City of Cannon Beach

CLATSOP COUNTY, OREGON

Wastewater Facilities Plan

December 2017

FINAL REVISED PER DEQ REQUIREMENTS 8/29/18

Civil West Engineering Services, Inc.

945 Geary Street • Albany, Oregon 97322
486 'E' Street • Coos Bay, Oregon 97420
609 SW Hurbert Street • Newport, Oregon 97365
10558 Hwy 62 Ste. B-1 • Eagle Point, Oregon 97524

Oregon
Kate Brown, Governor

Department of Environmental Quality
Northwest Region
700 NE Multnomah Street, Suite 600
Portland, OR 97232
(503) 229-5263
FAX (503) 229-6945
TTY 711

November 6, 2018

Bryce Majors
PO Box 368
Cannon Beach, OR 97110-0368

RE: WQ - CLATSOP COUNTY
CANNON BEACH, CITY OF/CANNON BEACH WWTP
Site ID # 13729/Permit # 102237 /EPA ID # OR0020222

Dear Mr. Majors,

I have reviewed the Draft City of Cannon (City) Beach Facility Plan (Plan) dated December 2017 and prepared by Civil West Engineering, Inc. and the response to comments to the April 2 letter from DEQ.

DEQ is satisfied with the Plan and the revisions and accepts it as the current Facility Plan of Cannon Beach.

There are certain projects that need attention. The Sludge lagoon banks need to be stabilized and secured. Also, a system wide SCADA system will help greatly with control, operation and data collection. Pump stations should be brought up to their design capacities. Electrical controls and standby power should be added and updated where needed. Special attention should be given to the two treatment plant influent pump stations: Ecola and Pacific.

In my opinion, all other projects are priority two. Projects that help protect expensive equipment, and improve ease of operation (not waste operator effort doing repetitive and uncomfortable jobs due to poor design) are worthwhile if they can be done inexpensively. The covers for some of the unit processes are a good example of these projects.

Otherwise, congratulations on getting a good project done. Don't let it sit on the shelf too long before you get started.

Feel free to contact me at pinney.mike@deq.state.or.us or by phone at 503-229-5310.

Regards,

Michael L. Pinney PE
Senior Environmental Engineer

Civil West Engineering Services, Inc.

Rogue Valley
10558 Hwy 62, Ste. B-1
Eagle Point, OR 97524
541-326-4828

South Coast
486 'E' Street
Coos Bay, OR 97420
541-266-8601

Willamette Valley
213 NW Water Avenue Ste. 100
Albany, OR 97321
541-223-5130

Central Coast
609 SW Hurbert Street
Newport, OR 97366
541-264-7040

August 29th, 2018

Department of Environmental Quality
ATTN: Michael Pinney
700 NE Multnomah Street, Suite 600
Portland, OR 97232

RE: Facility Plan Review – City of Cannon Beach

Dear Mr. Pinney,

We have reviewed and implemented your comments into the City of Cannon Beach Wastewater Facility Plan. Below you will find our comments and clarifications bulleted and in italics after your review notes:

EXECUTIVE SUMMARY:
Page 6: Please include as an objective: "Fulfill the engineering planning document requirement of the Clean Water State Revolving Fund, Oregon Infrastructure Finance Authority, and USDA- Rural Development."

- *This passage has been added to the plan.*

STUDY AREA CHARACTERISTICS:
Page 16: Zoning characteristics: It would be more helpful if this information was given in terms of acres of existing, built and build-out with potential increases in EDU and commercial spelled out.

- *Page 16 zoning characteristics: A map detailing zoning data on each lot has been included. The City did not have acreage total available, only this map.*

Section 3.2.4: Page 30: Wetlands could be described as buildable and unbuildable land and be described as above to be able to contribute to potential future flows or not.

- *Section 3.2.4 page 30: Wetlands buildability is addressed in the buildout plan added as an addendum to the plan.*

Section 3.3: Page 38: Population Data: Is there PSU population data available for the City? If so, it is the standard for population projections for the state and must be used.

- *Section 3.3 page 18: The PSU certified population estimate for 2017 is 1,705 persons.*

Section 3.4: Page 39: EDU Analysis: 140 gpd per person is a very high water consumption rate. I realize that given the touristic nature of the City it will be difficult to accurately measure the per person water and sewer usage. A more accurate measure should be attempted or this value discarded or at least explained.

- *Section 3.4 page 39: Cannon Beach is unusual in that there are 1,550 total residential connections and 1,705 persons, this gives an average household size of 1.1 persons. We have no data reflecting the* *average household size for permanent, full-time residents (460 such connections, estimated by counting only the local billing addresses). When calculating gpcd, this will tend to yield a much higher gpcd number than what is being used per full-time resident. This has been added to the plan for clarity.*

SECTION 4: EXISTING WASTEWATER FACILITIES
Table 4.1: Page 40: Add pipe material and pipe age to this table as the information is available.

- *Table 4.1 page 40: Collection system pipeline material has been added to the plan.*

Section 4.2: Existing Lift Stations and Forcemains: Pages 40 - 59: The description of the lift stations are a welcome addition to this plan. Include the design data table that each pump station should have to the descriptions. The collection area maps need to have the pump station location marked on them. A few were impossible to locate based on the descriptions. Although the collection maps were located elsewhere, it would be useful to have them here instead, or in addition. Other useful information would be collection area or EDU's, and overflow location information, also missing from the pump station descriptions.

- *Section 4.2: Lift station locations and have been added to the plan maps, as have detailed pump data and forcemain routes in Appendix D.*

Section 4.3: Existing Wastewater Treatment Plant: Include a sheet of the design data of the entire plant. This should be available from any wastewater treatment plant expansion plans. The data will include capacities of unit processes, volume and areas of basins and lagoons.

- *Section 4.3: A design data sheet detailing design data of the WWTP has been added to the plan.*

Is there a Stand-by generator that can run the plant in the event of a power loss?

- *There is a 200kW stand-by generator to operate the WWTP in the event of a power outage, this information has been added to the plan.*

Page 63: The placement of the water level meter in the Parshall flume seems to be in the wrong place. I believe this matter has been addressed separately. What effect would the sensor relocation have on flows measured at the WWTP?

- *Page 63: The City has relocated the Parshall flume water level meter. The City does not use influent metering to generate DMR data.*

Flow metering:
Effluent Magmeter size and in wrong place. The effluent magmeter does not operate at low flows due to oversizing and in a poor location. Address the practicality of relocating an effluent meter and issues of flow measurement at the WWTP.

- *Page 63: The City is currently working to fix the low flow metering issue at the plant. A simple weir box downstream of the UV system is the proposed solution. The weir box would monitor flow <200 gpm, and the existing 20" magmeter would cover larger flows >200 gpm. The existing SCADA system would control which flow signal is used to combine both sources.*

Return flows and rainwater from sludge storage lagoon: these flows volumes need to be measured and accounted for in the plant flow measurements. Are these flows happening when composite sampling is occurring?

- *Recirculated return flows will be captured by the new weir downstream of the UV. Currently, the flows are routed through the 20" magmeter and at low flows are likely not being captured.*

TSS limits have been violated from time to time recently. This has been attributed to clarifier size and I/I problems. Address these violations for cause and solutions.

- *The City has an active I/I reduction plan in place, and currently budgets for collection system testing, video monitoring, and line replacement. The City is planning to bring both basins online during periods of high flows to keep the TSS numbers within allowable levels.*

Outfall and Mixing Zone: When was the last Mixing Zone last updated? There is no discussion or description of the Outfall.

- *The NPDES permit does not consider the wetland discharge or any mixing zone. The permit levels are to be met "at the pipe" prior to the discharge location.*

SECTION 5: WASTEWATER FLOWS
Section 5.1.5 Inflow/ Infiltration Summary: The study and flows indicate there is a large amount ofI/I. Either that or population numbers cannot be accurate. Again, given the touristic nature of Cannon Beach population numbers can be difficult to pin down. Figure 5.I.4c seems to indicate the problem is getting worse. This is an area to concentrate funds and infrastructure construction and /or rehabilitation.

- *Section 5.1.5: The City has an active I/I reduction plan in place, and currently budgets for collection system testing, video monitoring, and line replacement.*

Wastewater Loads: What are the industrial contributions? Are there or will there be anything like a brewery in town that can load up the plant as they have in other Oregon cities?

- *There are no significant industrial loads, nor any breweries of size for concern.*

Please add a statement regarding the quality of the BOD and TSS testing. Does the City have a written QA/QC plan? Do they follow it?

- *Statement has been added regarding BOD and TSS testing. The City is currently working on developing a QA/QC plan.*

SECTION 6: BASIS OF PLANNING
Section 6.1.2.1 Clean water Act, Section 303 d: the most recent 303 d list dates from 2012.

Ammonia standards have changed some. The effect on Cannon Beach WWTP effluent should be examined. The RPA spreadsheet is available on the web.

- *The following has been added regarding ammonia standards: The Biolac WWTP at Cannon Beach has tested ammonia levels averaging 0.13mg/L over the 5-year DMR data set used for this report. The highest ammonia effluent reading was 1.4mg/L during wintertime. If future ammonia regulations (20 ppm)* *are lowered even by a factor of 10, we are confident that the WWTP would be able to meet the new regulations.*

Plant Reliability: Please note that EPA Guidelines for plant reliability were publishing in 1974. These guidelines are based on a "design flow" which is generally annual average flow. Also, in general, DEQ requires Class I reliability for all sewage pumping stations. However, for treatment plants, DEQ generally requires Class I reliability during the low flow season and Class II reliability during high flow season. Additionally, in general, a primary pm-pose for redundancy is for the treatment plant to have the ability to meet permit limits with any unit removed from service for periodic maintenance. DEQ expects that major maintenance activities will be performed during low flow periods. Therefore, as a general rule, redundancy requirements apply to maximum month dry weather conditions, not peak flow conditions. However, the plant must also have capacity to treat peak flows with all units in service. Please modify this section accordingly.

- *The system reliability and redundancy Section 6.1.4 has been modified to reflect the comments above on reliability.*

SECTION 9: CAPITAL IMPROVEMENT PLAN AND PROJECT FINANCING
As the City is not growing, concentration on maintaining the existing plant and collection system should be the focus of money spent. Thus, the emphases should be to ensure the plant operates as it is capable to, and the collection system is not a stormwater collection system that will fail in the future.

Page 108: Priority 1 Projects: I/I removal should be a priority. If significant I/I is removed, the whole treatment and collection system feels the relief. This should be a concerted effort that deals with the worst problem areas described in the I/I report. Pump station capacity is saved by collection system improvements that remove I/I.

- *The City is actively budgeting for sewer line replacement annually. As part of their CIP, they have elected to make this an ongoing item that is outside of the tiered priority structure.*

Priority 1 Projects: Sludge lagoon banks need to be stabilized and secured.

- *This work has already been completed.*

Please feel free to contact me should you have any questions or need clarification on any of the above items or the plan.

Regards,

Dan Vaage PE
Project Manager

Oregon

Kate Brown, Governor

Department of Environmental Quality
Northwest Region
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Portland, OR 97232
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FAX (503) 229-6945
TTY 711

April 2, 2018

Bryce Majors
PO Box 368
Cannon Beach, OR 97110-0368

RE: WQ - CLATSOP COUNTY
CANNON BEACH, CITY OF/CANNON BEACH WWTP
Site ID # 13729/Permit # 102237 /EPA ID # OR0020222

Dear Mr. Majors,

I have reviewed the Draft City of Cannon (City) Beach Facility Plan (Plan) dated December 2017 and prepared by Civil West Engineering, Inc. I have the following comments.

The Plan is well written and comprehensive in scope. The existing treatment system works but is aging and needs updating and some measures to protect the treatment capacity, make operations easier, more controllable and prepare the City for the future.

A Citywide SCADA system connecting the pump stations and treatment plant would greatly help operators know what is happening and when. Putting resources to responding to the Infiltration and Inflow (I/I) report is a wise investment to keeping the collection and treatment system sized to actual need as opposed to planning to include the contribution of stormwater and groundwater. Backup power and lift station rehabilitation are good investments in collection system reliability. I feel these are all good projects for the City to invest in to preserve the collection and treatment capacity.

Cannon Beach will not experience much growth as it is constrained by growth boundaries and available land. It is fortunate to not need to spend the money to expand the treatment system. The proposed projects are limited in scope. The fee structure allows for increases that are below state-wide average of similar fees.

The following are detailed comments on the Plan:

EXECUTIVE SUMMARY:
Page 6: Please include as an objective: "Fulfill the engineering planning document requirement of the Clean Water State Revolving Fund, Oregon Infrastructure Finance Authority, and USDA- Rural Development."

Acknowledgements: Please acknowledge the agency that provided funding for the Facilities Plan, if any.

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In my opinion, all other projects are priority two. Projects that help protect expensive equipment, and improve ease of operation (not waste operator effort doing repetitive and uncomfortable jobs due to poor design) are worthwhile if they can be done inexpensively. The covers for some of the unit processes are a good example of these projects.

I did not review the financing portion of this plan.

NEXT STEP
Please address my comments in an updated plan.

Feel free to contact me at pinney.mike@deq.state.or.us or by phone at 503-229-5310.

Regards,

Michael L. Pinney PE
Senior Environmental Engineer

CC: Matthew D. Wadlington, Civil West Engineering, 945 Geary Sr., Albany, OR 97322

City of Cannon Beach

CLATSOP COUNTY, OREGON

Wastewater Facilities Plan

December 2017

REGISTERED PROFESSIONAL ENGINEER
83524PE
OREGON
NOV. 10, 2005
MATTHEW D. WADLINGTON
EXPIRATION DATE: 06/30/2020

Civil West Engineering Services, Inc.

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Table of Contents

List of Figures and Tables

Section

1

1 Executive Summary

1.1 Background

The City of Cannon Beach provides utility services, including water and wastewater, to approximately 1,700 year-round residents and around 750,000 visitors each year. The City is located along a four-mile stretch of Hwy 101 on the Oregon coast approximately 80 miles west of Portland, Oregon.

Wastewater is collected in a conventional gravity sewer system through approximately 13 miles of pipe which conveys wastewater into one of the City's nine lift stations. From these lift stations, wastewater is eventually conveyed to the City's 3.4 MGD activated sludge treatment plant. The wastewater treatment plant is a BIOLAC treatment facility, which went online in October of 2007. This relatively new facility was constructed adjacent to the prior lagoon treatment plant and converted the facility's former facultative lagoons into biosolids storage facilities. The outfall for the treatment plant discharges effluent into managed wetlands, which act as a polishing system to buffer and protect the water quality in Ecola Creek.

Although the City's wastewater system has successfully met the City's needs, critical system components may require major improvement or upgrades. To ensure the City can continue to meet the needs of its residents, a new Wastewater Facilities Plan is needed. The last formal update to the Wastewater Master Plan occurred in 1993.

Through our investigation of the City's wastewater treatment and collection system, we found that the facilities are well maintained, but certain deficiencies do exist. The system appears to have shortfalls that must be addressed to improve daily operations. These shortfalls include in general, a lack of redundancy, and the lack of a system-wide fully integrated SCADA control/monitoring system. Currently staff must physically visit each facility to address system needs and to monitor system operation.

The objective of this effort is to fulfill the engineering planning document requirements of the Clean Water State Revolving Fund, Oregon Infrastructure Finance Authority, and USDA-Rural Development funding.

1.2 Recommended Improvement Projects

Due to the age and deficiency of portions of the City's wastewater system, we have evaluated numerous options for improvements. A summary of the final recommendations is below:

- Complete system-wide SCADA integration
- Redundancy on all DEQ required systems
- Continue Proactive I/I Abatement projects
- Backup Power at all Lift Stations
- Enclose UV and Headworks areas
- Rebuild inadequate/undersized Lift Stations

2 Introduction, Background and Need

Section

2

2.1 Background

The City of Cannon Beach owns and maintains a wastewater conveyance system that collects, transmits, and treats sanitary wastewater from residential and commercial customers within the City's Urban Growth Boundary (UGB). According to the 2010 Census data, the City of Cannon Beach population was 1690 persons. The Census population estimate for 2015 is 1,702 persons. Cannon Beach is unique in that population growth has been very slow for many decades, however, short-term population can easily increase to nearly 10,000 due to tourism during the summer months. Due to the population demands placed on the wastewater treatment plant during these population spikes, the plant has been designed to handle peak loading for population equivalents nearly six times that of the normal population.

CANNON BEACH WASTEWATER SYSTEM HISTORY (provided by Les Wierson, Public Works Committee Member)

From the 1920s to approximately 1960 sanitary waste was treated by individual septic systems. In the 1940s, systems were failing due primarily to poor soils, small building lots, and a growing population. In the early 1950s the State Sanitary Authority issued a building ban that included property sales until a sewerage system was installed. On December 9, 1955 the City of Cannon Beach was incorporated and a $250,000 G.O. bond issue was approved. Sewer service limits were generally from 8th Street on the north, Arbor Lane on the south, and Hwy 101 on the east, although homes on Sunset Blvd., east of Hwy 101, were included.

The initial sewerage system was financed by the G.O bonds, a $10 million tax levy, $3 per month user charge, a $100 hook-up fee ($90 if paid in cash), and a 33% federal grant for the treatment ponds and pump stations. The City had two paid staff positions; the City Recorder, who handled finance, and a Sewerage System Operator. Both positions reported to the Mayor and City Council. Engineers of record were Cornell, Howland, Hayes and Merryfield.

Sewage Stabilization Ponds were selected for sewage treatment because of lower cost to construct and operate. The Cannon Beach Stabilization Ponds were probably the first on the Oregon Coast. Design Criteria was 100 people per acre (water surface) and a minimum 18" water depth. The 10-acre ponds were rated by the State to treat 1000 people. At that time, the population was about 350 with summer visitors normally between Memorial Day and Labor Day. The pond depth was increased to 3 feet to allow zero discharge from June to September. The 2-cell pond headworks included a Parshall flume for flow measurement, a grit chamber, a chlorine contact chamber and a chlorine/control building (located at the north end w/outfall in grass area). The only access was from Hwy 101 on the east side. During construction the spar pole area used to clear and burn material ended up 18" above the specified depth on the south end of the south pond. The City accepted this change since it only affected storage volume.

Two lift stations were built in the initial system, the Main Lift Station and the Ecola (Pacific) Lift Station. Both stations were wet well-dry well with a building at ground level to house the electric motors, controls, and gasoline engine generators. The underground structure was a concrete caisson with cutting edge. It was sunk by excavating material inside the caisson. A Tremie concrete poured plug sealed the bottom. Old logs and debris made excavation difficult at both sites.

The collection system initially served customers south of Elk Creek (now Ecola) and north of Sunset Blvd. Two areas were left out because of limited funds. 8" rubber ring pipe was used in areas not in the flood plain (Presidential Streets, etc) and 8" A.C. pipe in the lower areas (downtown and Gower St. area). Service connections were made with wyes. The entire system was lamped and water tested. Excavation in the lower areas was extremely difficult due to sand, high ground water and corduroy road construction. Spruce St. between 2nd and 1st was constructed with uncompacted excess trench spoil.

Existing septic tanks were to be pumped out, the roof removed and filled with sand. The City had a sand pit at 7th and Ash open to the public.

In about 1960 the City installed sewers on Elliot Way, Hills Lane, Ross Lane and Arbor Lane. Financing was the same as the original plan. Cost to extend the system to the north end was beyond the City's capabilities mainly because of the lift station needed and was projected to be 5-10 years in the future. Paula Munson, leader in the proposed Breakers Point development, pledged $35K to help the project. North-end residents welcomed and supported the north-end sewerage additions since they were still under the State's building ban. The project also included a 33% Federal Grant for Elk Creek (now Ecola) lift station and pressure main on Hwy 101 bypass bridge. The system was designed and built to the same standards as the original system and completed in 1963.

In 1964 the Alaska tsunami destroyed the lift station and highway bridge. The lift station and bridge were rebuilt within a year. Sewer service was maintained by tank trucks to transport the waste to the City's stabilization ponds. Repairs were part of Federal Grants. The Corp of Engineers designed and built a dike from the lift station to the treatment ponds and Hwy 101 to protect the downtown area from future flooding.

In the early 70s the Tolovana Park area (south City Limits to Silver Point) with five lift stations were added to the system and the treatment ponds expanded with a new cell added to the northwest side of Cell 2. Access to the treatment pond was from 2nd St. east of the Main Lift Station. Excess trench material was used as fill for the City Park.

Early in the 1980s growth, mainly from visitors, caused a need for a new Master Plan for the treatment facilities. The State (DEQ) was also requiring more than secondary treatment. Kramer, Chin, and Mayo of Seattle was retained. In the new plan, a fourth cell was added and deeper than the other 3 cells and surface aerators were installed. Don Thompson, a local resident, promoted tertiary ponds east of Hwy 101. These were installed in 1984 and used until 2007 when the present treatment plant was placed in operation. One of the main problems for years has been pollution concerns in Ecola Creek.

The City still has land with dikes and piping on the east side of Hwy 101 that may be needed and used in the future.

Currently, there are nine lift stations serving residential and commercial customers within the City's Urban Growth Boundary. The nine lift stations are named, Ecola, Main, Pacific, Elkland, Haystack, Matanuska, Suislaw, Midway, and Sitka.

2.2 Previous Planning Efforts

The following provides a summary of the relatively recent wastewater planning efforts.

1. Wastewater Collection System Master Plan: Completed in May 1991 by Kramer, Chin and Mayo, the Plan recommended the following:
    a. Increasing the capacity between the Main and Pacific Lift Stations. This project was either done, or deleted when the Pacific Lift Station was rerouted to pump directly to the wastewater treatment plant.
    b. Reconfiguring the inlet to the Pacific Lift Station
    c. Replacing undersized pipes directly upstream of the Pacific Lift Station
    d. Upgrading both Matanuska and Pacific Lift Stations to meet recommended capacity requirements.
    e. Upgrading both Haystack and Suislaw Lift Station enclosures.
    f. Provide additional system capacity between the Ecola Lift Station and the Main gravity system.
    g. Replacing undersized pipes within the trunk main north of Ecola Creek.
    h. Replacing Lift Station mechanical equipment periodically.

2. Wastewater Treatment Master Plan Update: Completed in April 2004 by Tetra Tech/KCM, the Update recommended the following:
    a. Upgrading the Main Lift Station motors/pumps/controls and adding flow metering.
    b. Installation of a new headworks that includes grit removal, screening, and flow measurement.
    c. Replacing the lagoon style treatment plant with an aerated basin (Biolac) type of treatment plant.
    d. Replacing the chlorine based disinfection system with a UV based disinfection system.
    e. Modifying the existing lagoons to become facultative sludge lagoons for both sludge storage and stabilization of bio-solids.
    f. Construction of a new gravity outfall to the wetland area.
    g. Changing to an all-yearlong discharge to the wetlands, effectively changing their status back to Waters of the State.

3. City of Cannon Beach Pump Station Evaluations: Completed in May of 2009 by HLB/Otak, this Evaluation recommended the following:
    a. Ecola Lift Station
        i. Pump upgrades in size from 7.5 HP to 10.0 horsepower
        ii. Construction of a smaller control building
        iii. Construction of a separate valve vault
        iv. Construction of a defined wetwell overflow
    b. Main Lift Station
        i. Construction of a by-pass capability for pump station
    c. Pacific Lift Station
        i. Addition of an open-air cover for the on-site generator
        ii. Generator base needs to be cleaned and tar-coated
        iii. Building ventilator needs a new thimble and rain cap installed
        iv. Replace computer in control building
        v. Test lift station for real flow capacity
    d. Elkland Lift Station
        i. Re-sealing the vacuum system for the pumps, and building upgrades
        ii. Replacing the vacuum style pumps for conventional pumps and building upgrades
    e. Haystack Lift Station
        i. Upgrade pumps to 10.0 horsepower
        ii. Install four new 2” SS guide rails
        iii. Install two new SS top brackets

iv. Install two new 3/8" SS lifting chains
v. Repair cracked PVC fitting in the wetwell
vi. Add alarm to overflow float, and upgrade controls

f. Matanuska Lift Station
   i. Addition of protective double elbow to force main air release ports
   ii. Separate level controls so that bubbler and floats are operating independent of one another

g. Suislaw Lift Station
   i. Upgrade pumps to 10 horsepower
   ii. Install four new 2" SS guide rails
   iii. Install two new SS top brackets
   iv. Install two new 3/8" SS lifting chains
   v. Alarm overflow float should be tested from the lift station all the way to an auto dialer

h. Midway Lift Station
   i. Replacement of pumps in kind
   ii. Install four new 2" SS guide rails
   iii. Install two new SS top brackets
   iv. Install two new 3/8" SS lifting chains
   v. Addition of an overflow alarm float to the wetwell

i. Sitka Lift Station
   i. Install four new 2" SS guide rails
   ii. Install two new SS top brackets
   iii. Install two new 3/8" SS lifting chains
   iv. Addition of an overflow alarm float to the wetwell
   v. Addition of overflow piping to a location chosen by the city

2.3 Need for This Report

The Facilities Plan completed in 1976 was for the planning period between 1976 and 1998. The 1976 Facilities Plan has been updated numerous times and the City of Cannon Beach wishes to have a new plan developed to identify and address current operational requirements as well as recommend needed upgrades to the wastewater systems.

Oregon DEQ recommends that cities maintain a current wastewater facilities plan. Facilities plans typically cover a 20-year planning period maximum but are generally updated or reevaluated every 10 years to stay abreast of planning needs for each system.

The City's Lift Stations are showing their age and have experienced some major communications failures in recent years. While the City has worked hard to maintain these facilities, it is becoming increasingly difficult to provide reliable service with non-integrated infrastructure.

Considering the age of the existing Cannon Beach Wastewater Facilities Plan and the condition and needs associated with the City's wastewater system, the time has come to complete a new wastewater facilities plan for Cannon Beach.

