, with corrugated metal pipe (CMP) used for large culverts and outfalls. A few newer installations were made with PVC and HDPE pipe, including most of the six-inch pipe. The system serving the study area includes approximately 30 miles of pipe, 556 manholes, and 1,073 catch basins. The collection system inventory is detailed in Tables 3.2.1 and 3.2.2. Maps of the collection system are included in Appendix B.

All manholes and catch basins that were accessed during the course of the study were of concrete construction, although brick risers were noted on manholes at the Mill Slough Box. Spot inspections of the concrete pipe and manholes found no serious deficiencies in general, with the exception of those listed below. The CMP pipe that was inspected, particularly at Bay outfalls, was deteriorating, with several sections requiring repair. CMP would not be recommended for future installations.

The culvert crossing Thompson Road has flattened to an oval shape. There are no indications at this time that the culvert is unstable, but monitoring of the culvert for further distortion is

recommended. If the soils surrounding the culvert become unstable or the culvert deteriorates further, then the culvert should be replaced.

Blossom Gulch Creek and Mingus Pond drain into concrete box culverts (the Mill Slough Box) that join at 7th Street and Bennett Avenue, prior to discharging through a tide gate into the Bay at Curtis Avenue. Construction documents for the Slough Box date to 1915. The design life for concrete pipe is normally considered to be 100 years, and portions of the Slough Box are already 89 years old. Site inspections and field measurements found that the dimensions in the Slough Box vary considerably from the original construction drawings and verification of actual conditions is recommended prior to design of future projects involving reuse of the Slough Box.

There are several known problems with the Mill Slough Box. The seams of the box culvert have developed gaps and repair of past sinkholes above the slough box make it likely that reinforcement and repair is needed. Cracks allow water to short circuit the tide gate. Flow through these cracks has caused erosion of the soils below the tidegate. Eight to twelve inches of sand and gravel have built up in the bottom of the culvert on Bennett Avenue between 7th and 6th Streets, reducing the flow capacity.

In addition, several gravity sewer lines penetrate the upper portion of the Slough Box, causing reduced storm water capacity at high flows. These sewer pipes show signs of past repairs, indicating that strong flows and impact of debris have damaged the sewer pipe. It is recommended that a manual inspection and concrete testing of the Slough Box be made to determine the interior condition of the box culvert, the remaining strength of the concrete, and the condition of the gravity sewer lines that traverse the culvert during low stream flows in September. The City may want to consider installing metal protective shielding over the existing concrete and transite sewer pipes.

Wastewater treatment plant number 1 (WWTP1) has a 42-inch diameter outfall that discharges under the Coast Guard Cutter Orcas opposite Koosbay Boulevard. The storm drain lines serving the upper portion of Basin 4 discharge into the outfall at 6th Street. The outfall has marginal capacity for a 50-year storm for the storm water alone. Plant operators noted that during extreme rain conditions and high tides the combined storm water effluent mixture overflows at 7th and 6th and flows in the gutter to Highway 101. Separation of the storm water system from the outfall is recommended.

The 42-inch CMP culvert crossing Southwest Boulevard at Dakota Street has deteriorated and flow bypasses the tidegate through a hole near Coalbank Slough. Salt water draining back through the hole has damaged landscaping at adjacent homes. The computer model indicates that a 48-inch PVC culvert would be needed to meet future flows. Lining of the existing pipeline and replacement of the tidegate is planned during the summer of 2004.

Concrete wastes from construction projects have been washed into the storm drains in at least three locations and have hardened to form obstructions. These obstructions should be removed to restore design capacity to the storm sewers. One obstruction is located at 4th and Anderson, in front of the fire hall. The others are in front of the Post Office and the Egyptian Theater. In

addition to removing the existing obstructions, the City should add language to its ordinances to prohibit washing concrete wastes into the storm drains.

Piping in several areas, including the Mill Slough Box, is undersized for current flows. Pipe capacities and recommended upsizing for specific areas are discussed in Section 6.