2.4 Acknowledgements

Various members of the City of Cannon Beach Public Works Department and Wastewater Division have contributed significant time and effort to provide complete and accurate information and data required for proper planning of the community's water system needs. Public works administration, public works staff, wastewater treatment operators, billing records personnel and others have all helped to complete this effort. We wish to acknowledge and thank the following persons in particular:

Jim Arndt – Public Works Director
Dan Grassick – Past Public Works Director
Cruz Flores - Public Works Foreman
Bryce Majors - Public Works Wastewater Division
Trevor Mount - Public Works Wastewater Division
Mike Brown - Public Works Wastewater Division
Jennifer Barrett - Public Works Administration
Samantha Palmieri - Reception
Richard Bertellotti - Public Works Committee
Carolyn Propst - Public Works Committee
Les Wierson - Public Works Committee

Section 3

3 Study Area Characteristics

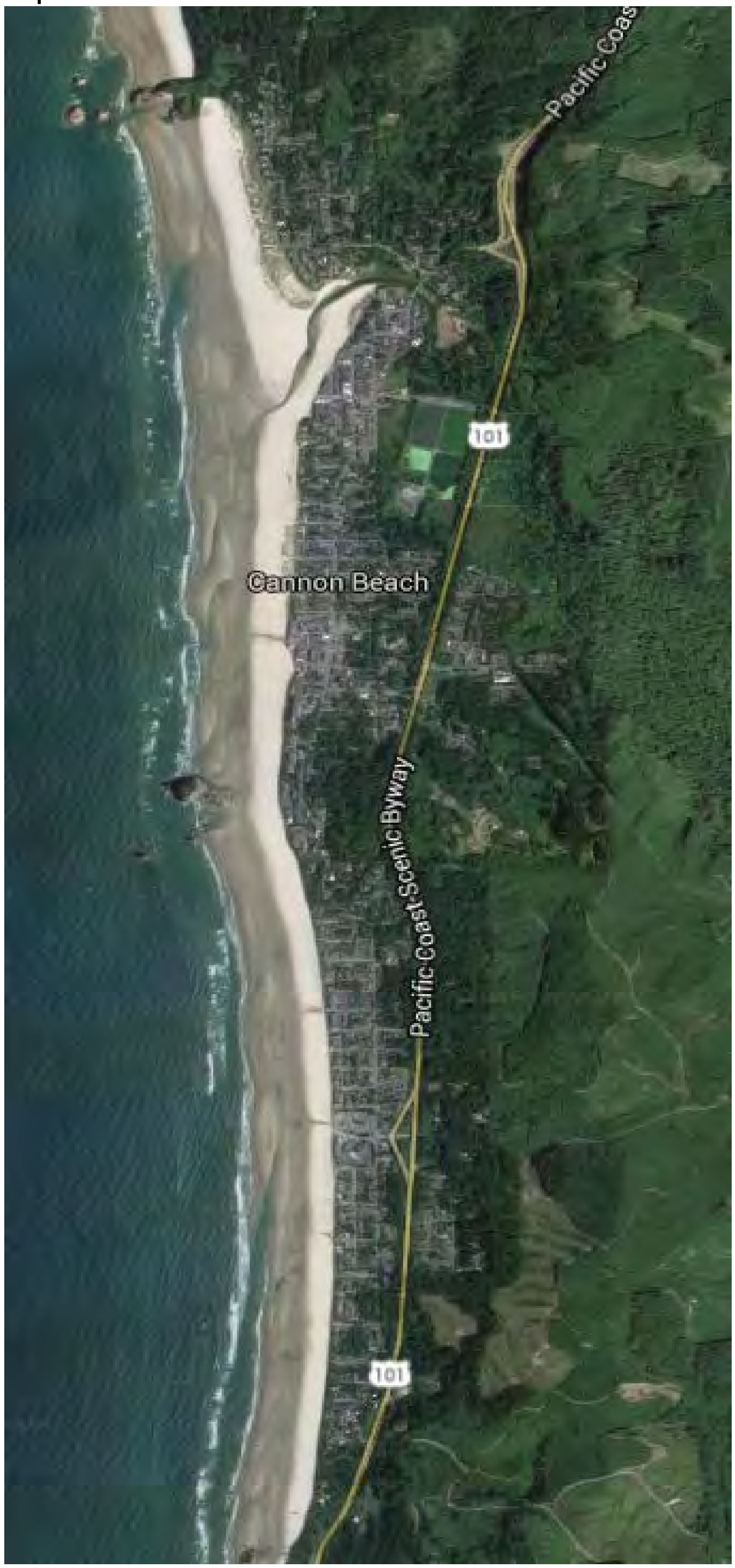
3.1 Study Area

The City of Cannon Beach is located along the northwestern coast of Oregon in Clatsop County, approximately 80 miles west of Portland. The City is situated on a particularly scenic stretch of the north Oregon coast, just south of Seaside. Cannon Beach is bounded by the Pacific Ocean to the west and, for the most part, Highway 101 to the east. Like many seaside communities, Cannon Beach is quite “long” in shape, measuring 3.6 miles north to south, and only 0.7 miles east to west. The primary access route to Cannon Beach is Highway 101. Highway 101 is most utilized by tourist traffic passing through the local area. A location map identifying the City of Cannon Beach is presented in Figure 3.1.1 below.

Figure 3.1.1 - Location Map

The study area for this Wastewater Facilities Plan includes all areas lying within the Urban Growth Boundary (UGB) for the City of Cannon Beach. A vicinity map depicting the study area for this plan is presented in Figure 3.1.2 below.

Figure 3.1.2 - Vicinity Map



3.2 Physical Environment

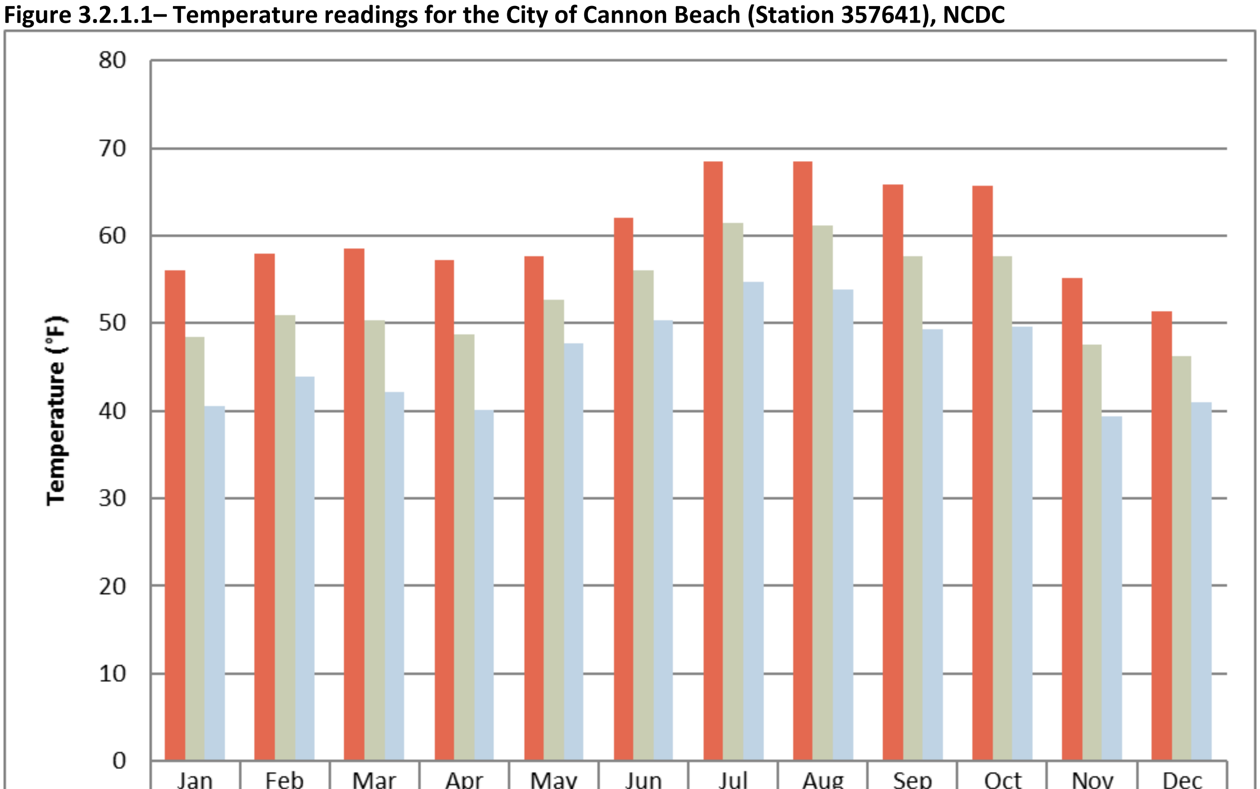
3.2.1 Climate

Climate data was obtained using long-term records collected at the Seaside weather station (Station 357641) as reported by the National Climatic Data Center. Seaside is approximately 9 miles north of Cannon beach and has the nearest weather station. Seaside is close enough in proximity and geography that it has similar weather to Cannon Beach, so the Seaside weather station will be used in this plan.

The figures below (Figure 3.1.2.1 and Figure 3.1.2.2) summarize the climate data obtained at the weather station from 1981-2015.

In Figure 3.2.1.1 below, the highest temperatures of the year typically occur from July through September. The coldest months are November and December. Cannon Beach's climate is one of the main attractions for tourism to the city. The high and low mean temperatures illustrate how the area is able to have the change of seasons while still remaining fairly mild in the coldest and hottest months of the year.

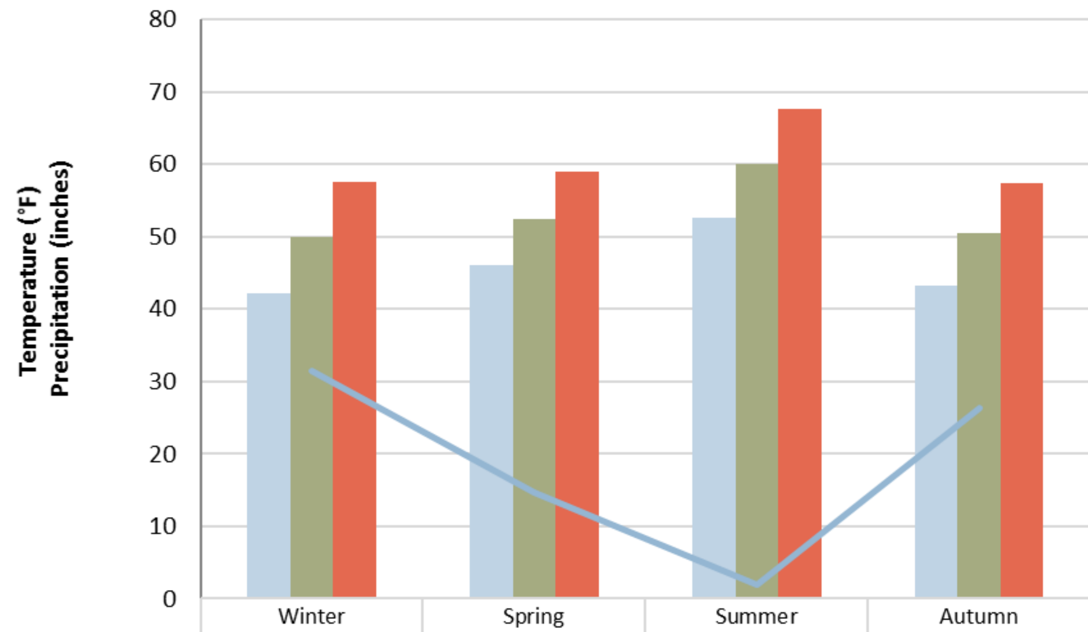
Figure 3.2.1.1– Temperature readings for the City of Cannon Beach (Station 357641), NCDC



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	56.1	57.9	58.5	57.2	57.7	62.1	68.4	68.5	65.8	65.7	55.2	51.3
Mean	48.4	50.9	50.4	48.7	52.7	56.1	61.5	61.2	57.6	57.6	47.5	46.2
Low	40.6	43.9	42.1	40.1	47.7	50.4	54.7	53.8	49.3	49.6	39.4	41

Figure 3.2.1.2 below is a breakdown of the seasonal data. This illustrates that the winter months (Dec.-Feb.) account for nearly half of the precipitation during the year. During the summer months (July-Sept.) Cannon Beach typically gets very little rain. This makes for very nice and dry recreational opportunities on the coast.

Figure 3.2.1.2– Seasonal data for the City of Cannon Beach (Station 357641), NCDC



	Winter	Spring	Summer	Autumn
Min. Temp (°F)	42.2	46.0	52.6	43.3
Avg. Temp (°F)	49.9	52.5	60.1	50.4
Max. Temp (°F)	57.5	59.0	67.6	57.4
Precip (in.)	31.5	14.7	2.0	26.4

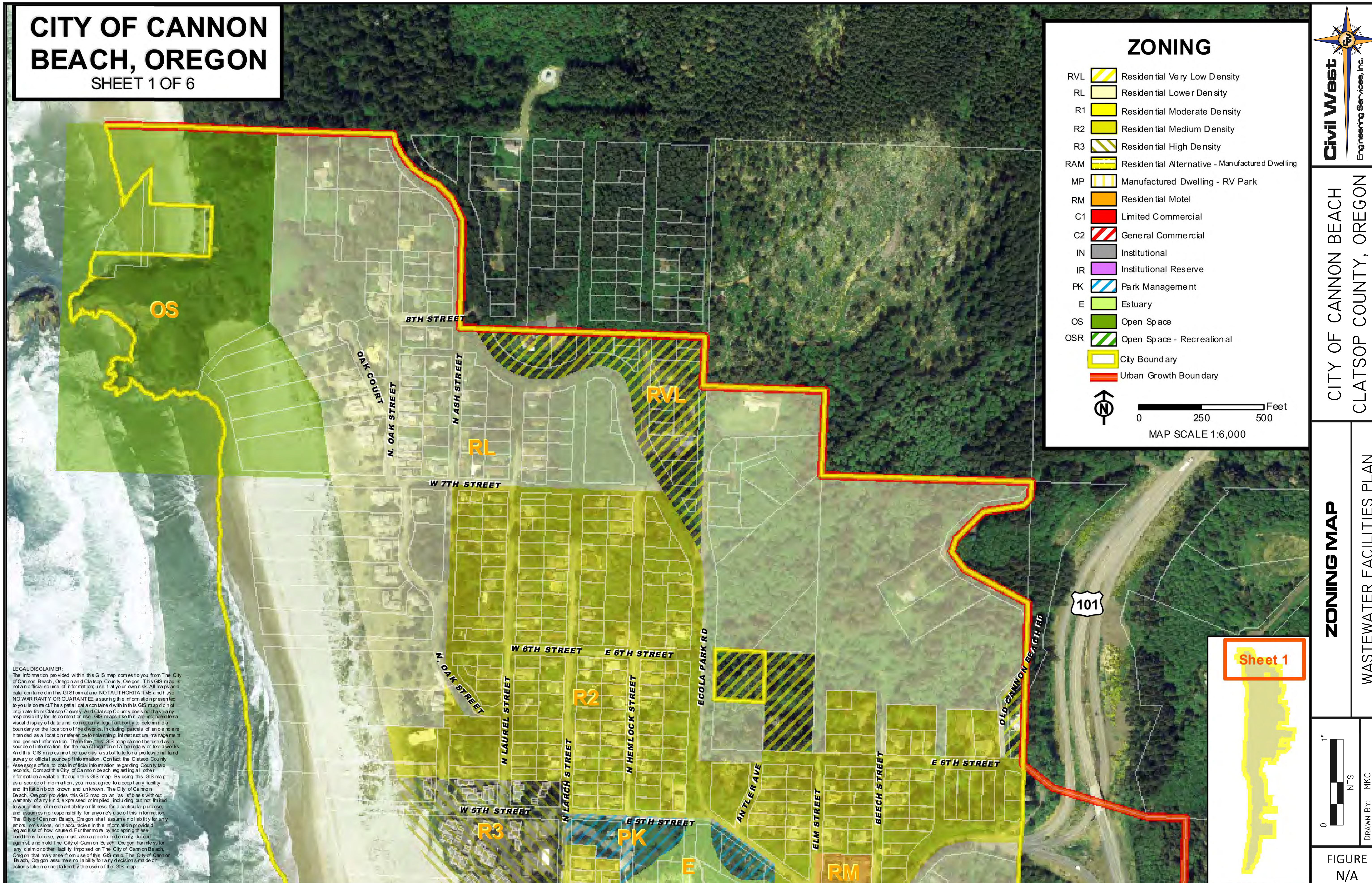
3.2.2 Zoning and Land Use Information

While most areas in the City of Cannon Beach are zoned for single family residential homes, there are also districts zoned for commercial, institutional, and public parks/recreational uses as summarized in Table 3.2.2.1 below.

Table 3.2.2.1 – Cannon Beach Zoning Districts

ZONING	Abbr.	ZONING	Abbr.
Residential Districts		**Public, Parks, & Recreational Districts**	
Very Low Density	RVL	Manufactured Dwelling Park & Recreational Vehicle Park	MP
Lower Density	RL	Open Space Recreation	OSR
Moderate Density	R1	Estuary	E
Medium Density	R2	Park Management	PK
High Density	R3	Open Space	OS
Alt./Manufactured Dwelling	RAM	**Overlay Zones**	
Motel	RM	Flood Hazard	FHO
Commercial Districts		Planned Development	PD
Limited	C1	Oceanfront Management	OM
General	C2	Wetlands Overlay Zone	WO
Institutional Districts			
Institutional	IN		
Institutional Reserve	IR		

Maps showing the location and boundaries of each zoning district and land use are included on the next seven sheets.



CITY OF CANNON BEACH, OREGON
SHEET 1 OF 6
ZONING
RVL Residential Very Low Density
RL Residential Lower Density
R1 Residential Moderate Density
R2 Residential Medium Density
R3 Residential High Density
RAM Residential Alternative - Manufactured Dwelling
MP Manufactured Dwelling - RV Park
RM Residential Motel
C1 Limited Commercial
C2 General Commercial
IN Institutional
IR Institutional Reserve
PK Park Management
E Estuary
OS Open Space
OSR Open Space - Recreational
City Boundary
Urban Growth Boundary
N
0 250 500 Feet
MAP SCALE 1:6,000
OS
RL
RVL
R2
R3
PK
E
RM
8TH STREET
OAK COURT
N. OAK STREET
N ASH STREET
W 7TH STREET
W 6TH STREET
E 6TH STREET
N. OAK STREET
N LAUREL STREET
N LARCH STREET
N HEMLOCK STREET
ECOLA PARK RD
W 5TH STREET
E 5TH STREET
ANTLER AVE
ELM STREET
BEECH STREET
E 6TH STREET
OLD CANNON BEACH RD
101
Sheet 1
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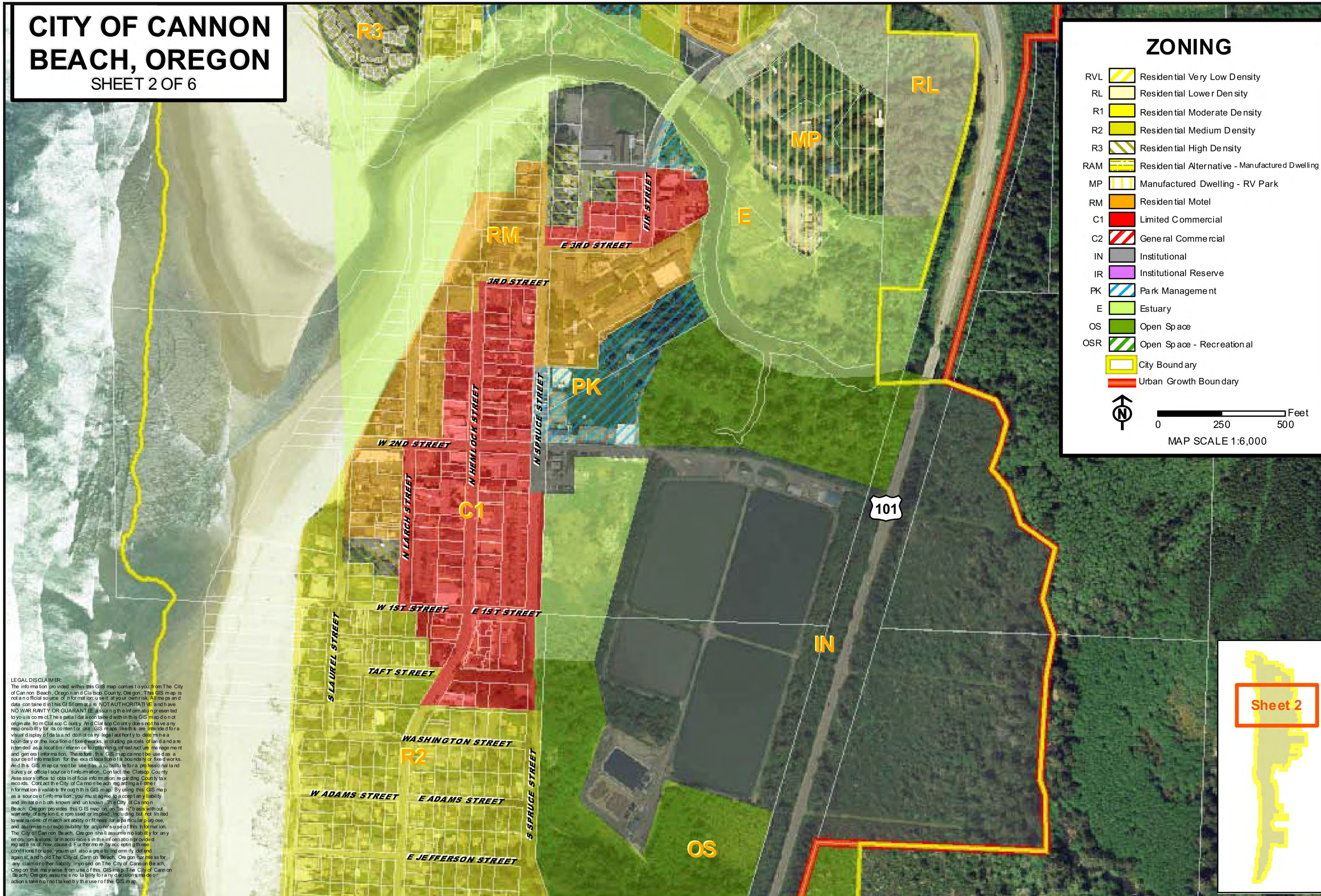
CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON
ZONING MAP
WASTEWATER FACILITIES PLAN
0 1"
NTS
DRAWN BY: MKC
DATE: DEC 2015
FIGURE
N/A

CITY OF CANNON BEACH, OREGON

SHEET 2 OF 6



Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

ZONING MAP

WASTEWATER FACILITIES PLAN

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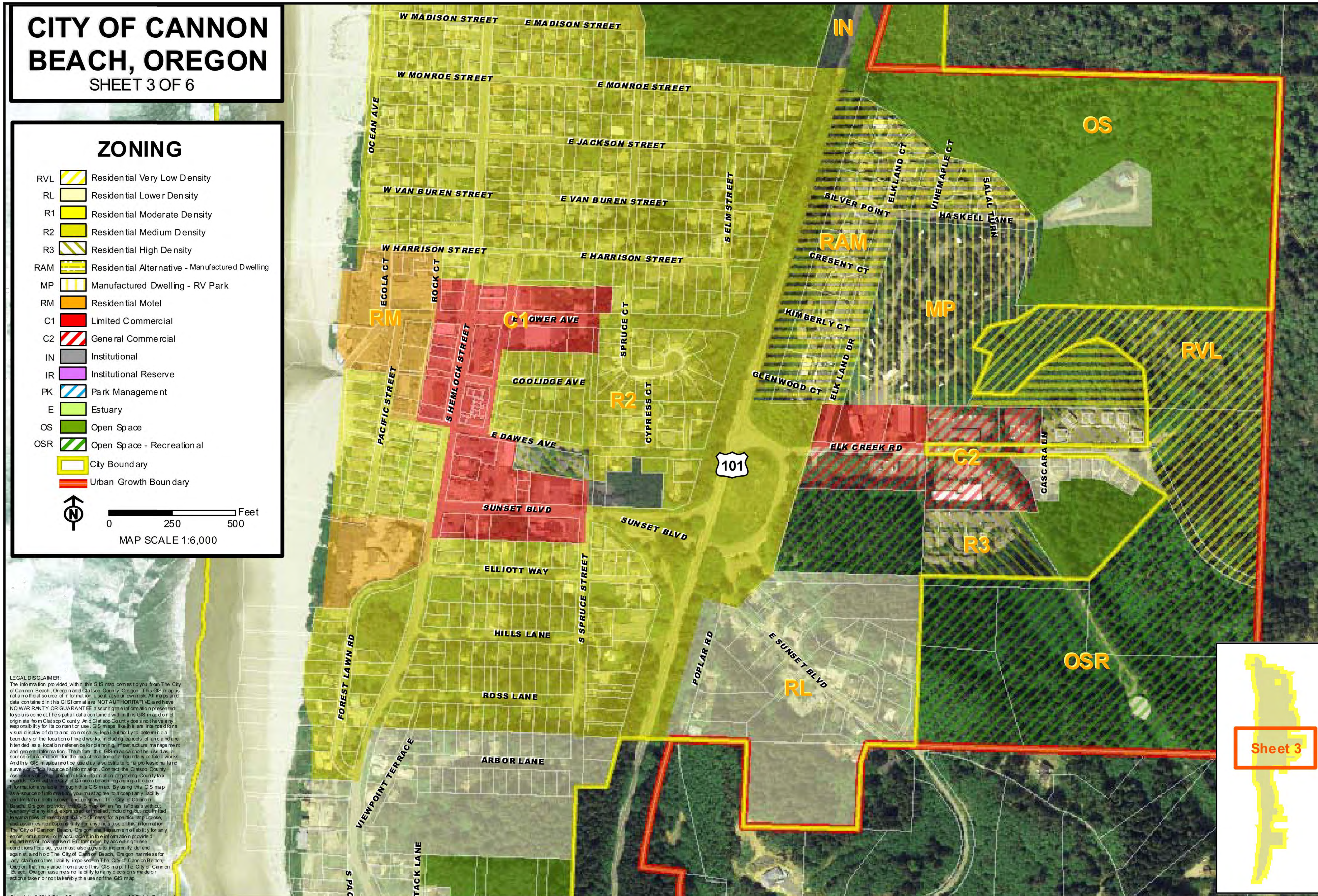
DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A

CITY OF CANNON BEACH, OREGON

SHEET 3 OF 6



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CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

ZONING MAP

WASTEWATER FACILITIES PLAN

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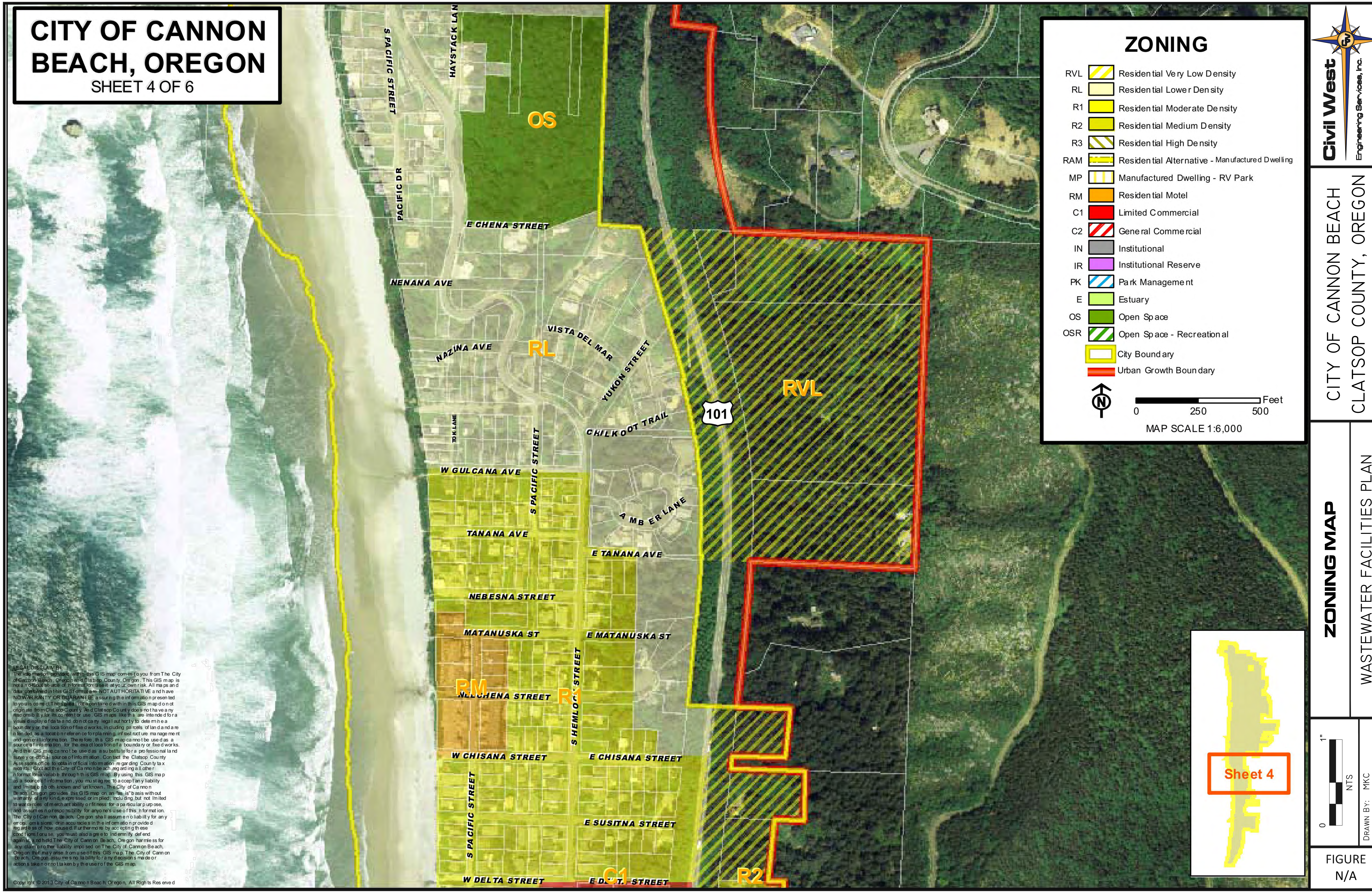
DATE: DEC 2015

FIGURE
N/A


CITY OF CANNON BEACH, OREGON
SHEET 4 OF 6
ZONING
RVL Residential Very Low Density
RL Residential Lower Density
R1 Residential Moderate Density
R2 Residential Medium Density
R3 Residential High Density
RAM Residential Alternative - Manufactured Dwelling
MP Manufactured Dwelling - RV Park
RM Residential Motel
C1 Limited Commercial
C2 General Commercial
IN Institutional
IR Institutional Reserve
PK Park Management
E Estuary
OS Open Space
OSR Open Space - Recreational
City Boundary
Urban Growth Boundary
N
0 250 500 Feet
MAP SCALE 1:6,000
OS
RL
RVL
RM
R1
C1
R2
101
S PACIFIC STREET
HAYSTACK LANE
PACIFIC DR
E CHENA STREET
NENANA AVE
NAZINA AVE
VISTA DEL MAR
YUKON STREET
CHILKOOT TRAIL
TOK LANE
W GULCANA AVE
S PACIFIC STREET
AMBER LANE
TANANA AVE
E TANANA AVE
NEBESNA STREET
MATANUSKA ST
E MATANUSKA ST
NELCHENA STREET
S HEMLOCK STREET
W CHISANA STREET
E CHISANA STREET
E SUSITNA STREET
W DELTA STREET
E DELTA STREET
Sheet 4
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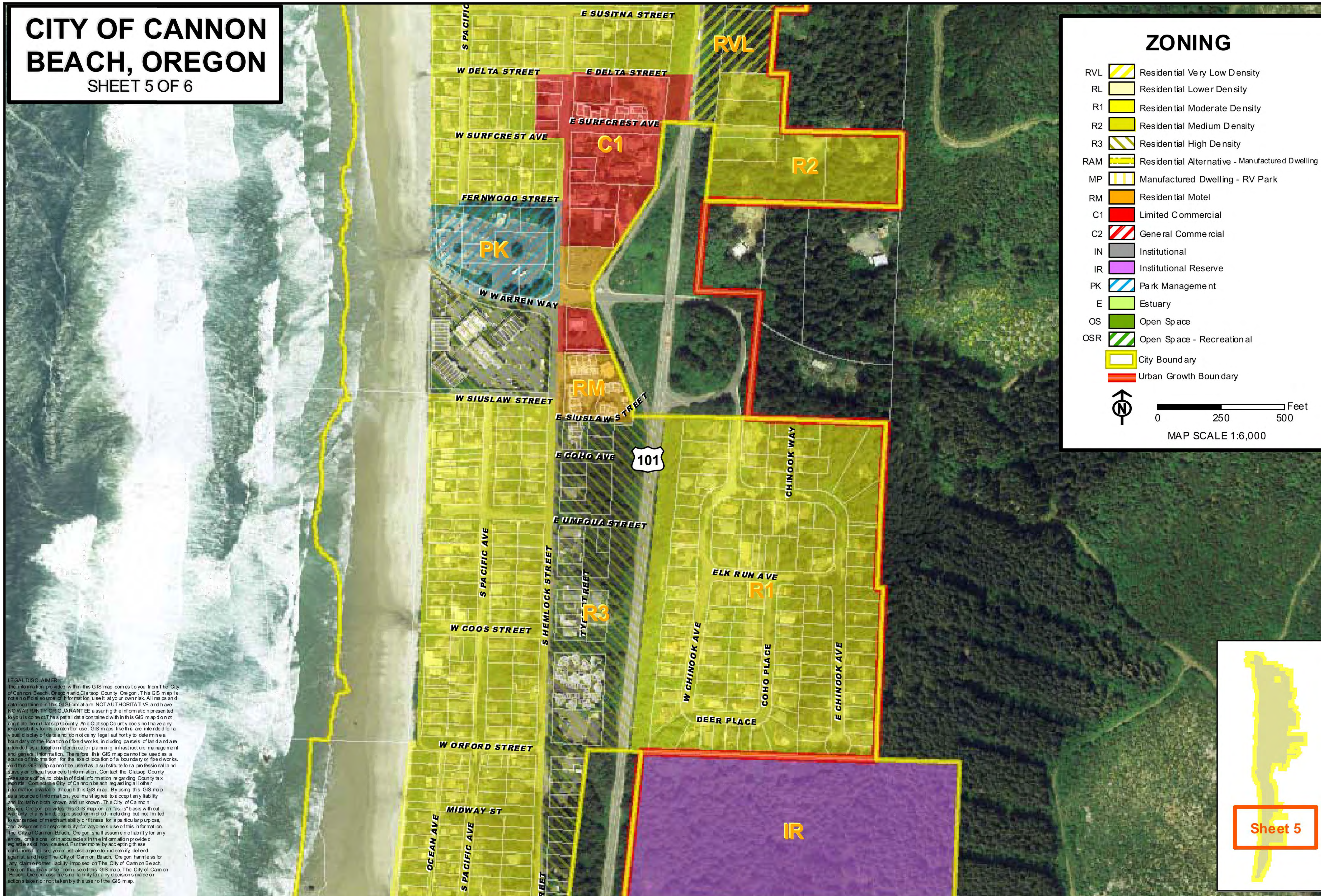
CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON
ZONING MAP
WASTEWATER FACILITIES PLAN
NTS
DRAWN BY: MKC
DATE: DEC 2015
FIGURE N/A



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CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

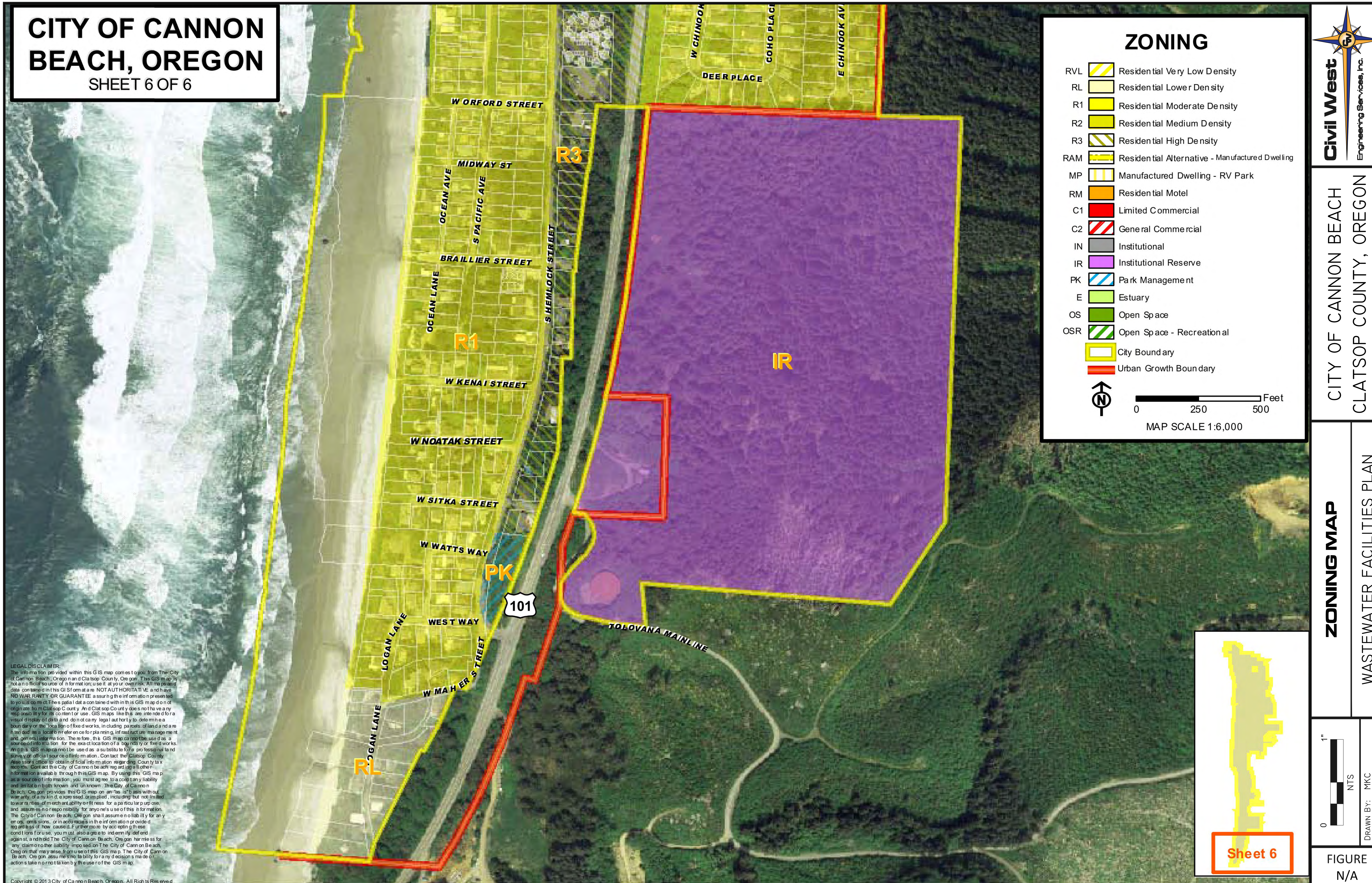
ZONING MAP

WASTEWATER FACILITIES PLAN

1" 0 NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A


CITY OF CANNON BEACH, OREGON
SHEET 6 OF 6
ZONING
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PK Park Management
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OS Open Space
OSR Open Space - Recreational
City Boundary
Urban Growth Boundary
N
Feet
0 250 500
MAP SCALE 1:6,000
W ORFORD STREET
MIDWAY ST
OCEAN AVE
S PACIFIC AVE
BRAILLIER STREET
OCEAN LANE
S HEMLOCK STREET
W KENAI STREET
W NOATAK STREET
W SITKA STREET
W WATTS WAY
WEST WAY
LOGAN LANE
W MAHER STREET
DEER PLACE
COHO PLACE
TOLOVANA MAINLINE
101
R1
R3
IR
PK
RL
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Sheet 6
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CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON
ZONING MAP
WASTEWATER FACILITIES PLAN
0
1"
NTS
DRAWN BY: MKC
DATE: DEC 2015
FIGURE N/A

CITY OF CANNON BEACH LAND USE MAP WITH RIGHT OF WAY

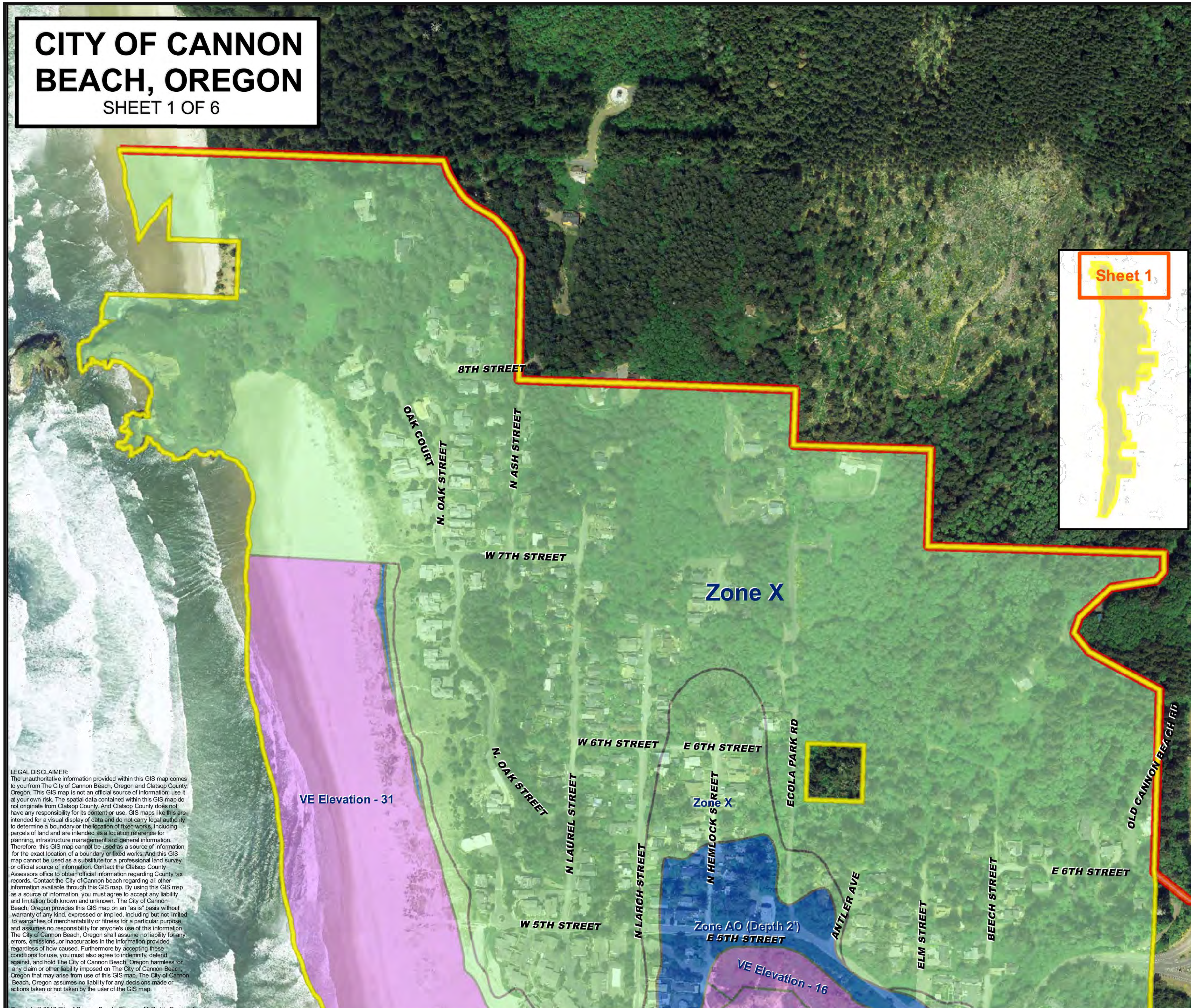
3.2.3 Floodplain

The City of Cannon Beach is located on a sandy beach, much of the town is low laying, with much of the town's elevation below 40'. Cannon Beach is also located in an area of high rainfall, isopluvial maps indicate an accumulated 5.0" daily precipitation occurring once every 5 years on average. Because wastewater lift stations, by their very nature, are at the lowest elevations, all lift stations are within areas defined on FEMA maps as susceptible to flooding during the 1% annual chance flood event, apart from the Elkland lift station, which is located on higher ground. Portions of the wastewater treatment are inside the FEMA 1% annual flood zone.

Maps showing the location and boundaries of the floodplains are included on the next six sheets.

CITY OF CANNON BEACH, OREGON

SHEET 1 OF 6



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FLOOD ZONES

- Velocity Zone - VE
- Zone - AE
- Zone - AO
- Zone - X
- City Boundary
- Urban Growth Boundary

N

0 250 500 Feet

MAP SCALE 1: 6,000

2010 FEMA FLOOD MAP LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 978)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
20 - - - 20	Transect line
97°10'30.5", 32°10'30.5"	Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
$^{42}76^{000m}$E	1000-meter Universal Transverse Mercator grid values, zone 10
600000 FT	5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

September 17, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

FLOODPLAIN MAP

WASTEWATER FACILITIES PLAN

0 1"

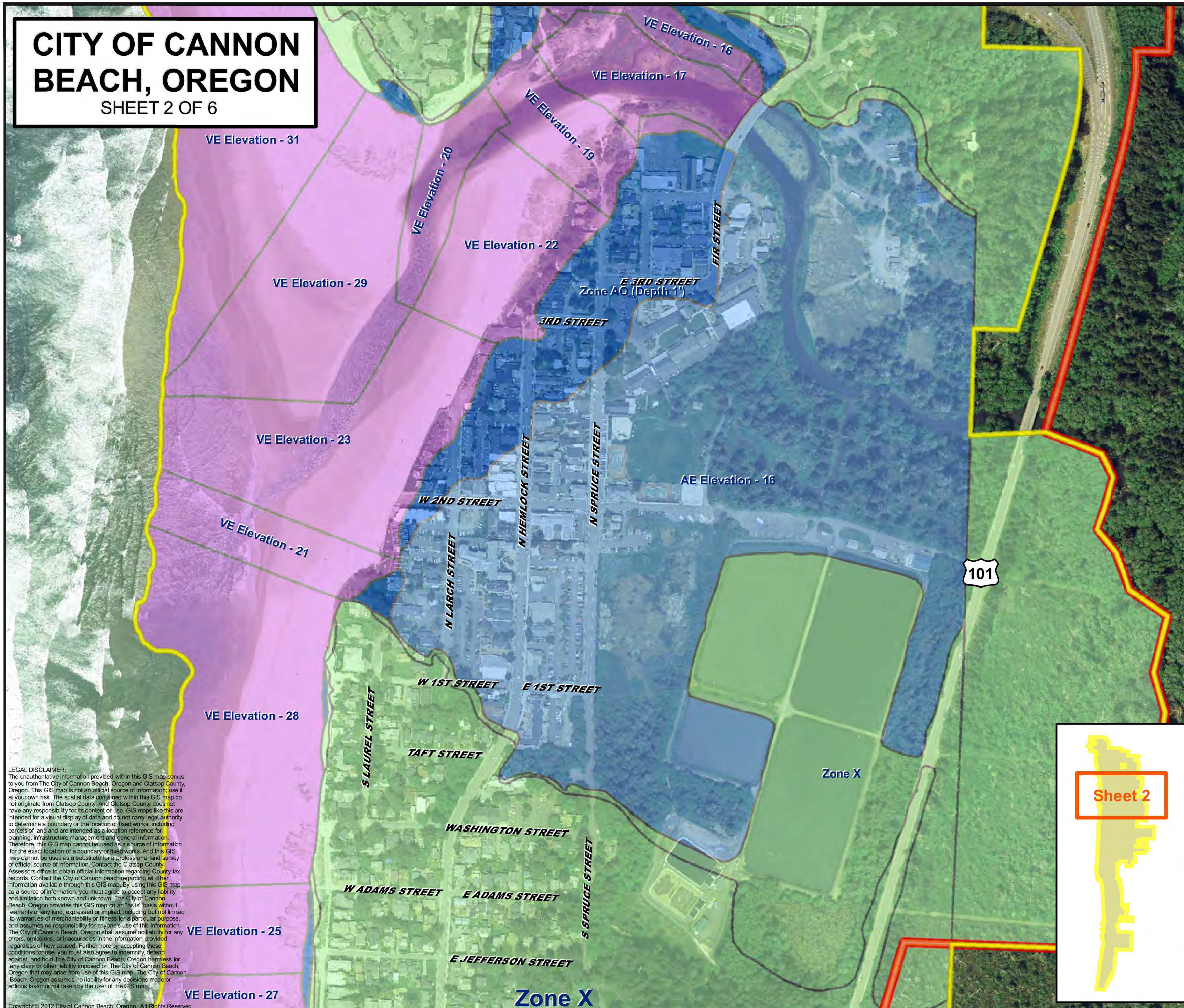
NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A

CITY OF CANNON BEACH, OREGON

SHEET 2 OF 6



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FLOOD ZONES

- Velocity Zone - VE
- Zone - AE
- Zone - AO
- Zone - X
- City Boundary
- Urban Growth Boundary

N

0 250 500 Feet

MAP SCALE 1: 6,000

2010 FEMA FLOOD MAP LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 978)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
97°10'30.5", 32°10'30.5"	Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
4276000mE	1000-meter Universal Transverse Mercator grid values, zone 10
600000 FT	5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

September 17, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

FLOODPLAIN MAP
WASTEWATER FACILITIES PLAN

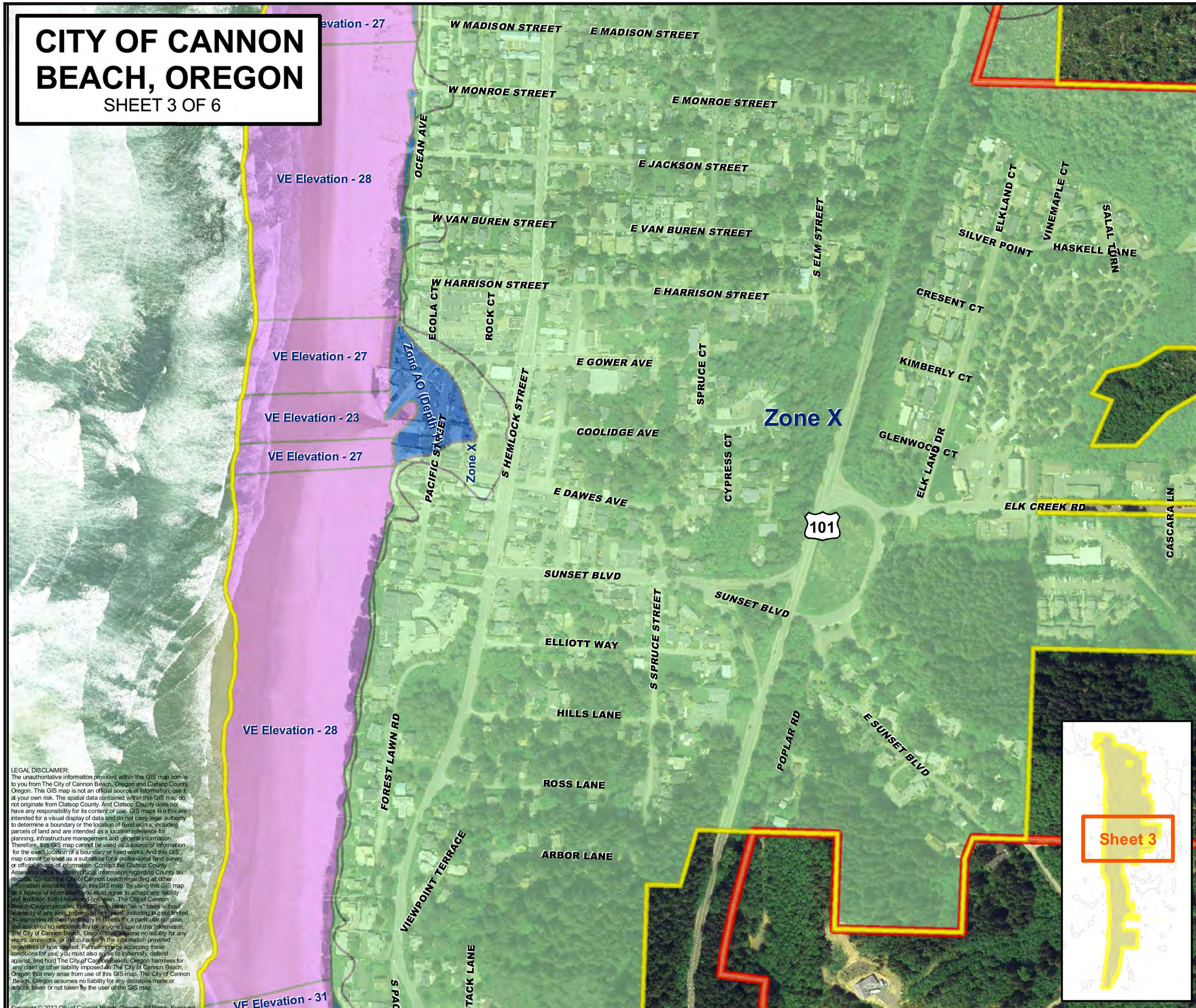
0 1" NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A