TABLE 3.2.1
COLLECTION SYSTEM APPURTANANCE INVENTORY

Item	Quantity
Manholes	556
Catch Basins	1,073
Cleanouts	7
Tideboxes	4
Tidegates	13
Ungated Outlets	20

TABLE 3.2.2
COLLECTION SYSTEM PIPING INVENTORY

Item	Pipe Size	Quantity (Feet)
Culvert pipe	6-inch	1,308
Culvert pipe	8-inch	28,554
Culvert pipe	10-inch	19,608
Culvert pipe	12-inch	33,160
Culvert pipe	15-inch	9,582
Culvert pipe	18-inch	11,603
Culvert pipe	21-inch	3,309
Culvert pipe	24-inch	4,324
Culvert pipe	27-inch	834
Culvert pipe	30-inch	3,228
Culvert pipe	33-inch	606
Culvert pipe	36-inch	4,825
Culvert pipe	42-inch	1,491
Culvert pipe	48-inch	1,153
Box Culvert	18"x27"	36
Box Culvert	10"x17"	262
Box Culvert	12"x16"	250
North Branch Mill Slough Box	42-inch	1,452
Box Culvert	4'x6'	1,150
Box Culvert	8'x5'	2,262
Forcemain	20-inch	28
Lateral pipe to Catch Basins	6 to 12-inch	30,696
Pipe Total		159,721

Dikes

A series of dikes provides protection for low-lying properties that front the Bay and sloughs from tidewaters.

Englewood and Libby Dikes front Coalbank Slough. Englewood Dike extends from South of Oregon Avenue to Old Wireless Lane and Libby Dike continues from that point to Red Dike Road. The dikes were privately built prior to 1920 of earthen construction. Their combined length is approximately 5,500 feet and they protect about 74 acres, of which 11 are residential lands. The dikes are currently privately owned and are maintained by the Englewood Diking and Libby Drainage Districts respectively. Tidewaters breach the dikes often, most recently in 2003. A study completed in 1987 by the US Army Corps of Engineers recommends removing the dikes and approximately 15 residences in the associated floodplain and restoring the land to wetland estuary. Portions of the Englewood and Libby dikes are in poor condition. The current has undercut the bank on the waterside of the dikes, creating unsupported overhangs and reducing the overall width of the dikes by up to three-feet.

Additional dikes follow the north bank of Coalbank Slough from 7th Street to the confluence with Isthmus Slough. The City has recently upgraded the dike between 7th and 5th Streets as part of a tidegate improvement program. Property owners east of Broadway have armored the dike with concrete and rock rubble.

From Coalbank Slough to Commercial Avenue is the most developed dike, which includes the Coos Bay Boardwalk. Raising the level of the dike from the boardwalk to Johnson Avenue, and installation of a paved footpath in the 1990's has reduced the incidents of flooding in the downtown area. This dike is in very good condition.

Tidegates

A series of tidegates and tideboxes limit flow from the Bay to the city side of the dikes at high tides. The waterfront was walked between the City limits at Yew Street on the north and Newport Avenue on the south on November 24, 2003 and on January 12, 2004. Observed outfalls were noted, including the presence and condition of tidegates. A summary of outfall and tidegate locations and conditions is included in Table 3.2.3. All of the tidegates, except Tidegate 5 are flapper style, either mounted at a headwall or on the end of the outfall pipe. Tidegate 5 is a flexible duckbill style. Tidegates are numbered consecutively from south to north, starting with the gate at the Englewood Market opposite Dakota Avenue. Additional tidegates are in the jurisdiction of the Englewood Diking and Libby Drainage Districts and are not discussed in detail in this report, but are listed in Table 3.2.4. Tidegate photos are included in Appendix C.

Most of the tidegates themselves were in operating condition, but the CMP piping and in a few cases the headwall were in poor condition. In several locations outfalls currently have no backflow prevention. Backflow prevention is recommended for all outfalls that have collection openings in the system below an elevation of 10 feet.

Tidegate 1
Tidegate 1, located at the Englewood Market currently has failing 42-inch CMP pipe with a hole on the Coalbank Slough side of the dike that allows salt water to backflow onto neighboring properties. This tidegate is difficult to access due to the steep banks of the dike surround it, and tends to silt in

and catch debris. The gate itself appears to be in good condition. This gate is scheduled for replacement in the summer of 2004.

Tidegate 2
Tidegate 2 is located at 7th Street and is mounted on a 12-inch concrete pipe. The pipe and gate are in good condition, but subject to silting in, and currently need cleaning.

Tidebox 3
Tidebox 3 is located on Lockhart Avenue at 5th Street. Two tidegates are located in the tidebox, 36-inch Tidegate 3 and 12-inch Tidegate 3A. A 36-inch corrugated plastic outfall line discharges from the box under the dike to Coalbank Slough. This tidebox was refurbished in 2003.

Tidegate 3B
Tidegate 3B is located at 7th Street and Kruse Avenue. The 8-inch tidegate is installed in the side of an elevated catch basin that is the overflow point for a natural drainage swale or unnamed creek. A piece of plywood had been placed over the top of the catch basin and weighted with rocks, apparently in an attempt to prevent backflow through the basin. The basin was plugged with woody debris, which may be preventing the tidegate from closing properly. The tidegate is undersized and not laid out in a manner to promote self-cleaning.

Tidegate 3C
Tidegate 3C is located at 5th Street and Coalbank Slough on the 36-inch outfall line from Tidebox 3. The gate is submerged, even at minus tides and was observed from the bank. The Tidegate appears to be in good condition. This tidebox was refurbished in 2003.

Tidegate 4
Tidegate 4 is located on Coalbank Slough at 5th Street. This tidegate was upgraded in 2001 with a new 24-inch PVC outfall. A CMP outfall pipe is located just east of this gate, which was abandoned after the upgrade.

Tidegate 5
Tidegate 5 is the only duckbill tidegate in the system. The 12-inch Tideflex gate is attached to a PVC outfall at Coalbank Slough south of 2nd Street. This gate appears to be in good condition.

Tidegate 6
Tidegate 6 is located on Coalbank Slough at Broadway. The 24-inch gate is attached to a HDPE outfall pipe and is in good condition.

Tidegate 7
Tidegate 7, located on Coalbank Slough east of Broadway and south of Les' Sanitary Service, is in good condition. This 24-inch outfall has a sediment basin with trash grates. The yard and parking area of Les' drains into the basin through an oil-water separator that is pumped annually. The incoming trash grate is plugged with plastic jugs and needs to be cleaned. The basin appears to work well at retaining sediment and currently is full and in need of servicing.

Tidegate 7A
Tidegate 7A is located on Coalbank Slough south of Front Street, behind Les' Sanitary Service. This 12-inch outfall has a sediment basin that currently is full and in need of servicing.

Tidegate 8
Tidegate 8 is located in Johnson Avenue at Front Street, next to Fred Meyers. The 42-inch gate is inside a vault next to Pump Station 15. While the gate is in good shape, the vault leaks around the frame of the door support. When the pumps discharge into the vault, water blows gravel away from the vault wall, leaving a pothole. The City grouted the void where the frame mounts to the vault during the course of this study, but a permanent repair would involve removing the flange, saw cutting the concrete riser, and pouring a new opening to properly fit the frame. The vault discharges to Isthmus Slough at Johnson Avenue, east of the vault.

Tidebox 9
Tidegates 9 and 9A are located in a tidebox in Highway 101 at Golden Avenue. Tidegate 9 is 36-inch diameter and serves the downtown storm drains. Tidegate 9A is the old 15-inch raw sewer overflow. While Tidegate 9A has been plugged at the connection to the sanitary sewer and is not shown as connecting to any catch basins or storm lines, it still has flow, indicating that it provides a path to drain groundwater from under the highway. A 36-inch steel discharge line drains the tidebox to Isthmus Slough. The City has had trouble sealing the vault doors in the past, and a large amount of silicon sealer was chiseled out before the door would open. A fixed gasket is recommended to seal the vault door so that it is easier to access the vault for gate inspection.

Tidegate 10
Tidegate 10 is located about 200 feet north of Golden Avenue. A 12-inch CMP pipe drains an area around the railroad tracks. While records indicate a spigot style tidegate on the end of the pipe, the pipe has holes and the flapper is missing off the gate. Replacement of both the CMP pipe and tidegate are recommended.

Tidegate 11
Tidegate 11 is located on Isthmus Slough at Elrod Avenue. City records show this gate as a 12-inch spigot type installed on an outfall prior to 1940. A 12-inch wood culvert with flow, but no gate and in poor condition was discovered at this location, but it is not known if this is the outfall shown on the City plans. It is possible that there is an additional outfall installed deeper than a minus 1.7 foot tide would uncover. The area served by this outfall flooded until a bypass was installed diverting high flows to Pump Station 15. It is recommended that this outfall be dye tested to verify that there is not another outfall. If this is the main outfall then it should be replaced and a tidegate installed.