CITY OF CANNON BEACH, OREGON

SHEET 3 OF 6



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FLOOD ZONES

- Velocity Zone - VE
- Zone - AE
- Zone - AO
- Zone - X
- City Boundary
- Urban Growth Boundary

N

Feet
0 250 500
MAP SCALE 1: 6,000

2010 FEMA FLOOD MAP LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet *
(EL 978)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
97°10'30.5", 32°10'30.5"	Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
4276000mE	1000-meter Universal Transverse Mercator grid values, zone 10
600000 FT	5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

September 17, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

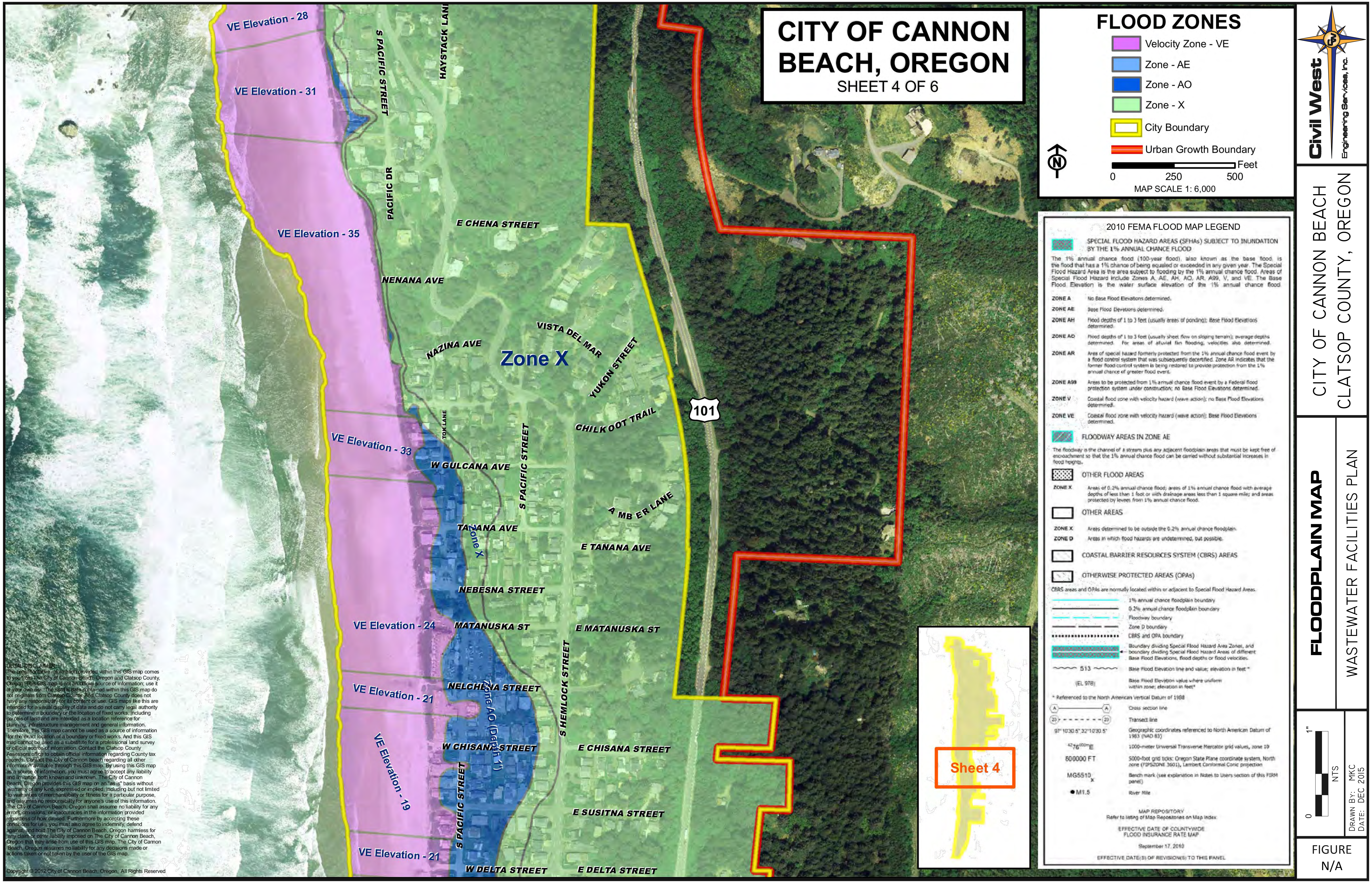
FLOODPLAIN MAP

WASTEWATER FACILITIES PLAN

1"
0
NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A



CITY OF CANNON BEACH, OREGON
SHEET 4 OF 6
FLOOD ZONES
Velocity Zone - VE
Zone - AE
Zone - AO
Zone - X
City Boundary
Urban Growth Boundary
Feet
0
250
500
MAP SCALE 1: 6,000
N
2010 FEMA FLOOD MAP LEGEND
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.
ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Area of special hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.
ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
FLOODWAY AREAS IN ZONE AE
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
OTHER FLOOD AREAS
ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
OTHER AREAS
ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513
Base Flood Elevation line and value; elevation in feet *
(EL 978)
Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988
Cross section line
Transect line
97°10'30.5" 32°10'30.5"
Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
4276000mE
1000-meter Universal Transverse Mercator grid values, zone 10
600000 FT
5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510
Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5
River Mile
MAP REPOSITORY
Refer to listing of Map Repositories on Map Index
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
September 17, 2010
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
Sheet 4
VE Elevation - 28
VE Elevation - 31
VE Elevation - 35
VE Elevation - 33
VE Elevation - 24
VE Elevation - 21
VE Elevation - 19
VE Elevation - 21
Zone X
Zone X
Zone AO (Depth 1)
S PACIFIC STREET
HAYSTACK LANE
PACIFIC DR
E CHENA STREET
NENANA AVE
NAZINA AVE
VISTA DEL MAR
YUKON STREET
CHILKOOT TRAIL
101
TOK LANE
W GULCANA AVE
S PACIFIC STREET
AMBER LANE
TANANA AVE
E TANANA AVE
NEBESNA STREET
MATANUSKA ST
E MATANUSKA ST
NELCHENA STREET
S HEMLOCK STREET
W CHISANA STREET
E CHISANA STREET
S PACIFIC STREET
E SUSITNA STREET
W DELTA STREET
E DELTA STREET
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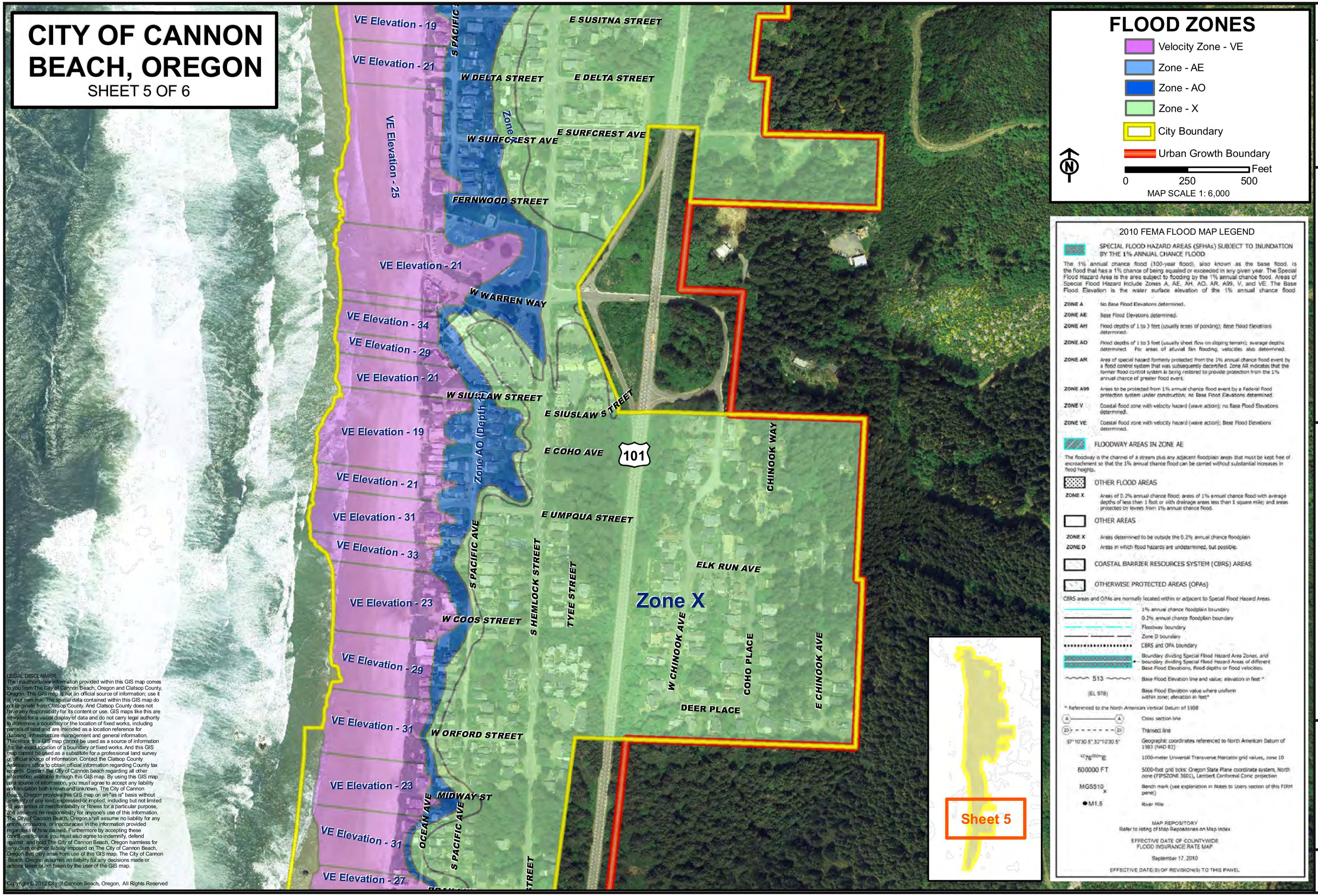
Civil West Engineering Services, Inc.
CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON
FLOODPLAIN MAP
WASTEWATER FACILITIES PLAN
0
1"
NTS
DRAWN BY: MKC
DATE: DEC 2015
FIGURE
N/A



Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

FLOODPLAIN MAP

WASTEWATER FACILITIES PLAN

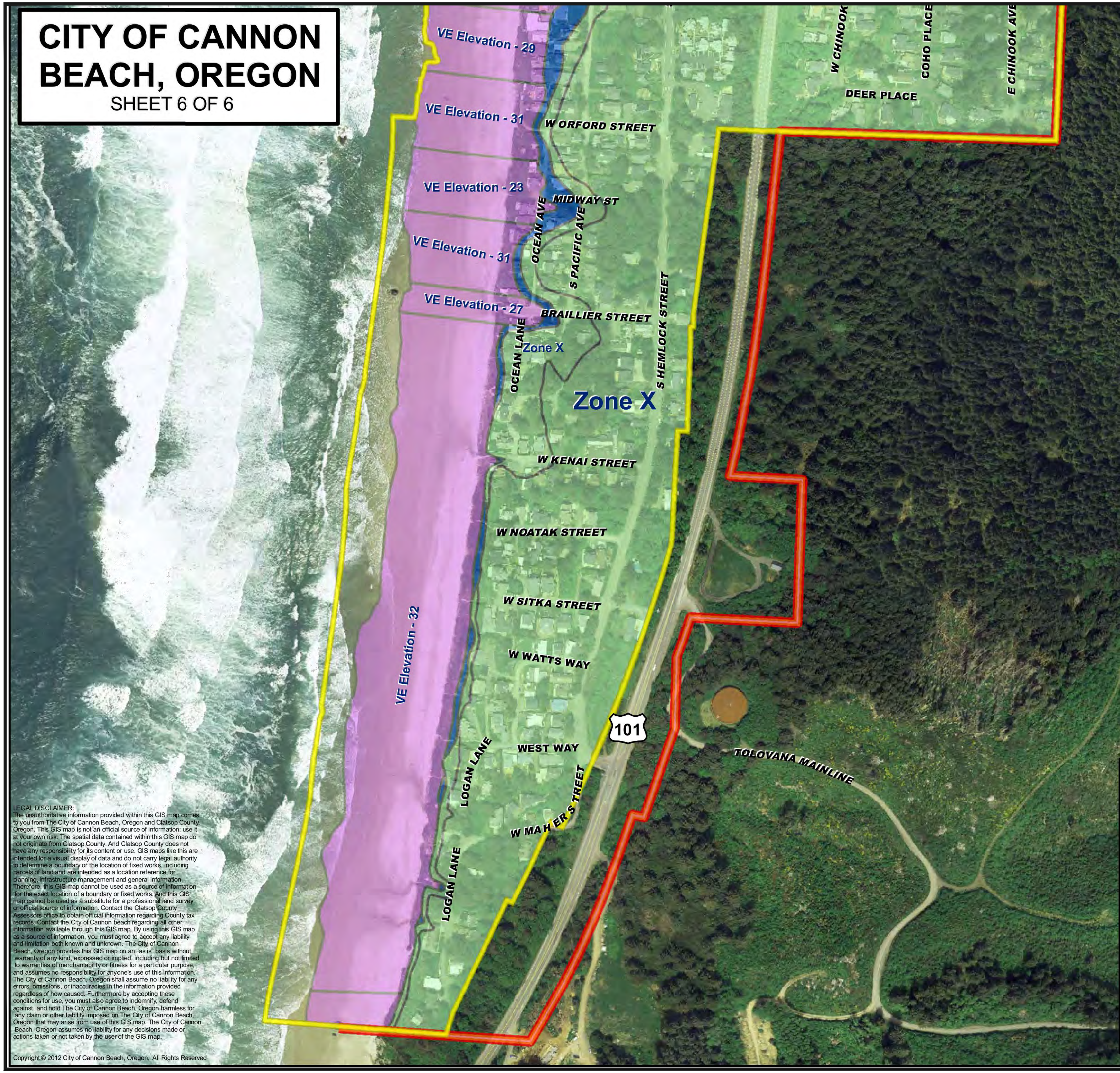
NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A

CITY OF CANNON BEACH, OREGON

SHEET 6 OF 6



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FLOOD ZONES

- Velocity Zone - VE
- Zone - AE
- Zone - AO
- Zone - X
- City Boundary
- Urban Growth Boundary

Feet
0 250 500
MAP SCALE 1: 6,000

2010 FEMA FLOOD MAP LEGEND

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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513	Base Flood Elevation line and value; elevation in feet *
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* Referenced to the North American Vertical Datum of 1988

A —— A	Cross section line
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600000 FT	5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

September 17, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

FLOODPLAIN MAP

WASTEWATER FACILITIES PLAN

0 1" NTS

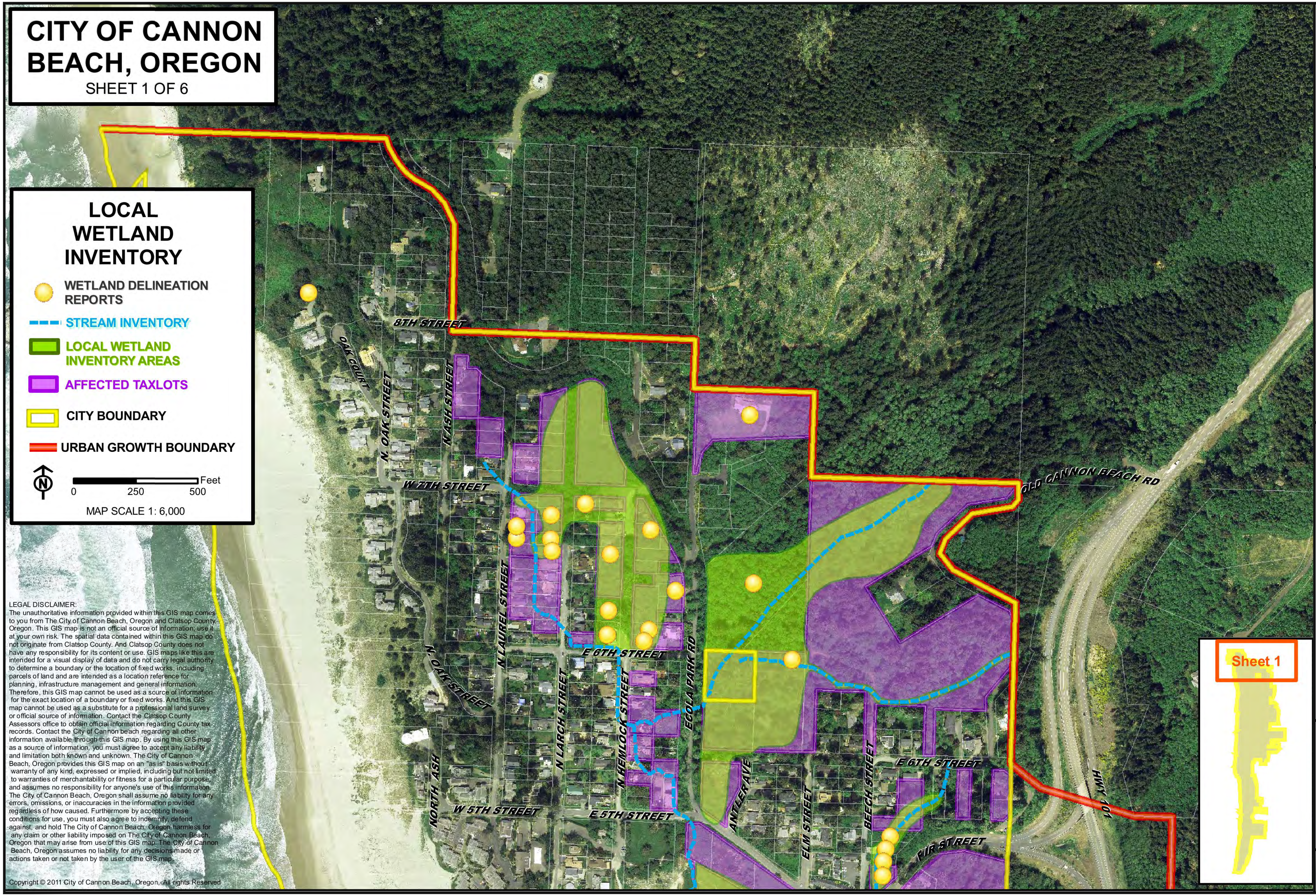
DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A

3.2.4 Wetlands

The U.S. Fish and Wildlife Service manages the National Wetlands Inventory (NWI) for wetlands and other aquatic habitats that may be subject to regulation under Section 404 of the Clean Water Act or other State/Federal statutes. A search of the NWI for Cannon Beach shows several wetlands and other aquatic habitats which are within or partially within the Cannon Beach UGB. Future water system projects must take wetland and aquatic habitat impacts into consideration and avoid disruptions where possible.

Maps showing the location and boundaries of the wetlands are included on the next six sheets.



Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

WASTEWATER FACILITIES PLAN

WETLAND MAP

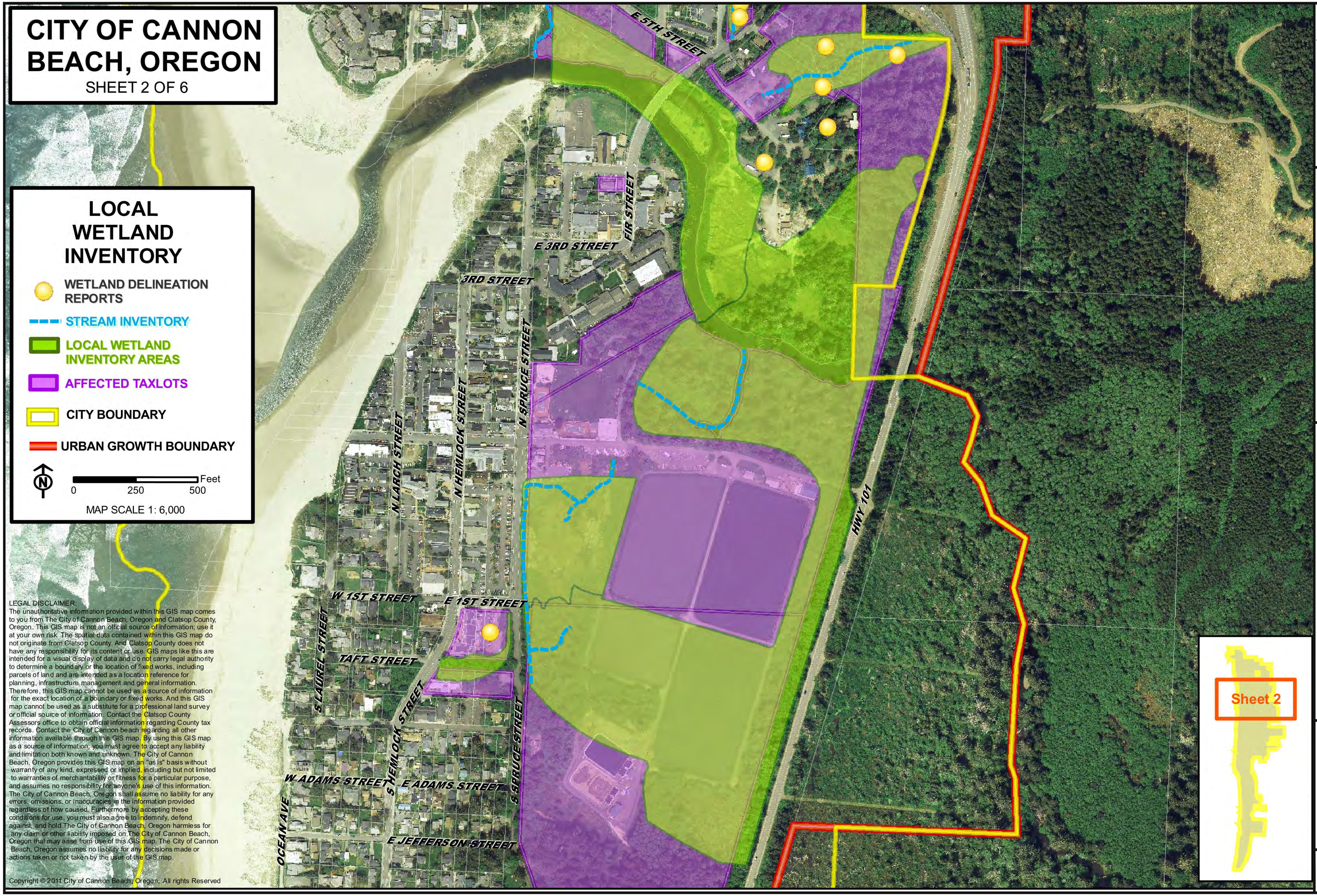
1"
NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A

CITY OF CANNON BEACH, OREGON

SHEET 2 OF 6



LOCAL WETLAND INVENTORY

- WETLAND DELINEATION REPORTS
- STREAM INVENTORY
- LOCAL WETLAND INVENTORY AREAS
- AFFECTED TAXLOTS
- CITY BOUNDARY
- URBAN GROWTH BOUNDARY

0 250 500 Feet

MAP SCALE 1: 6,000

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Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

WETLAND MAP

WASTEWATER FACILITIES PLAN

0 1" NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A

CITY OF CANNON BEACH, OREGON

SHEET 3 OF 6

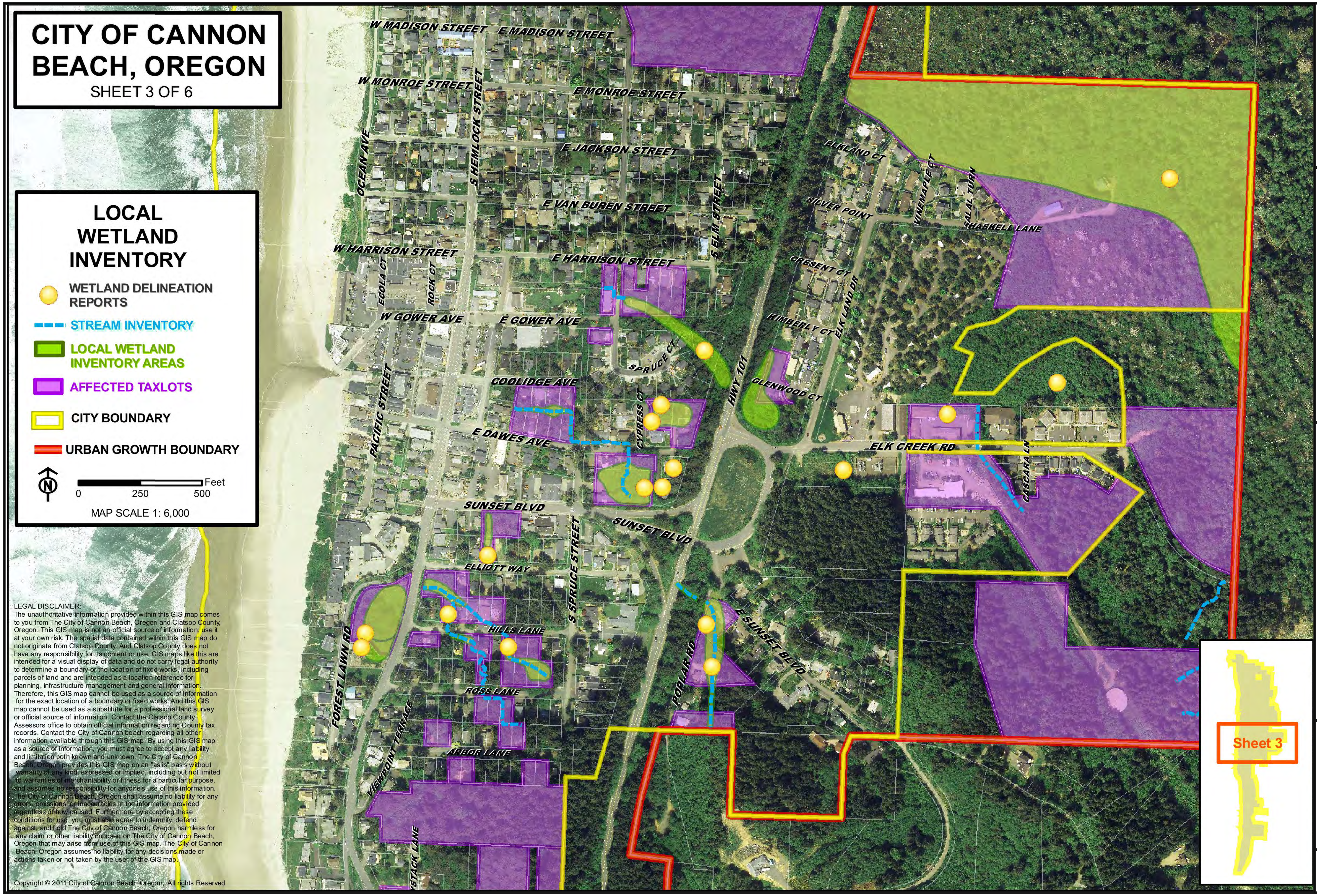
LOCAL WETLAND INVENTORY

- WETLAND DELINEATION REPORTS
- STREAM INVENTORY
- LOCAL WETLAND INVENTORY AREAS
- AFFECTED TAXLOTS
- CITY BOUNDARY
- URBAN GROWTH BOUNDARY