Tidegate 12
Tidegate 12 is at the discharge of the Mill Slough Box into Isthmus Slough at Curtis Avenue. The tidegate is a 6-foot by 8-foot wood flapper gate with a concrete headwall. The wood gate shows minor deterioration and should be monitored at least annually. Tidewater bypasses the gate through cracks in the concrete box culvert and has eroded a space under the culvert.

Tidegate 13
Tidegate 13 is located at Anderson Avenue and the Boardwalk. This gate was not accessible due to elevation below the low tide line. City records list the gate as a 12-inch spigot type.

Tidegate 14
Tidegate 14 is located at Central Avenue and the Boardwalk. This gate is supported by two pilings and appears to have a concrete spillway for erosion protection. The gate and pipe appear to be in good condition, although there was debris wedged in the gate at the time of observation. There are actually three outfalls at this location: a 24-inch concrete, an 18-inch CMP, and an abandoned pipe under the CMP. No tidegates were evident on any of these pipes. The 18-inch CMP has a broken end and is in poor condition

Tidebox 15
Tidebox 15 is located at 3rd Street and Commercial Avenue adjacent to Pump Station 11. Two tidegates are located in the box, a 12-inch and a 24-inch diameter flapper gate. The gates are sited to prevent backflow to the upper reaches of the gravity storm system when the pump station is activated. The gates appear to be in good condition.

Tidegate 16
Tidegate 16 is located at Commercial Avenue and the boardwalk. The 36-inch gate is mounted on a concrete outfall with stainless steel supports. The gate is in good condition.

Tidegate 17
Tidegate 17 is located at Market Avenue and Front Street in a tidebox in the Sause Brother's parking lot. This 30-inch gate shows signs of corrosion, but is otherwise in good condition. The vault cover has a grating to drain water from the parking lot. Sause Brother's personnel stated that there is no history of tidewaters backing up through the grate.

Tidegate 18
Tidegate 18 is depicted on City maps at Birch Avenue and Front Street in a tidebox. The manhole located at the mapped location does not have a tidegate. There is no tidegate on the existing outfall. This manhole previously was the overflow point for the sanitary sewer. The sanitary overflow has been plugged with concrete. The tidegate was likely removed as part of the program to remove raw sewage overflow points.

Tidegate 19
Tidegate 19 is located at Ivy Avenue and Bayshore Drive in a tidebox. The tidebox vault has filled with sand and debris to the point that less than 40% of the outfall is open. The tidegate does not appear to be able to fully close due to debris.

Tidegate 20
Tidegate 20 is located at Koosbay Boulevard under the Coast Guard Dock. This 12-inch CMP outfall and gate appear to be in good condition. There are signs of corrosion in the CMP where the collar of the gate is mounted. This gate should be monitored at least annually and the pipe replaced if the corrosion goes through the pipe.

Tidegate 21
Tidegate 21 protected the sanitary sewer overflow to the storm sewer from tidewaters. The gate was removed and the opening cemented in as part of a program to eliminate raw sewer overflows. The tidebox vault remains at Koosbay Boulevard and 6th Street and now serves storm water only. The original 24-inch CMP outfall pipe has been lined with 18-inch PVC and has no backflow protection. The outfall discharges about 25 feet north of the Coast Guard dock.

Tidegate 22
Tidegate 22 is located at Kingwood Avenue and the Bay. This 18-inch gate is mounted in a concrete headwall and appears to be in very good condition.

Tidegate 23
Tidegate 23 is located at Myrtle Avenue and the Bay. This 15-inch gate is mounted on a CMP pipe that is in extremely poor condition, with all flow bypassing the gate through holes in the pipe.

Tidegate 24
Tidegate 24 is located at Pine Avenue and the Bay. This 24-inch gate is mounted on a CMP pipe and appears to be in good condition. This gate had consistent flow when checked during dry weather.

Tidegate 25
Tidegate 25 is located near Wastewater Treatment Plant #2 and is not in the study area.

Tidegate 27
Tidegate 27 is located at the Bay across Highway 101 from the Union 76 tanks. This 24-inch CMP outfall has a concrete headwall. Both the pipe and tidegate are in poor condition.