N

0 250 500 Feet

MAP SCALE 1: 6,000



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Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

WETLAND MAP

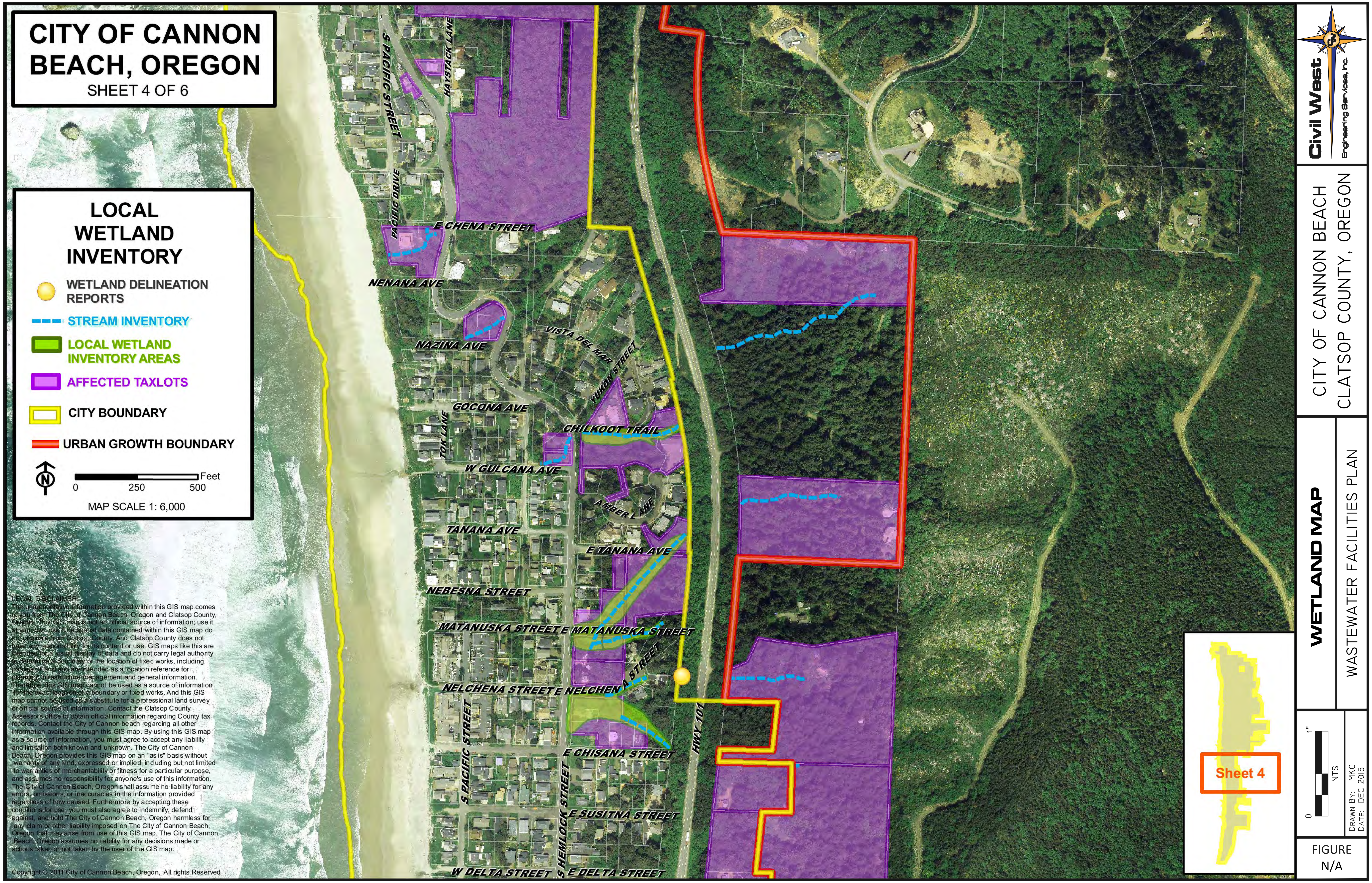
WASTEWATER FACILITIES PLAN

0 1"

NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A



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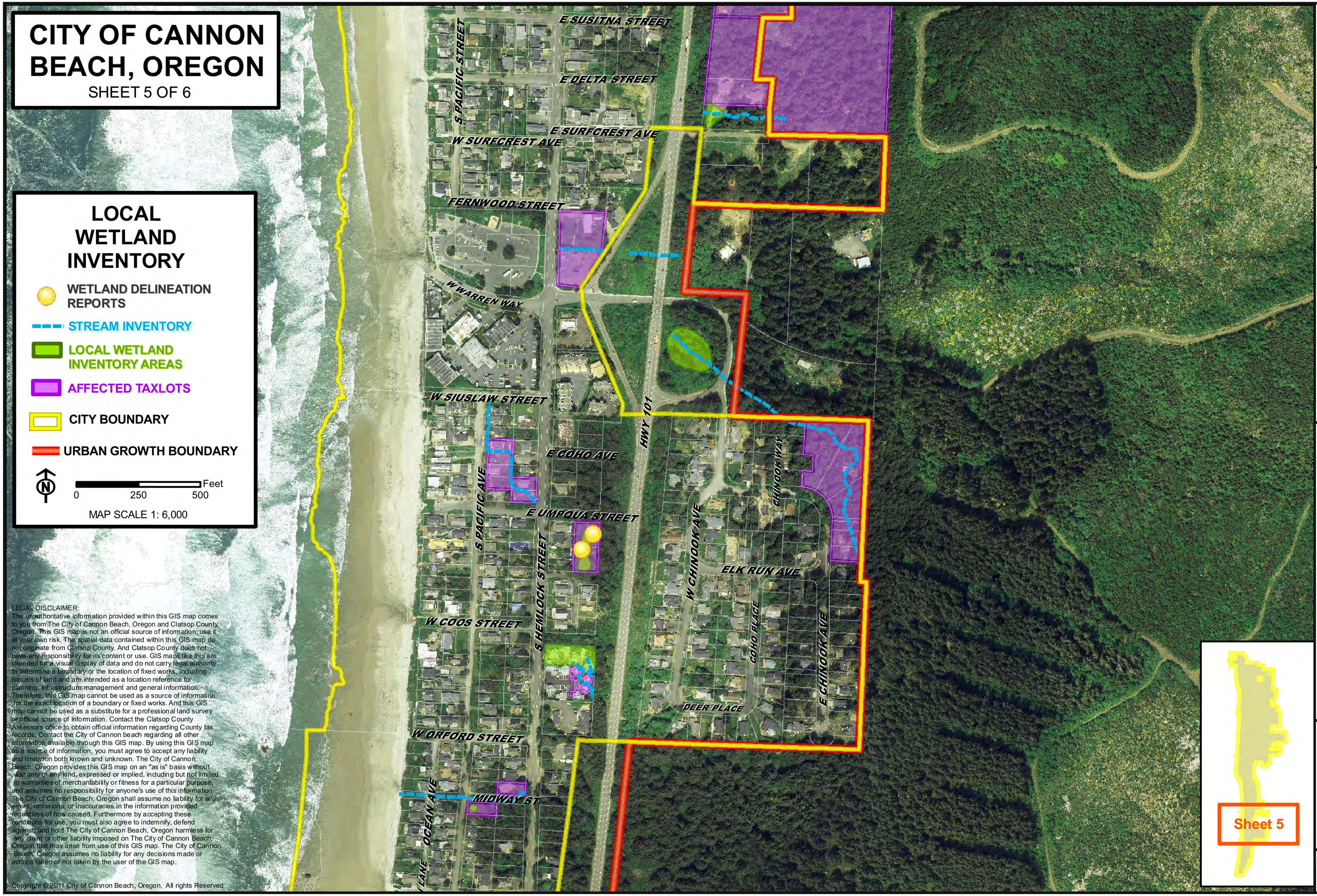
CITY OF CANNON BEACH, OREGON

SHEET 5 OF 6



LOCAL WETLAND INVENTORY

- WETLAND DELINEATION REPORTS
- STREAM INVENTORY
- LOCAL WETLAND INVENTORY AREAS
- AFFECTED TAXLOTS
- CITY BOUNDARY
- URBAN GROWTH BOUNDARY

N

0 250 500 Feet

MAP SCALE 1: 6,000

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CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

WETLAND MAP

WASTEWATER FACILITIES PLAN

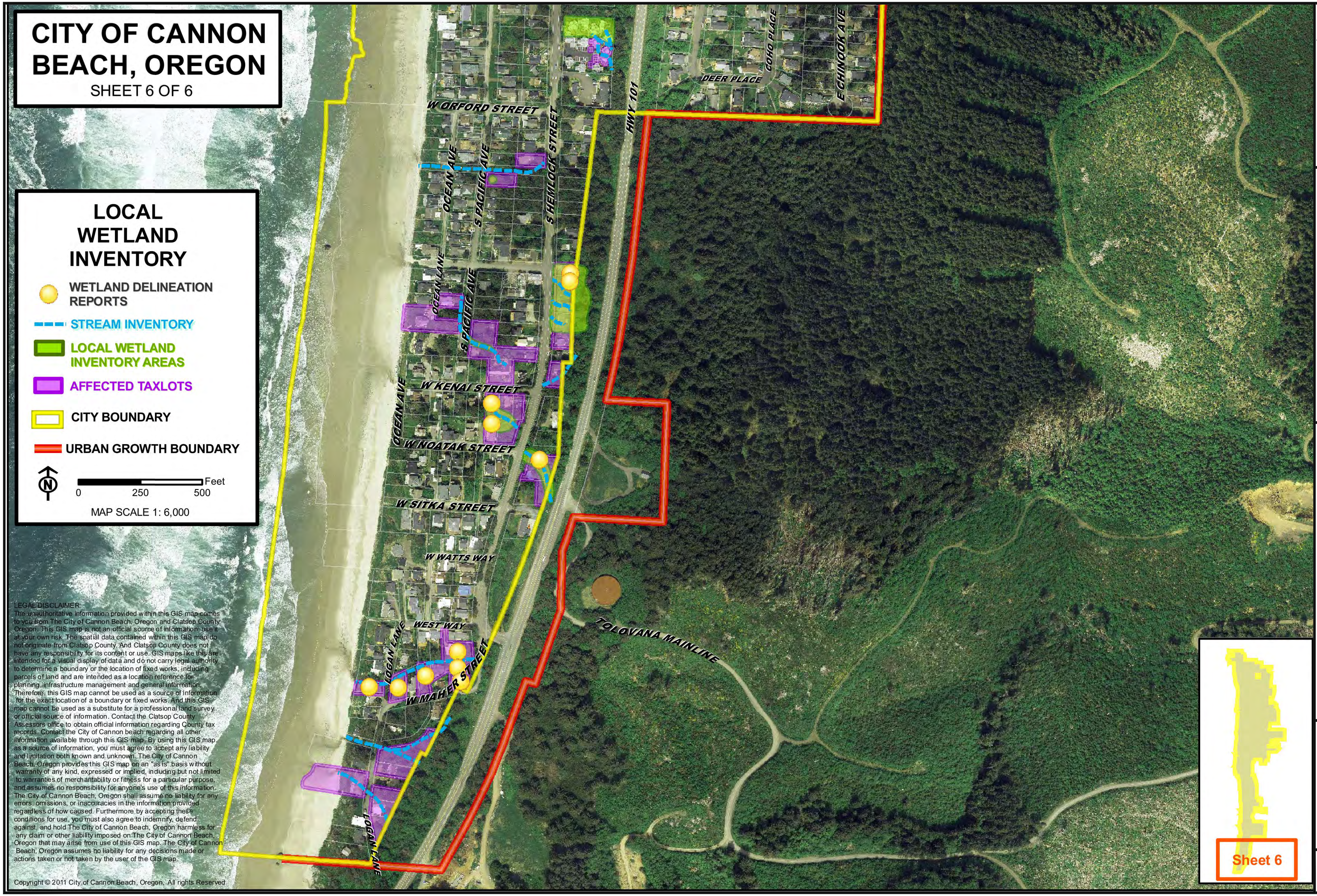
0 1" NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE N/A

CITY OF CANNON BEACH, OREGON

SHEET 6 OF 6



LOCAL WETLAND INVENTORY

- WETLAND DELINEATION REPORTS
- STREAM INVENTORY
- LOCAL WETLAND INVENTORY AREAS
- AFFECTED TAXLOTS
- CITY BOUNDARY
- URBAN GROWTH BOUNDARY

0 250 500 Feet

MAP SCALE 1: 6,000

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Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

WETLAND MAP

WASTEWATER FACILITIES PLAN

0 1"

NTS

DRAWN BY: MKC
DATE: DEC 2015

FIGURE
N/A

3.2.5 Soils

Based on the 2015 USDA and NRCS Soil Survey of Clatsop County, Oregon, the predominant soils in the study area are Walluski silt loam, Coquille-Clatsop complex, and Humitopepts-Tropaquepts complex. There is one historically active landslide in the City located near South Hemlock Street just south of East Chena Street. The surrounding area of town about 0.25 miles north of this location and running to the east is classified as a "Landsliding Likely" area by the Oregon Department of Geology and Mineral Industries.

Soil Types

- The area of the town north of the Ecola Creek is mostly comprised of Waldport fine sands on slopes from 3 to 30 percent. This area also contains Coquille-Clatsop complex on 0 to 1 percent slopes.
- South of the Ecola Creek is comprised of Coquille-Clatsop complex, further south and in the central area of town it is Walluski silt loam on 0 to 7 percent slopes.
- The area of the town south of Haystack Rock is comprised mostly of Humitopepts-Tropaquepts complex on the west along the coast, and Walluski silt loam running down the eastern side of the south of town.

3.2.6 Archeological/Historic Resources

According to the National Register of Historic Places (NRHP), there are three archaeological sites and one historic property located in Cannon Beach. These include:

- Bald Point Site (Smithsonian Trinomial: 35CLT23)
- Ecola Point Site (Smithsonian Trinomial: 35CLT21)
- Indian Creek Village Site (Smithsonian Trinomial: 35CLT12)
- West, Oswald, Coastal Retreat

There are also several other sites and structures in the City that are eligible to be considered historic but have not yet been registered with the NRHP. In the future, cultural resources should always be considered during planning for system upgrades and/or improvements.

3.2.7 Biological Resources

Biological resources in the area include numerous fish, birds, and mammals. Fish species in the Ecola Creek include, but is not limited to, Coho Salmon, Steelhead, and Cutthroat Trout. Several species of birds are known to breed in forests around the City of Cannon Beach including Bald Eagles, Puffins, and Pelicans. Mammals such as Roosevelt elk, deer, gray fox, squirrels, and raccoons also inhabit this area.

The U.S. Fish and Wildlife Service IPaC (Information for Planning and Conservation) tool was utilized to identify endangered species and migratory birds that may exist or could potentially be affected by activities in Cannon Beach. While no Critical Habitats were found, 9 endangered species and 14 migratory birds were identified in the search. These are summarized in Table 3.2.8.1 and Table 3.2.8.2 below.

Table 3.2.8.1 - Endangered Species

Common Name	Scientific Name	Status
Birds		
Marbled Murrelet	Brachyramphus marmoratus	Threatened
Northern Spotted Owl	Strix occidentalis caurina	Threatened
Short-Tailed Albatross	Phoesbastria (=Diomedea) albatrus	Endangered
Western Snowy Plover	Charadrius alexandrinus nivosus	Threatened
Xantus's Murrelet	Synthliboramphus hypoleucus	Candidate
Mammals		
Red Tree Vole	Arborimus longicaudus	Candidate

Reptiles		
Leatherback Sea Turtle	Dermochelys coriacea	Endangered
Loggerhead Sea Turtle	Caretta caretta	Endangered
Olive Ridley Sea Turtle	Lepidochelys olivacea	Threatened

Table 3.2.8.2 - Migratory Birds

Common Name	Scientific Name	Season
Bald Eagle	Haliaeetus leucocephalus	Year-Round
Black Oystercatcher	Haematopus bachmani	Year-Round
Caspian Tern	Hydroprogne caspia	Breeding
Fox Sparrow	Passerella iliaca	Wintering
Marbled Godwit	Limosa fedoa	Wintering
Olive-Sided Flycatcher	Contopus cooperi	Breeding
Peregrine Falcon	Falco peregrinus	Year-Round
Pink-Footed Shearwater	Puffinus creatopus	Year-Round
Purple Finch	Carpodacus purpureus	Year-Round
Rufous Hummingbird	Selasphorus rufus	Breeding
Short-Eared Owl	Asio flammeus	Year-Round
Snowy Plover	Charadrius alexandrinus	Breeding
Western Grebe	Aechmophorus occidentalis	Wintering
Willow Flycatcher	Empidonax traillii	Breeding

3.3 Population Data

The projected 2015 population of the City of Cannon Beach was 1,705 persons, according to the 2010 Census data. The Portland State University Certified Population Estimate was also 1,705 persons in 2017. Per population projections by the Oregon Office of Economic Analysis, Department of Administrative Services, the growth rate for Clatsop County within the 20-year planning period will vary from 0.15% (2015-2020) to 0.18% (2020-2035) to 0.20% (2035-2040) per year. Using this data gives a 2036 population of 1,768. Table 3.3.1 below summarizes the anticipated growth rate in the City during the planning period covered by this plan.

Table 3.3.1 - Population Projections

Population Projections	
Year	Population*
2015	1,705
2020	1,718
2025	1,734
2030	1,750
2035	1,765
2036	1,768
2040	1,783

*Based on OAE Population Forecast 2000-2040

3.4 EDU Analysis

An Equivalent Dwelling Unit (EDU) is used in water and wastewater master planning to show typical monthly residential usage per connection. Cannon Beach is unique in that most of their residential connections are seasonal-use and will not be used in calculating the EDU. Of 1,550 residential connections, only 460 have Cannon Beach billing addresses which would indicate that these are full-time resident connections.

Cannon Beach is unusual in that there are 1,550 total residential connections and 1,705 persons, this gives an average household size of 1.1 persons. We have no data reflecting the average household size for permanent, full-time residents (460 such connections, estimated by counting only the local billing addresses). When calculating gpcd, this will tend to yield a much higher gpcd number than what is actually being used per full-time resident.

EDU calculations for this master planning effort were based on metered water usage data from August 2013 – July 2016 provided by the City. During this time, the average monthly amount of water consumed by all 460 full-time residential customers was 1.96 MG, which translates to an overall usage of 140 gpd per metered full-time residential connection.

Since sewer fees are charged based on water usage, the same EDU definition will apply to the wastewater system as the potable water system.

Based on water sales the current EDU count is estimated at 2,396 EDUs. This number is the basis for the rate analysis in Section 9.2.3 of the report.

4 Existing Wastewater Facilities

Section 4

This chapter provides a detailed description of the existing wastewater conveyance and treatment facilities as well as an evaluation of their condition and capacity. Information presented in this chapter has been obtained from the WWTP operators and other City staff, field reconnaissance, WWTP operating records, project drawings, as-built drawings, and from the City's previous planning efforts.

The City of Cannon Beach's Wastewater Facilities include approximately:

- 367 Manholes
- 88,000 linear feet of gravity sewer main
- 9 lift stations
- 10,500 linear feet of pressure force main
- Wastewater treatment plant
- 4 sludge storage basins
- 1250 linear feet 12" effluent discharge pipe to the wetlands adjacent to the Ecola River

4.1 Existing Gravity Collection System

The existing wastewater collection system includes approximately 367 manholes and 88,000 linear feet of gravity sewer main. The material and condition of the gravity main varies widely, as some of the original AC pipes installed in 1958 are still in service while other sections were recently installed or replaced with PVC pipe. Some downstream sections of pipe are 10 and 12 inches in diameter, while most of the collection system pipes are 8 inches in diameter.

See Figures 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.7, 4.2.8, and 4.2.9 for collection system maps. Table 4.1 below summarizes the length and size of pipe in each collection system basin.

Table 4.1 - Basin Sewer Pipe Summary

Basin Sewer Pipe Summary			
Basin	Pipe Size (inches)		
	8" AC* 40-60 years old	10" AC* 40-60 years old	12" AC* 40-60 years old
Ecola	14,470'		
Main	16,395'		3,105'
Pacific	18,000'		
Elkland	2,135'		
Haystack	1,780'		
Matanuska	21,316'	2,234'	
Suislaw	2,350'		
Midway	3,290'		
Sitka	2,850'		
*The majority of pipe in town is Asbestos Concrete, with PVC sections in repair areas			

4.2 Existing Lift Stations and Force mains

There are nine lift stations which are required to provide service to the residential and commercial customers within the City's Urban Growth Boundary. These include the Ecola Lift Station, the Main Lift Station, the Pacific Lift Station, the Elkland Lift Station, the Haystack Lift Station, the Matanuska Lift Station, the Suislaw Lift Station, the Midway Lift Station, and the Sitka Lift Station.

The Ecola Lift Station is located at Fir Street and East 5th Street and pumps wastewater to the manhole in the intersection at Fir Street and Beaver Avenue. The discharge manhole is a part of the Main basin gravity system.

The Main Lift Station is located at North Spruce Street and East 2nd Street and pumps wastewater directly to the wastewater treatment plant.

The Pacific Lift Station is located on Pacific Street between West Gower Avenue and West Dawes Avenue. The Pacific Lift Station pumps wastewater to a discharge manhole approximately 500' south of the wastewater treatment plant, the discharge manhole then drains via gravity to the wastewater treatment plant.

The Elkland Lift Station is located in the Elkland RV Resort just east of Highway 101. This lift station pumps wastewater to a discharge manhole 75' south of the intersection of East Sunset Road and Reservoir Road. The discharge manhole is a part of the Pacific basin gravity system.

The Haystack Lift Station is located on the private property of 1880 Pacific Street. This lift station pumps wastewater from the Haystack Basin to a discharge manhole in Hemlock Street at South Pacific Street. The discharge manhole is a part of the Pacific basin gravity system.

The Matanuska Lift Station is located on South Pacific Street in between Matanuska Street and Nelchena Street. This lift station pumps wastewater to a discharge manhole in Hemlock Street just north of East Chena Street. The discharge manhole is part of the Pacific basin gravity system.

The Suislaw Lift Station is located on Suislaw Street just west of Hemlock Street in the right of way near the beach. This lift station pumps east to the discharge manhole at Hemlock Street that is a part of the Matanuska basin gravity system.

The Midway Lift Station is located on Midway Street between Ocean Avenue and South Pacific Avenue. This lift station pumps east to the discharge manhole at Hemlock Street that is a part of the Matanuska basin gravity system.

The Sitka Lift Station is located on West Sitka Street between Hemlock Street and the beach. The actual wetwell and pumps are located down on the beach, while the control building and discharge manhole are located approximately 160' east in West Sitka Street. This lift station pumps to the discharge manhole in Sitka Street which is a part of the Matanuska basin gravity system.

Each lift station is designed differently and has different issues. The common theme among the deficiencies in the lift stations are the lack of redundancy and the lack of a fully integrated SCADA controls and monitoring. The following sections describe the individual lift stations and the deficiencies noted at each.

4.2.1 Ecola Lift Station

The Ecola Lift Station is located on the southwest corner of East 5th Street and Fir Street and serves the Ecola basin. The lift station was placed into service in 1961 with new pumps installed in 1988. The lift station has two, 7.5 horsepower, Cornell pumps operating on 60 Hz, 460V, three phase power. The 6” HDPE force main pumps the wastewater south under the Ecola Creek to a discharge manhole in the intersection of Fir Street and Beaver Avenue. This discharge manhole is a part of the Main basin gravity system. The design capacity of the lift station with one pump operating (firm capacity) is 400 gpm (0.576 MGD).

Ecola Lift Station

The pumps are set in a semicircular drywell, with the other half of the circle being the wetwell. The wetwell and drywell are approximately 14.75 feet in diameter.

See Figure 4.2.1 for the service basin map

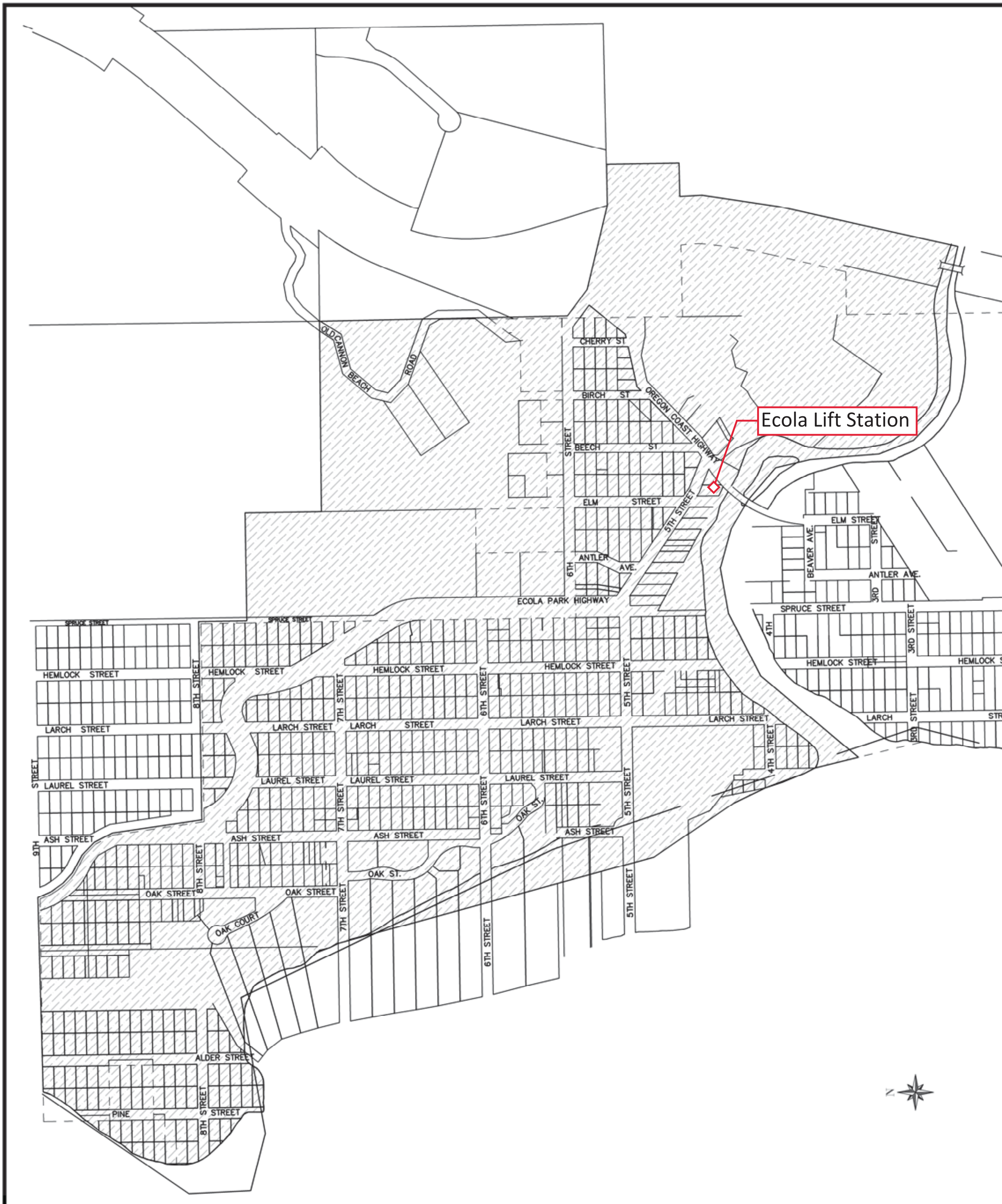
The force main between the Ecola Lift Station and the discharge manhole is a 6” HDPE pipe which was installed as an upgrade to the original pipe in 2006. The force main is approximately 520 feet long.

This lift station has an 80kW dedicated on-site backup generator. The generator is located inside the control building.

This lift station is equipped with a Kaye Dialog 8 channel auto dialer. There is a bubbler for level control, and a high-level float for alarm notification, the high level float lights a red light on the exterior of the building.

Noted deficiencies with the Ecola Lift Station include:

- System only has a bubbler for level control, no overflow redundancy.
- No remote monitoring capability.
- No remote control capability.
- Building is too small to access equipment for maintenance.
- Pumping system is undersized and does not meet DEQ redundancy requiremts.



Civil West Engineering Services, Inc.	Drawn By: DCV Date: July 2016	0 1" 1" = 600'	**Ecola Basin Map**	FIGURE
	WASTEWATER FACILITIES PLAN		CITY OF CANNON BEACH CLATSOP COUNTY, OR	4.2.1

4.2.2 Main Lift Station

The Main Lift Station is located on the southwest corner of North Spruce Street and East 2nd Street and serves the Main gravity system and the pumped discharge from the Ecola basin. The Main Lift Station is one of the two large lift stations in the conveyance system. The lift station was originally constructed in 1958. The lift station has two, 30 horsepower Cornell pumps, which pump the wastewater to the headworks of the treatment plant. The design capacity of the lift station with one pump operating, as is normally the case, is 1,400 gpm (2.02 MGD).

Main Lift Station

The pumps are set in a semicircular drywell, with the other half of the circle being the wetwell. The pump motors are set above grade and power the pumps via jackshafts.

See Figure 4.2.2 for the service basin map

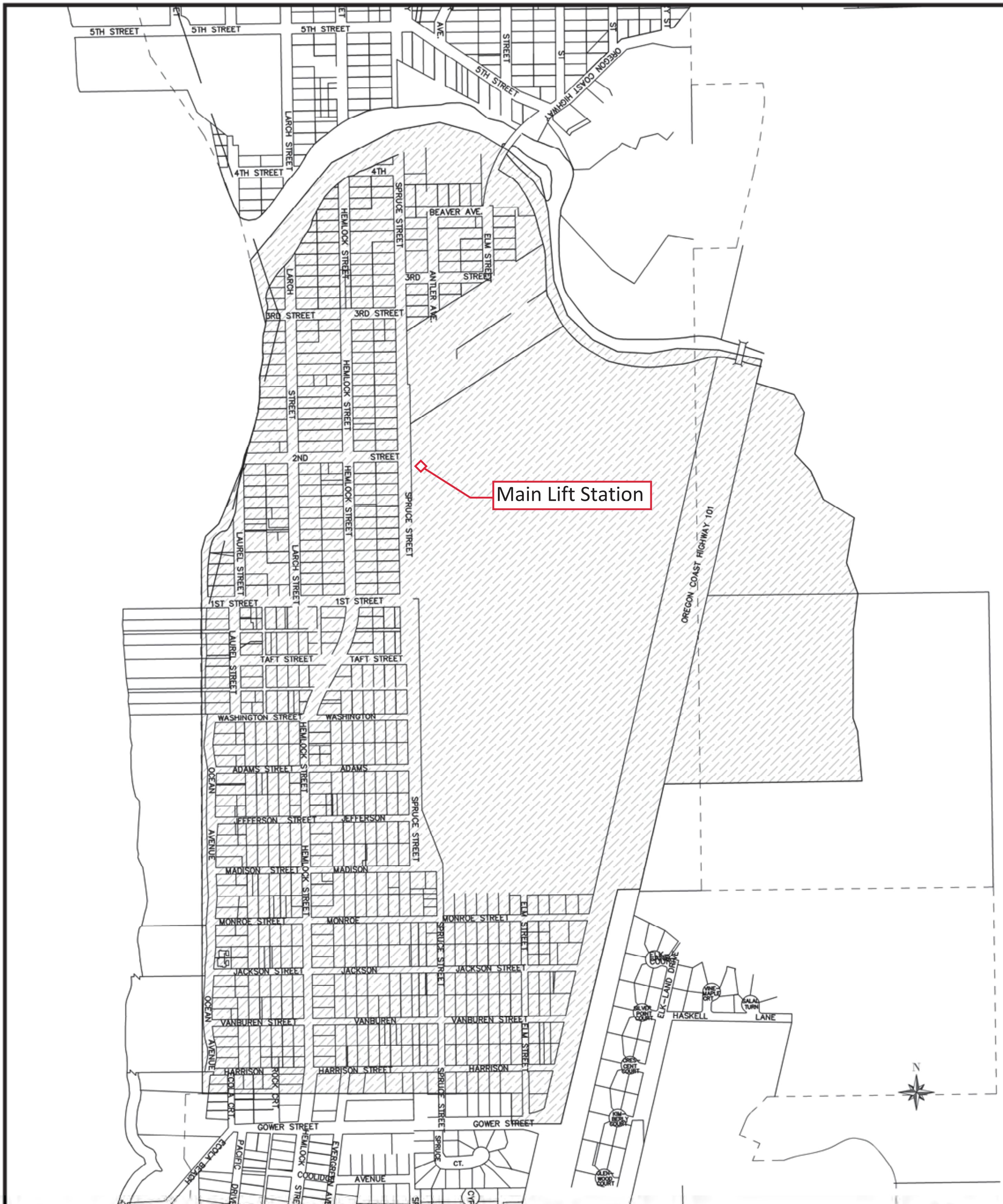
The force main between the Main Lift Station and the discharge at the treatment plant is a 12" PVC pipe which was installed in 1983. The force main is approximately 2,300 feet long.

This lift station does have a dedicated backup generator, but the generator is remote to the lift station. The backup generator is located at the wastewater treatment plant and is a 75kW Caterpillar generator equipped with an automatic transfer switch hardwired to the Main Lift Station.

This lift station is equipped with both transducer and bubble type level controls. There is also a high-level float, that when triggered will operate both pumps at full speed, send an alarm signal to the auto dialer, and light a red light on the exterior of the building. This lift station has a Sensaphone 8000 auto dialer with 8 inputs.

Noted deficiencies with the Main Lift Station include:

- No capability for remote monitoring.
- No capability for remote control.



Civil West Engineering Services, Inc.	DRAWN BY: DCV DATE: JULY 2016	0 1" 1" = 600'	**Main Basin Map**	FIGURE
	WASTEWATER FACILITIES PLAN		CITY OF CANNON BEACH CLATSOP COUNTY, OR	4.2.2

4.2.3 Pacific Lift Station


Pacific Lift Station

The Pacific Lift Station is located on Pacific Street between West Dawes Avenue and West Gower Avenue and serves the Pacific basin, the Elkland basin, the Haystack basin, and the Matanuska basin (the Matanuska basin also serves three smaller basins on the south end of town). The lift station was originally constructed in 1958, and has two 45 horsepower pumps, which pump the wastewater 2,600 feet to a discharge manhole located approximately 500 feet south of the headworks. The discharge manhole drains via a 10” concrete gravity line to the headworks at the wastewater treatment plant. The design capacity of the lift station with one pump operating, is 1430 gpm (2.06 MGD).

The pumps are set in a 12.75-foot diameter semicircular drywell, with the other half of the circle being the wetwell. There is an additional 8-foot diameter collection well upstream of the lift station.

See Figure 4.2.3 for the service basin map

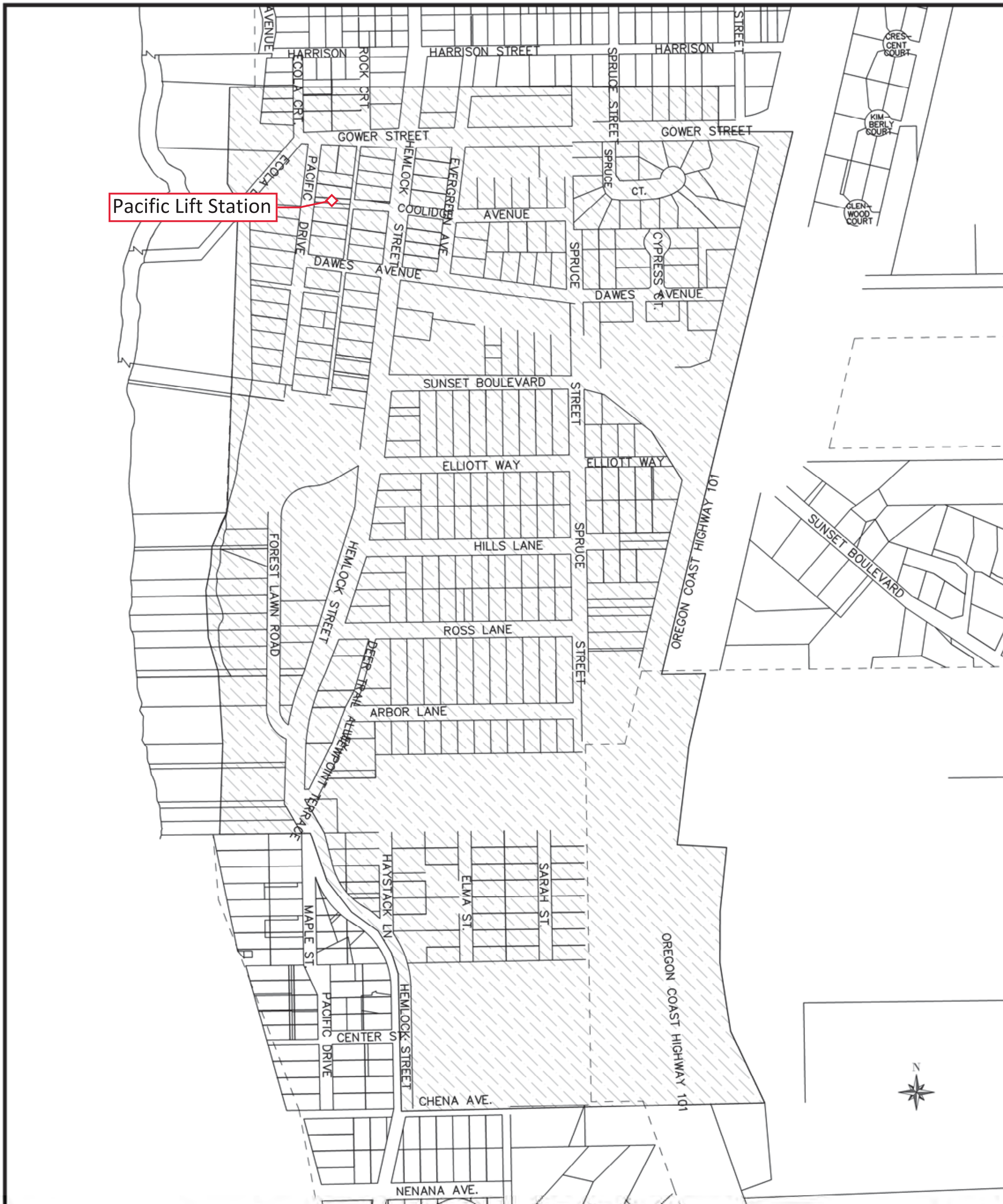
The Pacific Lift Station has a dedicated, permanent backup 80kW generator equipped with an automatic transfer switch. The generator is located inside the control building.

This lift station is equipped with a Sensaphone 2000 auto dialer with 8 inputs. There is a bubbler for level control, and floats for backup level control. There is also a red light outside the building that lights during a high level alarm.

The force main between the Pacific Lift Station and the discharge manhole is unique in that it splits at West Gower Avenue and Rock Court with one line heading north and one line heading east. The line heading up Rock Court turns east on West Harrison Street and the line heading east turns north at South Hemlock Street to join together at the intersection of West Harrison Street and South Hemlock Street. Both legs of the loop are believed to be 6” AC pipe with the remainder of the force main in 10” PVC pipe. The 10” PVC force main is approximately 2,600 feet long. It has three manual air release valves.

Noted deficiencies with the Pacific Lift Station include:

- No capability for remote monitoring.
- No capability for remote control.
- Lift station pumps are currently not meeting DEQ requirements for redundancy.
- Split force main is restrictive.



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DATE: FEB 2016

0 1"
1" = 400'

WASTEWATER FACILITIES PLAN

Pacific Basin Map

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

FIGURE 4.2.3

4.2.4 Elkland Lift Station

Elkland Lift Station

The Elkland Lift Station is located in the southeast corner of the RV resort on the east side of Highway 101, and serves the RV resort and the small neighborhood in the surrounding area. The lift station was built in 1985. The lift station has two 7.5 horsepower Flygt pumps, which pump the wastewater to a discharge manhole located on Reservoir Road approximately 75 feet south of East Sunset Boulevard. The design capacity of the lift station with one pump operating is 250 gpm (0.36MGD).

The pumps are set in a 6-foot diameter wetwell. The wetwell is approximately 17.5 feet deep, from the top of the wetwell to the floor of the well. The wetwell has a volume of 825 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (3.9').

This lift station has no dedicated on-site backup source of power. The control building has an exterior mounted manual transfer switch and plug. The City has mobile generator sets available in the event of a power emergency.

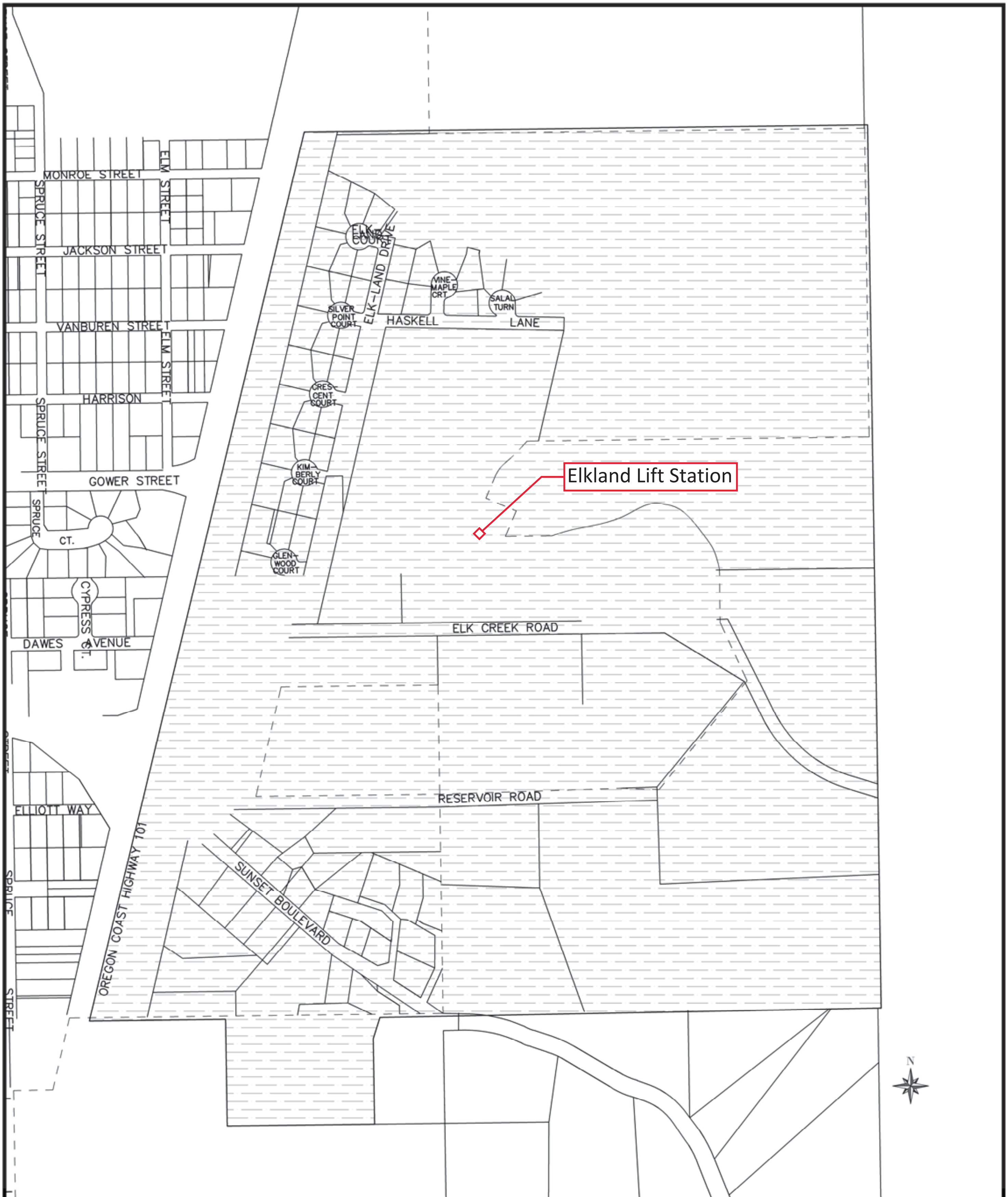
This lift station is equipped with a Sensaphone 2000 auto dialer with 8 inputs. There is a transducer for primary level control and a bubbler for backup level control. There is also a high level float that lights a red light on the exterior of the building as a high level alarm.

See Figure 4.2.4 for the service basin map

The force main between the Elkland Lift Station and the discharge manhole is a 4" diameter PVC pipe. The force main is approximately 1,200 feet long.

Noted deficiencies with the Elkland Lift Station include:

- No capability for remote monitoring.
- No capability for remote control.



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DATE: JULY 2016

0 1"
1" = 400'

Elkland Basin Map

FIGURE 4.2.4

WASTEWATER FACILITIES PLAN

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

4.2.5 Haystack Lift Station

Haystack Lift Station

The Haystack Lift Station is located on an easement on private property at 1880 Pacific Drive and serves the Haystack basin. The lift station was originally constructed in 1970. The lift station has two 5 horsepower submersible Flygt brand pumps, which pump the wastewater to a discharge manhole located in Hemlock Street near the intersection with South Pacific Street. The design capacity of the lift station with one pump operating is 260 gpm (0.37 MGD).

The pumps are set in a 4-foot diameter wetwell. The wetwell has an operating volume of 140 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (1.5').

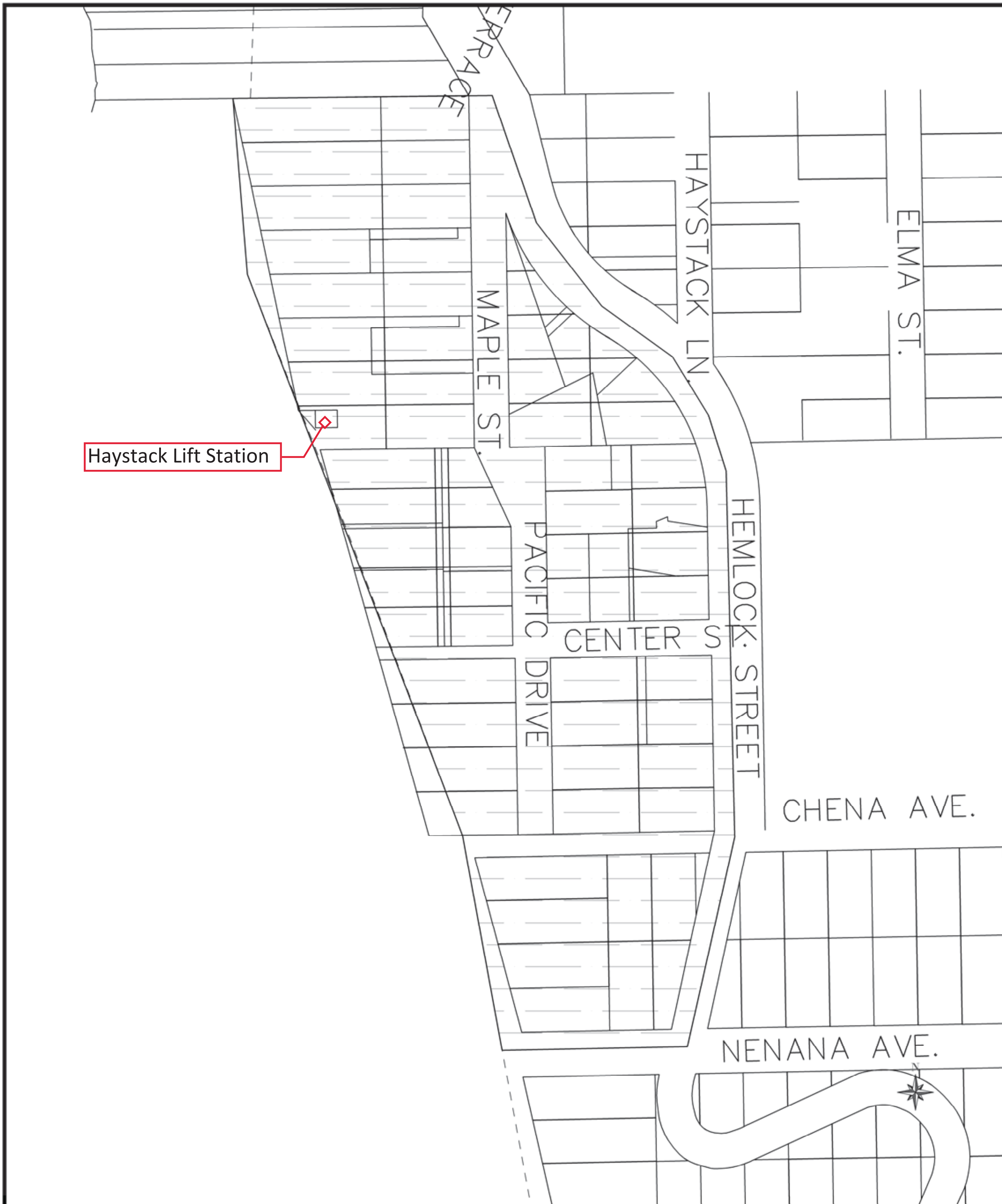
See Figure 4.2.5 for the service basin map

This lift station has no dedicated on-site backup source of power. The control building has a manual transfer switch and plug located inside the building. The City has mobile generator sets available in the event of a power emergency.

The force main between the Haystack Lift Station and the discharge manhole located in the intersection of Hemlock Street and South Pacific Street is 4 inch AC and is approximately 500 feet long.

Noted deficiencies with the Haystack Lift Station include:

- No redundancy built into the overflow system, float only.
- There is no dialer and no phone service at this location.
- High level alarm is a red light on the building exterior.
- No capability for remote monitoring.
- No capability for remote control.
- No on-site backup power source.



Civil West Engineering Services, Inc.	DRAWN BY: DCV DATE: JULY 2016	0 1" 1" = 150'	**Haystack Basin Map**	FIGURE
	WASTEWATER FACILITIES PLAN		CITY OF CANNON BEACH CLATSOP COUNTY, OR	4.2.5

4.2.6 Matanuska Lift Station

Matanuska Lift Station

The Matanuska Lift Station is located on South Pacific Drive just south of Matanuska Street in the parking lot of the Stephanie Inn and serves the Matanuska basin, and receives pumped flows from the three southernmost basins, Suislaw, Midway, and Sitka. The lift station was originally constructed in 1970. Three 35 horsepower submersible Flygt brand pumps were installed in 2007, which pump the wastewater to a discharge manhole located in Hemlock Street near the intersection with South Pacific Street. The design capacity of the lift station with two pumps operating is 1190 gpm (1.71MGD).