Tidegate E1
Tidegate E1 is located in Englewood directly east of Montana Avenue, where Middle Creek meets the dike at Coalbank Slough. The 60-inch tidegate has a wood headwall in good condition. The old 48-inch CMP culvert was replaced with a corrugated PVC pipe in the last three years. Both the gate and pipe are in very good condition. The Englewood Diking District maintains this tidegate.

Tidegate E2
Tidegate E2 is located in Englewood directly east of Pennsylvania Avenue, at Coalbank Slough. The Englewood Diking District maintains this 36-inch tidegate, which was installed approximately 10 years ago.

Tidegates E3, E4, & E5
Tidegates E3, E4, and E5 are located in Englewood on Middle Creek, west of Southwest Boulevard and north of Illinois Avenue. These 12-inch tidegates were installed by the City in 2002 to protect individual properties and are maintained by the City.

Outfalls

There are a number of documented and undocumented outfalls that do not have tidegates. The majority of the undocumented outfalls appear to drain individual or small groups of catch basins near the railroad tracks or on Highway 101. Outfalls that serve areas with drainage openings lower than 10-foot elevation require tidegates to prevent backflow of tidal waters. Outfalls that meet these conditions include numbers 0b, 8a, 11a, 17a, 17c, and 17d. There may be other outfalls that were submerged or otherwise not apparent during the dike inspections and so are not listed. Specific outfalls with deficiencies are listed below:

Outfall 9
Outfall 9 at Golden Avenue is a 36-inch concrete pipe. While the end section of the pipe has broken off, the outfall appears to be long enough to function well at this time. If the remaining pipe shows signs of failure in the future, then this pipe should be replaced.

Outfall 19
Outfall 19 at Ivy Avenue is a 24-inch CMP pipe in poor condition. This outfall is recommended for replacement.

Outfall 21A
Outfall 21A at Koosbay Boulevard is a combined storm/effluent outfall. A separate storm water outfall is recommended.

Outfall 23A
Outfall 23A is a 12-inch concrete outfall located just north of Myrtle Avenue. This outfall is semi-buried but otherwise is in good condition.

Outfall 24A
Outfall 24A just north of Pine Avenue is a 12-inch CMP pipe in poor condition. This outfall is recommended for replacement.

Outfall 26
Outfall 26 is located at Teakwood Avenue and does not have a tidegate. The concrete 18-inch outfall is in good shape, although partially silted in and in need of cleaning. This outfall serves areas above the high tide line and should not need a gate.

Outfall 26A
Outfall 26A, located just north of Teakwood is a 12-inch CMP pipe in poor condition. This outfall is part of the ODOT system and is recommended for replacement.

Outfall 26B
Outfall 26B, approximately 175 feet north of Teakwood is a 15-inch CMP pipe in poor condition. This outfall is part of the ODOT system and is recommended for replacement and extension to the tide line.