The pumps are set in a 9-foot diameter wetwell. The wetwell has an operating volume of 2,140 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (4.5’).

See Figure 4.2.6 for the service basin map

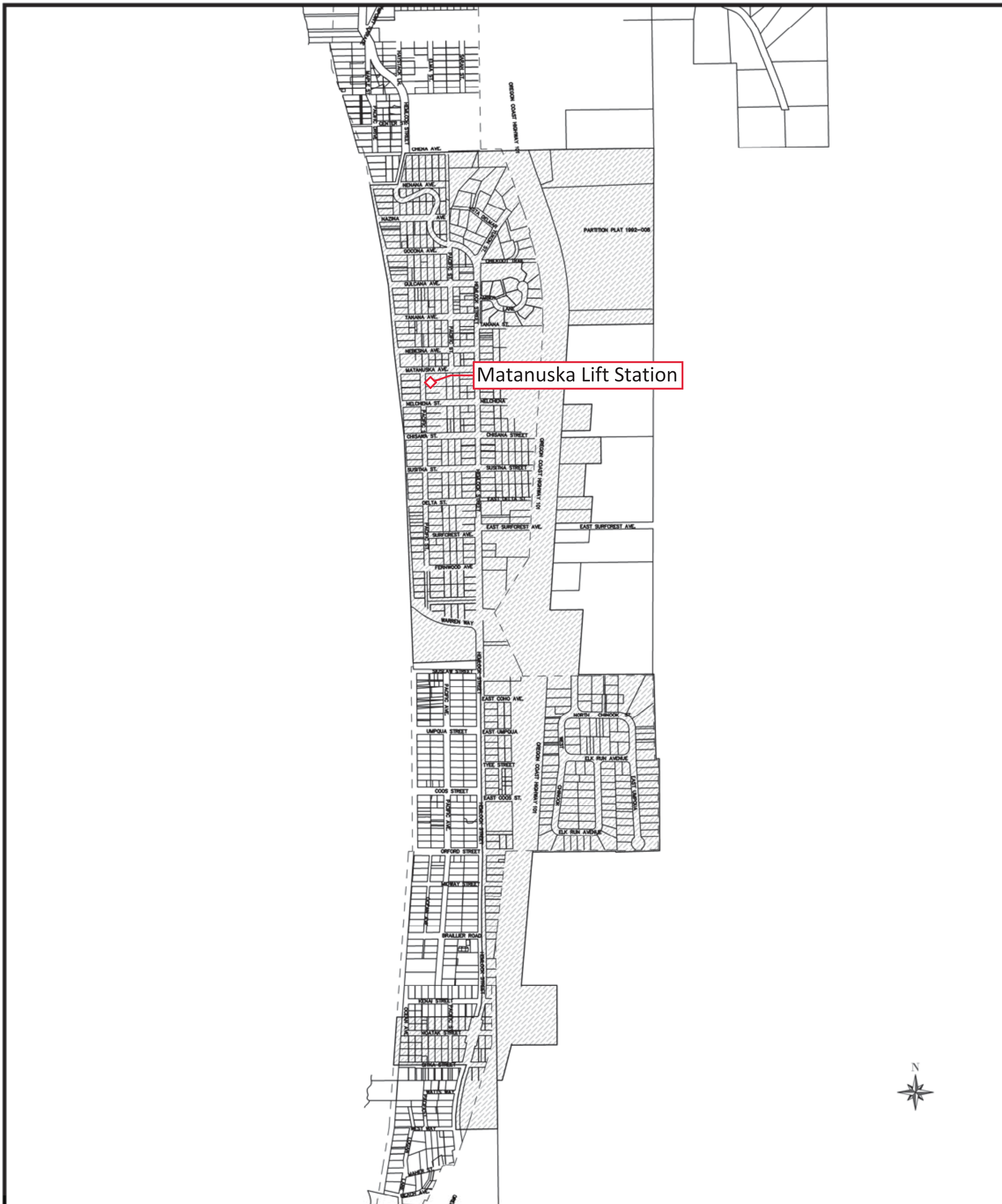
This lift station has a dedicated on-site backup source of power. The control building has an automatic transfer switch connecting to a 100kW generator.

This lift station is equipped with a Sensaphone 2000 auto dialer with 8 inputs. There is a bubbler for level control and no backup level control. There is a high-level float that triggers a high level alarm and lights a red light on the exterior of the building. The red light will also turn on in the event of a pump failure or power outage.

The force main between the Matanuska Lift Station and the discharge manhole located in Hemlock Street just north of East Chena Street is 10 inch PVC and is approximately 2,450 feet long. The discharge manhole is a part of the Pacific basin gravity system.

Noted deficiencies with the Matanuska Lift Station include:

- The generator set is open to the elements. A shared structure is desired that would house both the generator set and the controls.
- No overflow redundancy, the system only has a bubbler for level control.
- No capability for remote monitoring.
- No capability for remote control.



Civil West Engineering Services, Inc.

Drawn By: DCV
Date: JULY 2016

0 1"
1" = 1000'

Matanuska Basin Map

FIGURE 4.2.6

WASTEWATER FACILITIES PLAN

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

4.2.7 Suislaw Lift Station

Suislaw Lift Station

The Suislaw Lift Station is located at the intersection of West Suislaw Street and South Pacific Avenue and serves the Suislaw basin. The lift station was originally constructed in 1970. The lift station has two 5 horsepower submersible Flygt brand pumps, which pump the wastewater to a discharge manhole located in Hemlock Street near the intersection with West Suislaw Street. The design capacity of the lift station with one pump operating is 300gpm (0.48 MGD).

The pumps are set in a 4-foot diameter wetwell. The wetwell has an operating volume of 190 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (2.0').

See Figure 4.2.7 for the service basin map

This lift station has no dedicated on-site backup source of power. The control building has a manual transfer switch and plug located inside the building. The City has mobile generator sets available in the event of a power emergency.

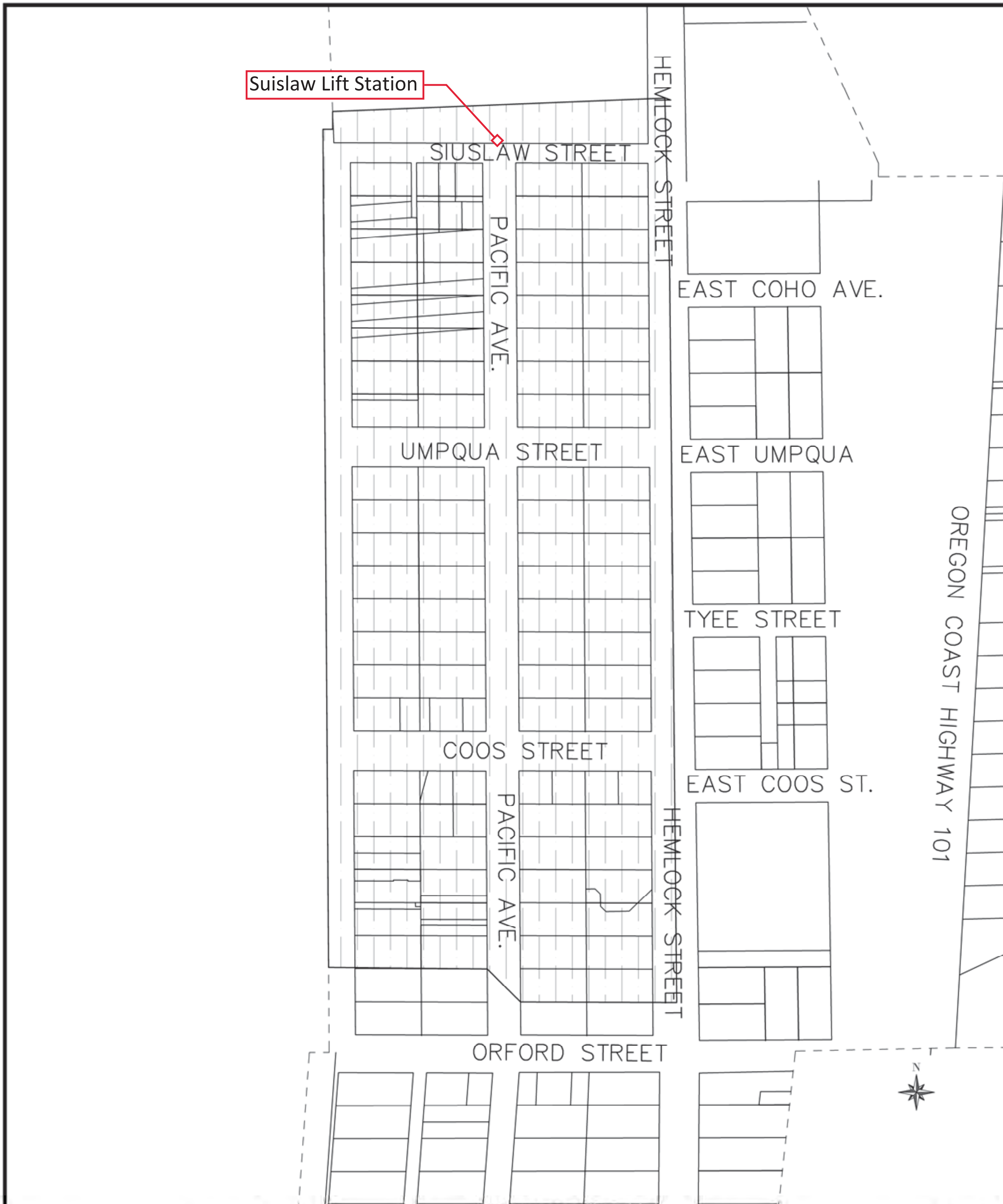
This lift station is equipped with a Raco "Guard It" 4 channel auto dialer. There is a bubbler for level control and no backup level control. There is a high level float used only for high level alarms that triggers a red light on the exterior of the building.

The force main between the Suislaw Lift Station and the discharge manhole located in the intersection of Hemlock Street and West Suislaw Street is 4 inch AC and is approximately 265 feet long.

The city has expressed the desire to construct a "pocket park" in the area of the Suislaw Lift Station.

Noted deficiencies with the Suislaw Lift Station include:

- No redundancy built into the overflow system.
- No capability for remote monitoring.
- No capability for remote control.
- No on-site backup power source.



Civil West Engineering Services, Inc.

DRAWN BY: DCV
DATE: JULY 2016

0 1"
1" = 200'

WASTEWATER FACILITIES PLAN

Suislaw Basin Map

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

FIGURE 4.2.7

4.2.8 Midway Lift Station


Midway Lift Station

The Midway Lift Station is located in a public right of way in between Ocean Avenue and Pacific Avenue approximately 250 feet south of West Orford Street, and serves the Midway basin. The lift station was originally constructed in 1970. The lift station has two 5 horsepower submersible Flygt brand pumps, which pump the wastewater to a discharge manhole located in Hemlock Street near the intersection with Midway Street. The design capacity of the lift station with one pump operating is 400 gpm (0.58 MGD).

The pumps are set in a 4-foot diameter wetwell. The wetwell has an operating volume of 113 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (1.2').

See Figure 4.2.8 for the service basin map

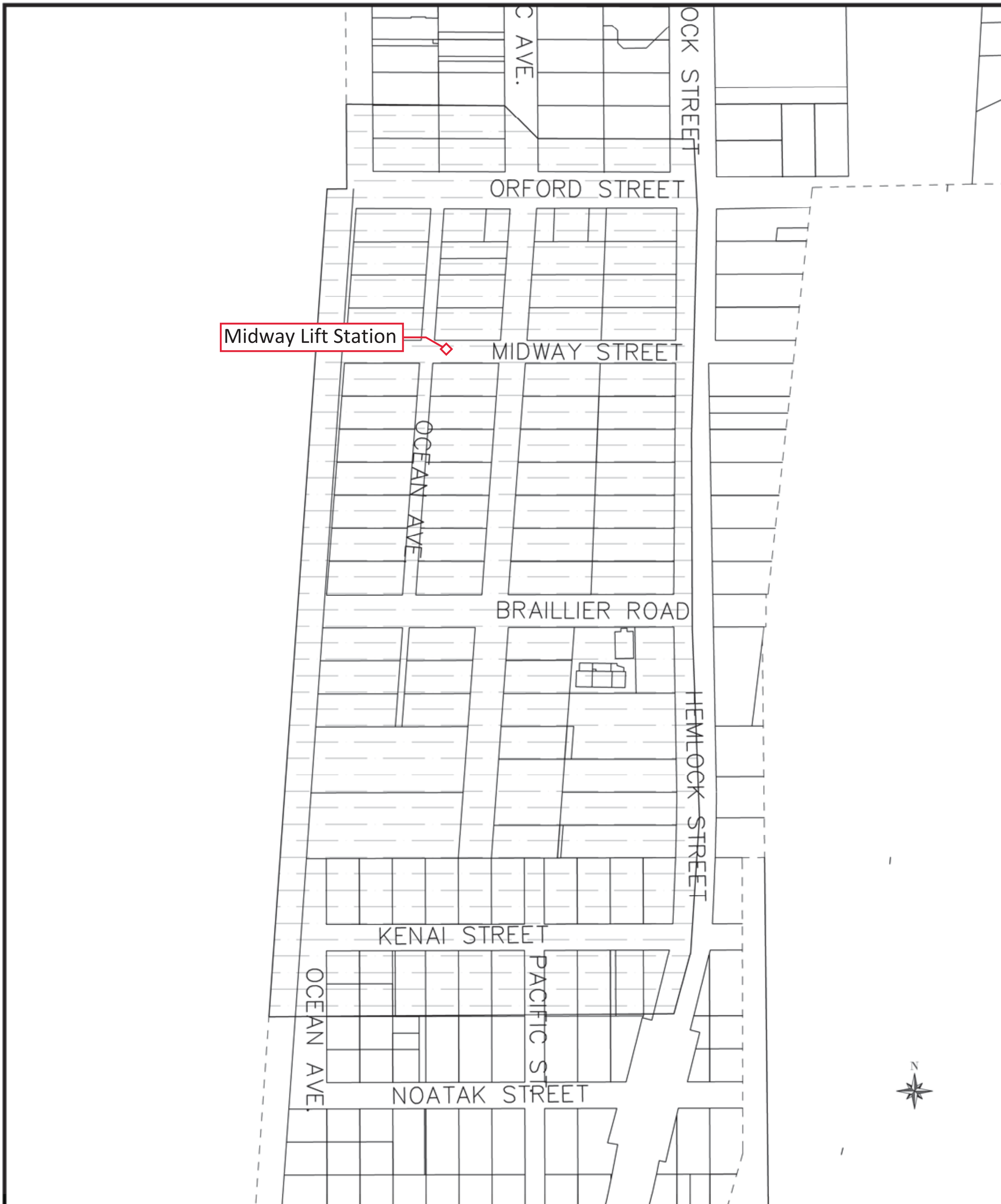
This lift station has no dedicated on-site backup source of power. The control building has a manual transfer switch and plug located inside the building. The City has mobile generator sets available in the event of a power emergency.

The force main between the Midway Lift Station and the discharge manhole located in the intersection of Hemlock Street and Midway Street is 4 inch AC pipe and is approximately 380 feet long.

The city has expressed the desire to create a "pocket park" around the Midway Lift Station.

Noted deficiencies with the Midway Lift Station include:

- No redundancy built into the overflow system. This station only has a bubbler for level control.
- There is no dialer, nor phone service at this location.
- No capability for remote monitoring.
- No capability for remote control.
- No on-site backup power source.



Civil West Engineering Services, Inc.	DRAWN BY: DCV DATE: JULY 2016	0 1" 1" = 200'	**Midway Basin Map**	FIGURE
	WASTEWATER FACILITIES PLAN		CITY OF CANNON BEACH CLATSOP COUNTY, OR	4.2.8

4.2.9 Sitka Lift Station

The Sitka Lift Station is located on the beach approximately 160 feet west of the control building located at the west end of West Sitka Street and serves the Sitka basin. The lift station was originally constructed in 1970. The lift station has two 10 horsepower submersible Flygt brand pumps, which pump the wastewater to a discharge manhole located in West Sitka Street next to the control building. This discharge manhole is a part of the Matanuska basin gravity system. The design capacity of the lift station with one pump operating is 435 gpm (0.63 MGD).

Sitka Lift Station

The pumps are set in a 4-foot diameter wetwell. The wetwell has an operating volume of 432 gallons between the Lead Pump On elevation and the Lead Pump Off elevation (4.6').

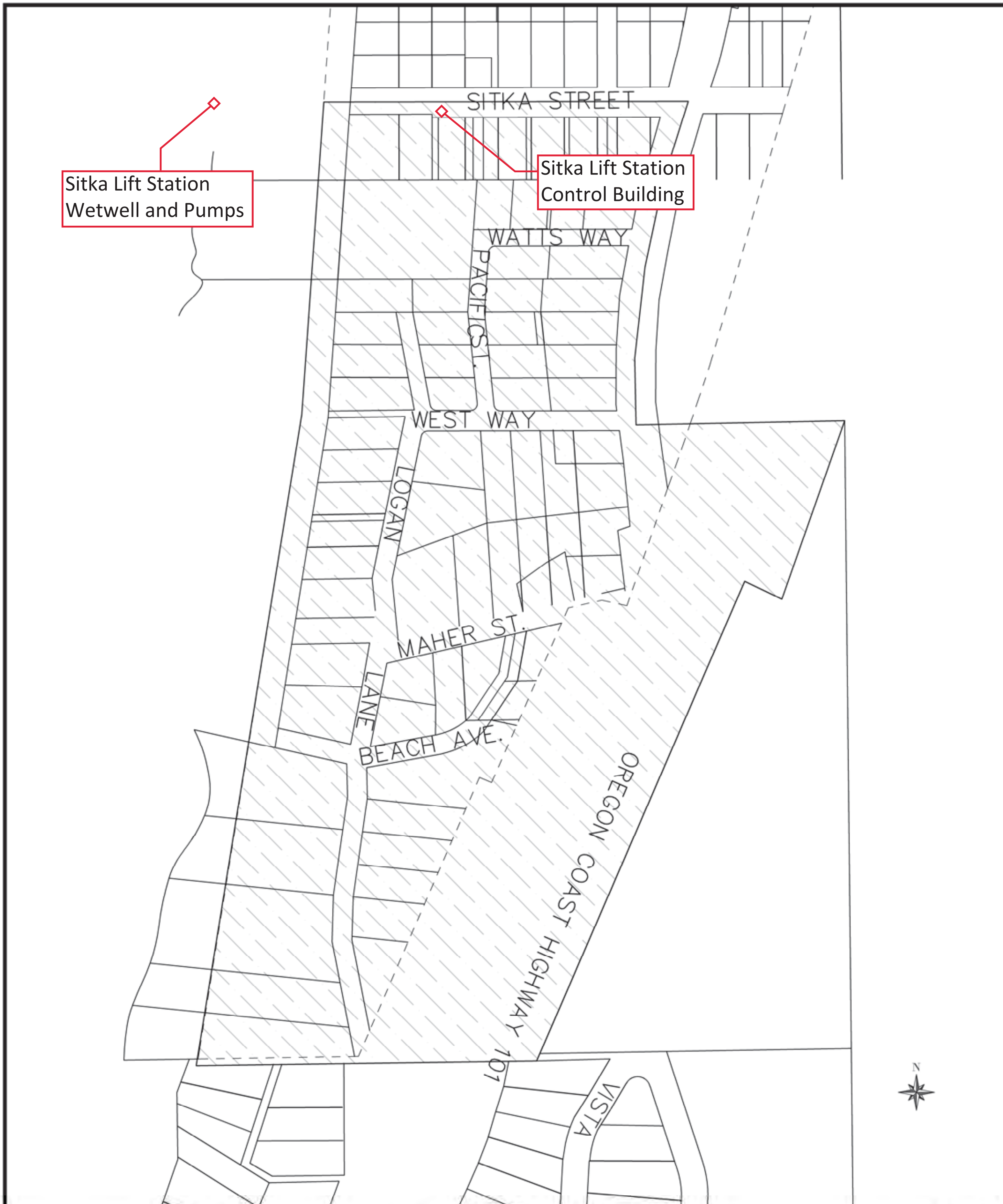
See Figure 4.2.9 for the service basin map

This lift station has no dedicated on-site backup source of power. The control building has a manual transfer switch and plug located inside the building. The City has mobile generator sets available in the event of a power emergency.

The force main between the Sitka Lift Station and the discharge manhole located 160 feet to the east in West Sitka Street is 4 inch AC pipe.

Noted deficiencies with the Sitka Lift Station include:

- No overflow redundancy, system is running on float only for level control.
- There is no dialer and no phone service at this location.
- High level alarm is a red light on building exterior.
- No capability for remote monitoring.
- No capability for remote control.
- No on-site backup power source.



Civil West Engineering Services, Inc.

Drawn By: DCV Date: JULY 2016	0 1" 1" = 200'	**Sitka Basin Map**	FIGURE
WASTEWATER FACILITIES PLAN		CITY OF CANNON BEACH CLATSOP COUNTY, OR	4.2.9

4.3 Existing Wastewater Treatment Plant

The first Wastewater Treatment Plant was constructed in 1959, and consisted of two stabilization ponds totaling 8.6 acres in surface area. The stabilization ponds were designed to serve a peak summer tourist population of 2,200 persons at an average flow of 220,000 gpd with an average BOD loading of 300 lbs. per day.

In 1970, a third pond was built (approximately 3.7 acres), allowing for treatment of up to 430 lbs. per day.

In 1984, an aerated pond was added next to the three existing ponds, and a natural wetland type polishing pond system was built just to the east of the existing ponds on the other side of Highway 101.

In 1994, the Pacific Lift Station was upgraded and the force main was rerouted to pump to the wastewater treatment plant.

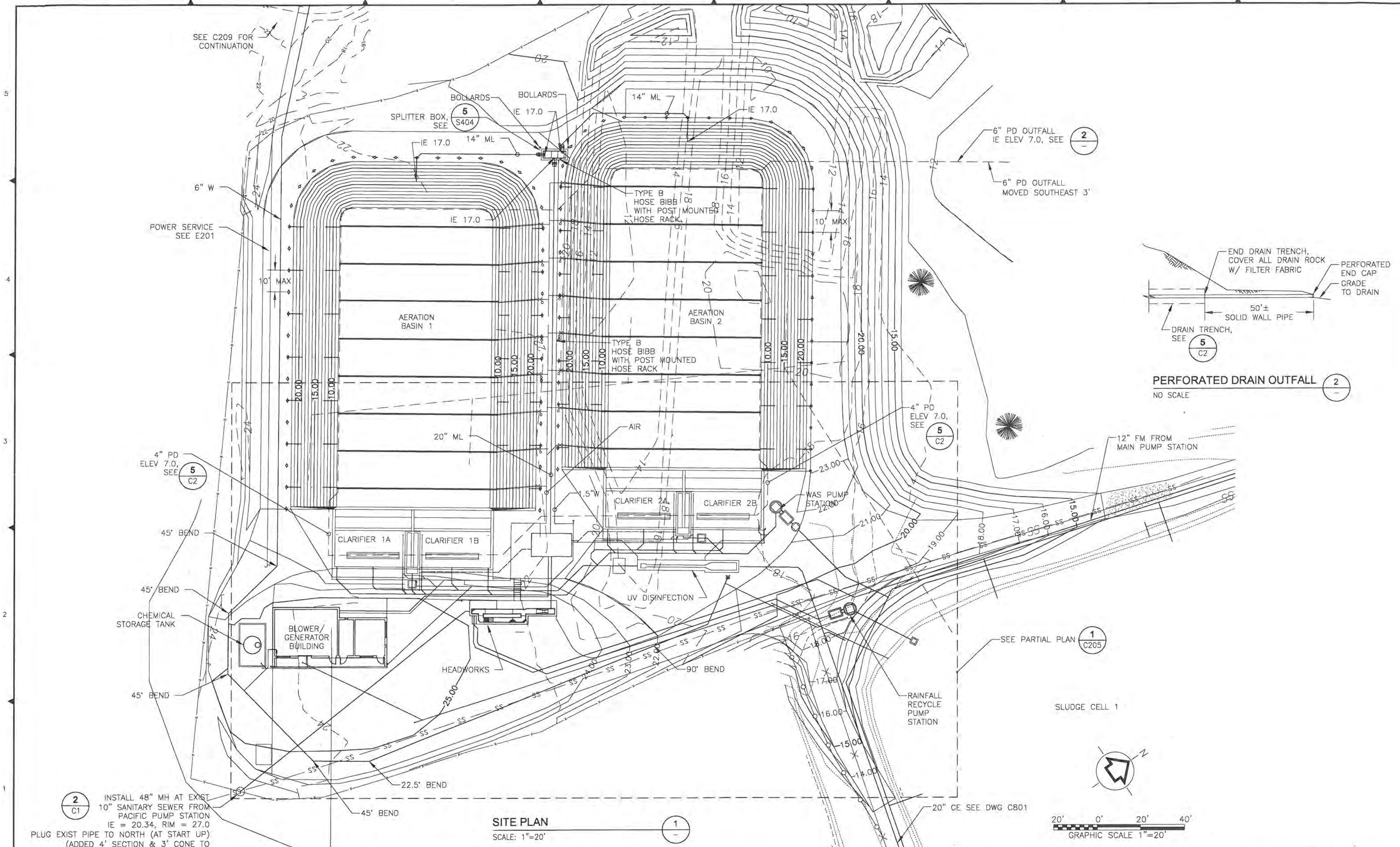
In 2007, two new Biolac aeration basins with integrated clarifiers went online. The basins were constructed just south of the aerated pond in the area that was previously used for sludge storage. Once the Biolac basins were operational, the former facultative lagoons were converted to facultative sludge storage lagoons. The new WWTP is equipped with a 200kW genset for backup power.

See Figure 4.3.a for a Site Plan of the current treatment facilities.
See Figure 4.3.b for process flow diagram.