TABLE 3.2.3
OUTFALL/TIDEGATE INVENTORY

Map #	Location	Size	Gate Type	Age	I. E.	Condition/Material
	Coal Bank Slough					
0a	North of Oregon	24”	None			?
0b	75’ south of Dakota	36”	None			Plugged and abandoned
1	Dakota Ave	42”	Spigot	1964	4.14	Good/ CMP flattened
2	South 7th	12”	Spigot	1963	0.90	Good/ Concrete
3	S. 5th @ Dike	36”	Spigot	2003	-5.15	Good/ HDPE
3a	S. 5th @ Lockhart	36”	Tidebox	2003	-2.15	Good
3b	S7th @ Kruse	8”	Tidebox			Undersized –backflows-bad layout
4	S. 5th @ Dike	21”	Spigot	2001	-4.44	Good/ HDPE
5	S. 2nd	12”	Tideflex			Not accessible
6	S. Broadway	24”	Spigot	1997		Good/ HDPE
7	S. 1st	24”	Spigot	1997		Maintenance problem-debris/ HDPE
7a	Front	12”	Spigot			Maintenance problem-debris/ HDPE
	Isthmus Slough					
8	Johnson @ Front	42”	Headwall	1974	-3.47	Tidebox leaks @ pavement/concrete
8a	Golden	12”	None			Poor-replace/ CMP
9	Golden @ 1st	36”	Headwall			Good/ concrete outfall has broken end
9A	Golden @ 1st	15”	Headwall			Good
10	North of Golden	12”	Spigot			Bad/ CMP, needs replacement
11	Elrod	12”	Spigot			
11a	Elrod	12”	None			Poor/ Wood
11b	150’ north of Elrod	12”	None			?
12	Curtis (Mill Slough)	5’x8’	Headwall			Good / wood gate-concrete culvert
13	Anderson	12”	Spigot			Collar needs replacing/ ductile iron
13a	100’ South of Central					Poor/CMP, Possibly abandoned
14	Central	18”	Spigot			Good/CMP
14a	Central	18”	Spigot			CMP in poor shape, Tidegate missing
14b	Central	24”	None			Good/ Concrete
15	3rd @ Commercial	12”	Tidebox			Good
15a	3rd @ Commercial	24”	Tidebox			Good
16	Commercial	36”	Headwall			Good
17	Market @ Front	30”	Headwall			Good
17a,b&c	Alder	?	None			?
17d	Birch	18”	None			Good/CMP
18	Birch @ Front	24”		1958		Plugged/ CMP
	Coos Bay					
18a	Cedar St.	12”	None			Concrete
18b	Date St		None			Submerged
18c	Fir St	10	None			HDPE
19	Ivy @ Bayshore	24”	Tidebox	1959		Corrugated Iron
19a	Ivy Outfall	24”	None	1959		Poor/ CMP
20	Koosbay Blvd.	12”	Spigot			Good/ CMP
21	Koosbay @ N. 6th	18”	None			Good/18” PVC in 24” CMP
21a	Koosbay Blvd.	42”	None			Combined WWTP/Storm outfall
22	Kingwood	18”	Headwall		1.62	Very good/ CMP w/ concrete headwall
23	Myrtle	15”	Spigot	1981	1.02	Very Poor/ CMP, needs replacement
23a	80’ North of Myrtle	12”	None			Good/Concrete
24	Pine	24”	Spigot	1954	1.46	Good/ CMP
24a	50’ North of Pine	12”	None			Poor/ CMP
26	Teakwood	18”	None			Concrete w/ headwall
26a	100’ N of Teakwood	12”	None			Poor/ CMP
26b	175’ N of Teakwood	15”	None			Poor/ CMP
27	Union 76 Tanks	24”	Headwall			Poor/ CMP, 6” holes in CMP

TABLE 3.2.4
ENGLEWOOD OUTFALL/TIDEGATE INVENTORY IN CITY LIMITS

Map #	Location	Size	Gate Type	Age	Maintained By	Condition/Material
	Coal Bank Slough					
E1	East of Montana	60”	Headwall	2001	Diking District	Very Good/CPP
E2	East of Pennsylvania	36”	Spigot	1994	Diking District	Unknown/CPP
E3	Middle Creek	12”	Spigot	2002	City	Good
E4	Middle Creek	12”	Spigot	2002	City	Good
E5	Middle Creek	12”	Spigot	2002	City	Good

Pump Stations

The City has two storm water pump stations, Pump Station 15 located next to Fred Meyers on the vacated portion of Johnson Avenue, and Pump Station 11, located on the southeast corner of Third Street and Commercial Avenue.

Pump Station 15

Pump Station 15 was built in 1974 and serves the area surrounding Highway 101 between Curtis and Kruse Avenues west to 4th Street. The station is located next to the Fred Meyer store on vacated Johnson Avenue, east of Highway 101. The 42-inch concrete forcemain discharges into Coalbank Slough directly east in the vacated Johnson Avenue right of way. Storm water flows into a vault in vacated Johnson Avenue, north of the station. During low tide storm water flows directly through a tidegate that bisects the vault and gravity flows to the slough. When tidal pressures close the tidegate, flow is diverted into the wetwell of the pump station, where it is pumped around the tidegate, pressurizing the slough side of the vault in Johnson Avenue.

The station has a brick pump house located over the wetwell, housing three Byron Jackson pumps. The two 15 HP pumps were replaced last year and had soft start motor controls added this year. The 30 HP pump was rebuilt two years ago, and also had a soft start added. A 75 kW Onan generator provides backup power. While no deficiencies were noted for the pump station, leakage in the pressurized vault has eroded soils around the vault access, and water sprays through gaps in the concrete when the pumps are activated. A photograph of this station is included in Figure 3.2.1 and the operating parameters are detailed in Table 3.2.5.

Two draw down capacity tests were attempted for this station. The first test was attempted on an outgoing tide, and since the wetwell level varied with the tide we were unable to determine how much of the level change was due to the pumps and what portion was tidal. The second attempt was made at a slack high tide. While wetwell levels remained stable, the results of the measurements and calculations were that the station capacity was only 1,500 gpm, less than 40% of the factory rating for one of the smaller pumps alone. The collection system serving this station has a fairly flat profile and the collection system acts as storage, which would need to be taken into account when calculating the volume pumped down during a draw down test. The actual volume pumped cannot be calculated from measuring the wetwell dimensions only, and accurate record drawings and elevations are not available for the collection system. The capacity of this station could be checked by calculating the volume of the outfall line and vault and placing dye in the wetwell, but to check

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each pump would be a time consuming process, and would require a large amount of dye to be discharged to the Bay. As the two 15-HP pumps are new and the maintenance crew feels that the larger pump operates satisfactorily, no further attempts were made to verify capacity.

FIGURE 3.2.1
PUMP STATION 15

FIGURE 3.2.2
PUMP STATION 11

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TABLE 3.2.5
PUMP STATION 15 DATA

Parameter	**Value**
Construction Date	1974
Number of Pumps	3
Type	Constructed over wetwell
Level Control	Float Switches
Discharge Point	Coalbank Slough @ Johnson
Backup Power	75 kW generator
PUMP 1	
Type	Vertical Turbine
Design Capacity (GPM@FT head)	Est. at 11,000 @11' *
Motor HP	30
Manufacturer	Southern Well
Year of Last Upgrade (1989 install)	2002
Current Output (GPM)	unknown
PUMP 2	
Type	Vertical Turbine
Design Capacity (GPM@FT head)	4,350 @ 8
Motor HP	15
Manufacturer	Byron Jackson
Year of Last Upgrade	2003
Current Output (GPM)	unknown
PUMP 3	
Type	Vertical Turbine
Design Capacity (GPM@FT head)	4,350 @ 8
Motor HP	15
Manufacturer	Byron Jackson
Year of Last Upgrade	2003
Current Output (GPM)	unknown

* Design data for this pump is not available. Capacity estimated from similar pump curve.

Pump Station 11

Pump Station 11 was built in 1969 and serves the downtown area between 2nd and 4th Streets and Commercial and Curtis Avenues. The 20-inch diameter force main discharges into the gravity storm drain on Commercial Avenue. Storm water gravity flows from the station into the storm drain until the level in the station exceeds a preset height, at which point the pumps are activated. The station has duplex pumps with a drywell over wetwell configuration. The drywell is considered a confined space and requires a minimum of two personnel to access. The controls and electric service are located in the drywell. A photograph of this station is included in Figure 3.2.2 and the operating parameters are detailed in Table 3.2.6.

The pump output for each pump exceeded the original design specifications when tested on March 8, 2004. The combined output for both pumps operating together was just under 4,500 gpm. While the pumps are currently operating well, the original equipment has exceeded their recommended life and obtaining replacement parts is difficult. The below grade wetwell makes access cumbersome and the electric components are at risk of flooding in the case of power or pump failure. The controls and electrical components are outdated and worn. There is no connection for a generator. When the pumps are replaced, it is recommended that the City consider eliminating the drywell and building an above ground pump house.

TABLE 3.2.6
PUMP STATION 11 DATA

Parameter	**Value**
Construction Date	1969
Number of Pumps	2
Type	Wetwell/Drywell
Level Control	Float Switches
Discharge Point	Commercial Ave. Storm Drain
Force Main Diameter (inches)	20
Backup Power	None
PUMP 1	
Type	Turbine
Design Capacity (GPM@FT head)	2,680 @ 11
Motor hp	15
Manufacturer	Paco
Year of Last Upgrade	unknown
Current Output (GPM)	2,970
PUMP 2	
Type	Turbine
Design Capacity (GPM@FT head)	2,680 @ 11
Motor hp	15
Manufacturer	Paco
Year of Last Upgrade	unknown
Current Output (GPM)	3,600