4.3.1 Headworks

Included in the 2007 plant improvements was a new headworks, see Figure 4.3.1. The headworks includes a 9” Parshall flume to measure flows. There is an inclined shaftless auger with 0.25” openings which serves as the primary screen and a manually cleaned bar rack with 0.625” openings as the standby/overflow screen. Each screen (inclined shaftless auger and manually cleaned bar rack) is rated at 4.5 MGD.

See Figure 4.3.1 for headworks plans.



REV	DATE	DES	CHECK	APPROVALS	REVISION DESCRIPTION
1	03.15.08				DRAWING CONFORMED TO CONSTRUCTION RECORDS

DATE: DEC 2005 — CIVIL REVIEW:
DESIGNED: SLK/RSK — ELEC REVIEW:
DRAWN: RSK — MECH REVIEW:
CHECKED: SLK — STRUC REVIEW:
APPROVED: JDM — MECH REVIEW:

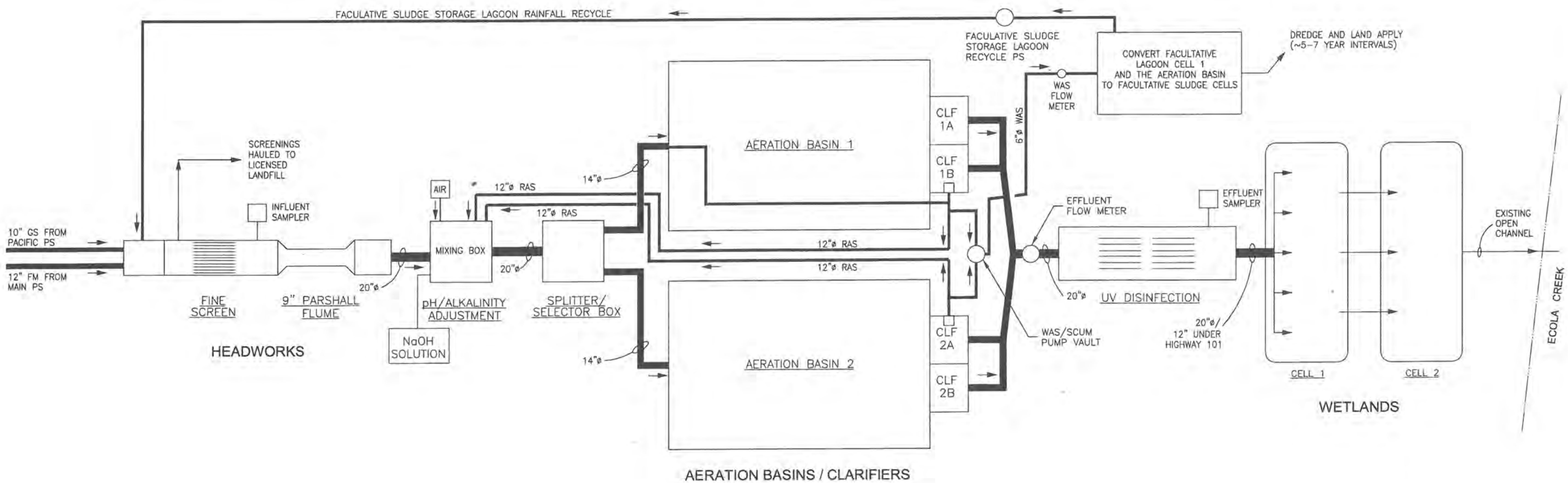
TETRA TECH/ KCM
7080 SW Fir Loop
Portland, Oregon 97223
503-684-9097 Fax: 503-598-0583

RECORD DRAWING
ORIGINAL DRAWING REVISED BY KCM BASED ON INFORMATION PROVIDED BY BIG RIVER CONSTRUCTION. KCM CANNOT VERIFY THE ACCURACY OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS INCORPORATED HEREIN AS A RESULT

CITY OF CANNON BEACH
WASTEWATER FACILITIES IMPROVEMENTS

PARTIAL SITE LAYOUT & PIPING PLAN

FILE NO: C204.DWG
PROJECT NO: 3530018
DWG NO: C204
SHEET: 23 OF 103



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DATE: FEB 2006
DESIGNED: JDM
DRAWN: RSK
CHECKED: JDM
APPROVED: JDM
CIVIL REVIEW:
ARCH REVIEW:
STRUC REVIEW:
MECH REVIEW:

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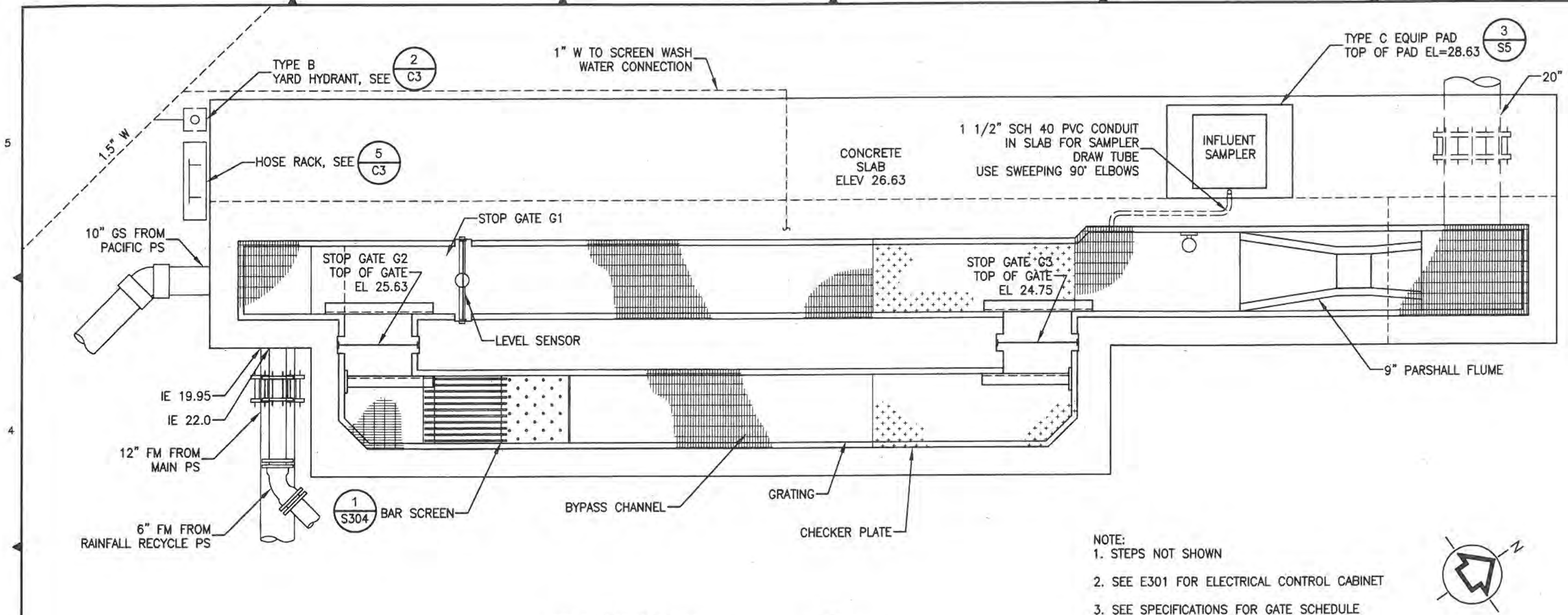
CITY OF CANNON BEACH
WASTEWATER FACILITIES IMPROVEMENTS

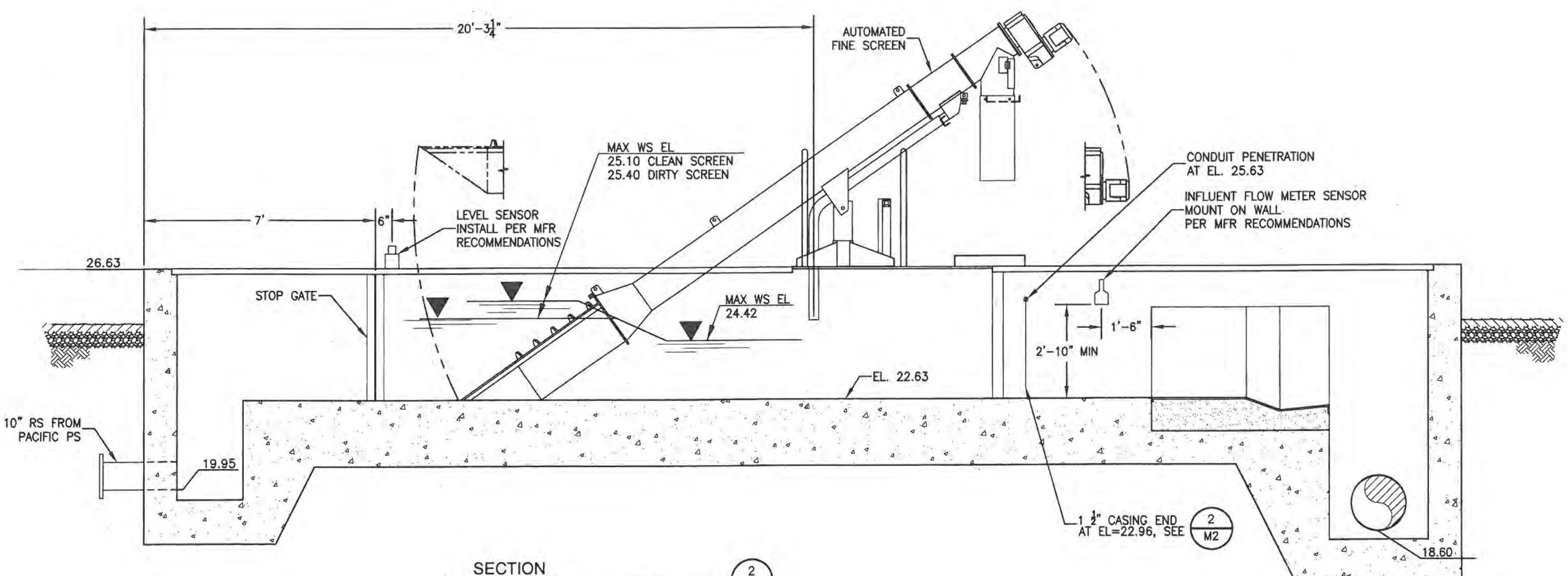
PROCESS SCHEMATIC

FILE NO: G4.DWG
PROJECT NO: 3530018
DWG NO: G4
SHEET: 4 OF 103



NOTE:
1. STEPS NOT SHOWN
2. SEE E301 FOR ELECTRICAL CONTROL CABINET
3. SEE SPECIFICATIONS FOR GATE SCHEDULE

HEADWORKS PLAN 1/–
SCALE: 1/2"=1'



SECTION 2/–
SCALE: 1/2"=1'

REV	DATE	DES	CHECK	APPROVALS	REVISION DESCRIPTION
1	03.15.08				DRAWING CONFORMED TO CONSTRUCTION RECORDS

DATE: DEC 2005 — CIVIL REVIEW:
DESIGNED: SLK — ARCH REVIEW:
DRAWN: RSK — STRUC REVIEW:
CHECKED: SLK — MECH REVIEW:
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CITY OF CANNON BEACH
WASTEWATER FACILITIES IMPROVEMENTS

HEADWORKS PLAN AND SECTIONS

FILE NO: M301.DWG
PROJECT NO: 3530018
DWG NO: M301
SHEET: 33 OF 103

4.3.2 Aeration

The wastewater treatment plant employs two Biolac aeration basins. The basins are powered by three 60 horsepower blowers. Dissolved oxygen sensors are installed in the basins and The blower motors are controlled by A-B Powerflex 400 VFDs. For much of the time, only one basin is in service. The design summary of the aeration basins is below:

Aeration Basins	
Type	Biolac Selector Type
Aeration	Fine Bubble Tube Diffusers
Peak Influent Flow	2.25 MGD
Maximum RAS Flow	462 gpm
Percent RAS at peak	30%
Volume	1.15 MG
Length	156 feet
Width	106 feet
Depth	12 feet

4.3.3 Clarifiers

Both aeration basins flow into dual integrated rectangular clarifiers for a total of four clarifiers. The design summary of the clarifiers is below:

Basin 1 and 2 Clarifiers		Total for all 4 Clarifiers
Type	Biolac Rectangular Hopper	
Size	26.5 feet x 35 feet	
Overflow Rate (gpd/sf)		
Ave. Annual Flow:	319	1,276
Max. Month Flow:	638	2,552
Peak Hour Flow:	1,595	6,380
Weir Overflow Rate (gpd/lf)		
Ave. Annual Flow:	10,960	43,840
Max. Month Flow:	14,150	56,600
Peak Hour Flow:	47,870	191,480
Return Activated Sludge (gpm):	462	1,848
Waste Activated Sludge (gpd):	5,890	23,560

4.3.4 Magmeter

Between the clarifiers and the UV channel there is a “Tiger-Mag” 20-inch magnetic flowmeter.

4.3.5 UV System

Effluent gravity flows from each of the clarifiers though the effluent flow meter and then to the UV disinfection channel. The UV disinfection channel is 26 feet long, one-foot-wide and runs at a minimum depth of 18.5”. The UV system consists of one channel with two banks of lights at 24 lamps per bank. The UV disinfection system is rated for flows up to 3.94 MGD.

4.3.6 Rainwater Recirculation

During heavy storm events, rainwater can accumulate in the sludge storage lagoons. This excess rainwater is pumped back through the headworks for full treatment and discharged.

4.3.7 Outfall

After the flow is measured and run through the UV disinfection system, it flows by gravity east through a 12” pipe under Highway 101. The outfall then empties via an 18” multiport diffuser manifold (seven 8” discharge ports spaced unevenly along the 584-foot manifold, with discharges at 0, 118, 200, 308, 428, 519, and 584 feet from the first port) into a natural wetland area and then ultimately to Ecola Creek. Sampling for compliance assurance takes place after the UV disinfection, at what is known as “end of pipe”. Though the wetlands provide for some effluent polishing, the permit limitations must be met prior to discharge to the wetlands.

4.3.8 Sludge

Activated sludge is generated during the treatment process and is either returned to the aeration basins as return activated sludge (RAS) or stored in the sludge lagoons as waste activated sludge (WAS). Sludge is collected from the clarifiers and the RAS pumps return some of the sludge to the aeration basins. The remainder of the sludge is pumped by the WAS pumps to the old stabilization ponds that are now used for sludge storage.

4.3.9 Operations

Presently, the wastewater treatment plant is operated using one Biolac treatment train most of the time.

5 Wastewater Flows

Section

5

5.1 Wastewater Volume

The City of Cannon Beach's Wastewater Treatment Plant is unique in that nearly all the influent flow is directed from two lift stations. Therefore, the maximum flow into the plant is limited to the maximum pumping capacities of the two lift stations plus a relatively small amount of recirculated lagoon water during large rain events. During periods of high flows, both the Main Street Lift Station and the Pacific Lift Station will often be pumping at the same time, which represents the peak instantaneous flow to the plant. However, during low flow periods, the pump stations will also occasionally both be running at the same time. Since both pump stations are duplex stations, with their firm capacity being pumped with a single pump (due to redundancy requirements), these combined flows will also represent the peak instantaneous flow to the plant.

5.1.1 Flow Definitions

Wastewater is typically described through flow and loading characteristics. Flow characteristics define the hydraulic volumes that the plant experiences and what it must be capable of treating. Loading characteristics describe what is in the wastewater (i.e. contaminants, waste products, chemicals, etc.) that must be substantially removed before the water can be discharged into the environment as effluent.

The following terms will be used in flow analysis and flow projections in this Study:

Dry Weather Period: Defined as the period when the precipitation and streamflows are low. This period is defined in the Oregon Administrative Rules (OAR 340-041-0207) as May 1 through October 31.

Wet Weather Period: Defined as the period when streamflows, rainfall and groundwater levels are high. This period is defined in OAR 340-041-0207 as November 1 through April 30.

Average Annual Flow (AAF) or Average Daily Flow (ADF): Total wastewater flow for an average 12-month period, from January 1 through December 31, divided by the total number of days in the year.

Base Sewerage: Total daily flow for the period between June 1 and September 31. This is used as a basis to calculate I/I.

Average Dry-Weather Flow (ADWF): Total wastewater flow for the dry-weather period divided by the number of days in the period.

Maximum Month Dry-Weather Flow (MMDWF): Total wastewater flow for the month with the highest flow during the dry-weather period, divided by the number of days in the month.

Maximum Month Dry-Weather Loading (MMDWL): Average BOD loading for the month with the highest BOD loading during the dry-weather period.

Average Wet-Weather Flow (AWWF): Total wastewater flow for the wet-weather period divided by the number of days in the period.

Maximum Month Wet-Weather Flow (MMWWF): Total wastewater flow for the month with the highest flow during the wet-weather period, divided by the number of days in the month.

Peak Day Average Flow (PDAF): Total flow for the day with the highest wastewater flow during the year.

Peak Week Flow (PWF): Average Daily Flow during the peak 7-day flow period.

Peak Instantaneous Flow (PIF): Flow for the highest peak of the year, expressed as a daily flow.

The following terms will be used in the statistical analysis of flow rates:

Ten-year Maximum Month Dry-Weather Flow ($MMDWF_{10}$): The monthly average dry-weather flow with a 10% probability of occurrence.

Five-year Maximum Month Wet-Weather Flow ($MMWWF_5$): The monthly average wet-weather flow with a 20% probability of occurrence.

Five-year Peak Day Average Flow ($PDAF_5$): The peak day average flow associated with a five-year storm event.

Five-year Peak Instantaneous Flow (PIF_5): The peak instantaneous flow during a five-year storm event.

The following terms will be used in the Inflow and Infiltration Analysis:

Base Infiltration Flow: The base daily average flow in the wastewater collection system due to inflow and infiltration. It is calculated by subtracting the base sewer flow rate from the average dry-weather flow.

Average Wet-Weather Inflow and Infiltration Flow (AWW I/I): The daily average flow in the wastewater collection system due to inflow and infiltration. It is calculated by subtracting the base sewer flow rate from the average wet-weather flow.

Maximum Monthly Wet-Weather Inflow and Infiltration Flow (MMWW I/I): The average daily flow during the maximum monthly occurrence in the wastewater collection system due to inflow and infiltration. It is calculated by subtracting the base sewer flow rate from the system maximum monthly wet-weather flow.

Peak Day Inflow and Infiltration Flow (PD I/I): The maximum daily flow in the wastewater collection system due to inflow and infiltration. It is calculated by subtracting the base sewer flow rate from the system peak daily average flow.

Peak Instantaneous Inflow and Infiltration Flow (PIF I/I): The peak instantaneous or peak hourly flow in the wastewater collection system due to inflow and infiltration. It is calculated by subtracting the base sewer flow rate from the system peak instantaneous flow.

5.1.2 Summary of Available Data

The influent flow data included in the Discharge Monitoring Reports (DMRs) from January 2011 through December of 2015 have been used for flow analysis and wastewater characteristics. Influent flows are measured by a Parshall flume flow meter in the headworks. Treatment Plant flows, as recorded on the DMRs, are measured at the effluent with a 20" meter just prior to the UV disinfection system.

Daily rainfall totals were referenced from the Wastewater Plant daily records.

Based on the DMR data described above, some of the design flows can be calculated. Below are the calculations for AAF, Base Sewerage, ADWF, and AWWF:

$$\text{AAF} = \frac{\text{Total Wastewater Flow}}{\text{Days in Year}} = \frac{1126\ \text{MG}}{1826\ \text{Days}} = 0.62\ \text{MGD}$$

$$\text{Base Sewerage} = \frac{\text{Total Flow During Jun.} - \text{Sept.}}{\text{Days in Jun.} - \text{Sept.}} = \frac{227.87\ \text{MG}}{460\ \text{Days}} = 0.50\ \text{MGD}$$

$$\text{ADWF} = \frac{\text{Total Flow During Dry Period}}{\text{Days in Dry Period}} = \frac{460.79\ \text{MG}}{920\ \text{Days}} = 0.50\ \text{MGD}$$

$$\text{AWWF} = \frac{\text{Total Flow During Wet Period}}{\text{Days in Wet Period}} = \frac{665.21\ \text{MG}}{906\ \text{Days}} = 0.73\ \text{MGD}$$

5.1.3 Dry Weather Flow

As indicated in the referenced DEQ guidelines, the ten-year Maximum Monthly Average Dry-Weather Flow ($MMDWF_{10}$) would be the monthly average flow in the rainiest summer month of high groundwater. West of the Oregon Cascades, the $MMDWF_{10}$ almost invariably occurs in May. The 10-Year MMDWF represents the anticipated monthly flow corresponding to the monthly rainfall accumulation during May with a 10% probability of occurrence in any given year.

Precipitation probabilities for various locations in Oregon are included in the report entitled "Climatography of the United States No. 20, Monthly Station Climate Summaries, 1971 – 2000" as published by the National Climatic Data Center. The closest probabilistic data sets are for the City of Seaside and have been used for this analysis.

The graph in Figure 5.1.3 is based on five data points representing the average daily wastewater flows versus average monthly rainfall totals as shown in Table 5.1.3. The points generate a trend line which can be used to predict average wastewater flows from a given monthly rainfall total. The 10-year MMDWF is the flow corresponding to the 10% probability precipitation of 6.63 inches for the month of May, as determined by the above referenced climatography report. As shown in Figure 5.1.3, the corresponding $MMDWF_{10}$ is 0.66 MGD.

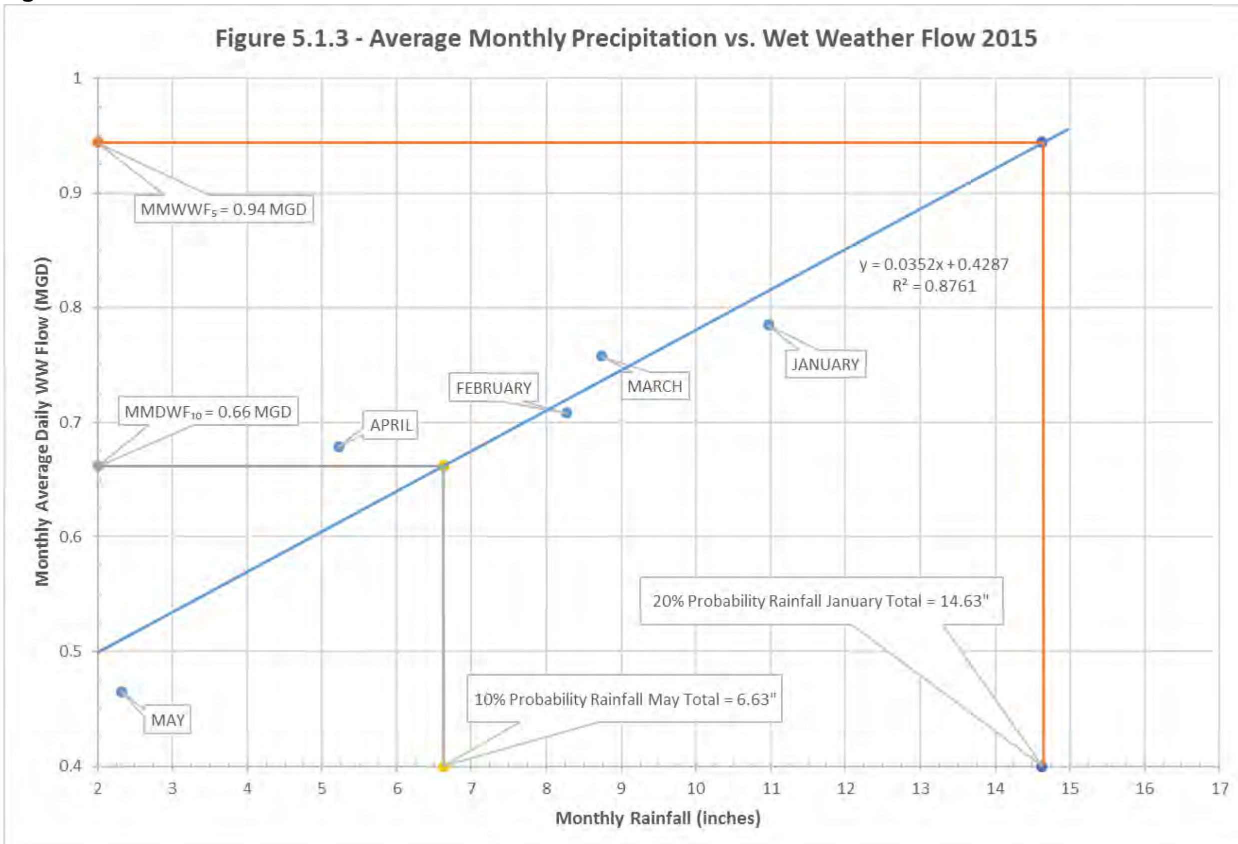
Table 5.1.3 also indicates the 10-year May accumulation (0.9 May) based on Data from Climatology of the US No. 20 for years 1971-2000 published by the National Climate Data Center. This represents the amount which exceeds 9 out of 10 totals which have been recorded in May. It also indicates the 5 year January accumulation (0.8 Jan) which represents the amount which exceeds 4 out of 5 totals which have been recorded in January.

Table 5.1.3 - Average Rainfall and Wastewater Flows

Rainfall and Flow Averages 2015		
Month	Monthly Rainfall	Monthly Ave. Daily Flow MGD
January	10.97	0.78
February	8.27	0.71
March	8.74	0.76
April	5.23	0.68
May	2.32	0.46
0.8 (Jan)	14.63*	
0.9 (May)	6.63*	

*Climatology of the US No. 20 for years 1971-2000 published by the National Climate Data Center

Figure 5.1.3 – $MMDWF_{10}$ & $MMWWF_5$ Calculation



5.1.4 Wet Weather Flow

Like many communities in western Oregon, the City of Cannon Beach struggles with high volume wastewater flows caused by inflow and infiltration into the sanitary sewer system during the wet season. The flow analysis presented in the following section is based on the Oregon DEQ Guidelines for Making Wet-Weather and Peak Flow Projections for Sewage Treatment in Western Oregon (first published in 1996). These guidelines describe a detailed method for estimating wet-weather flow and peak flows in wastewater collection systems. This method is used to develop the minimum estimate for current flows from which to project future flow rates.

The referenced DEQ design guidelines indicate that high groundwater, west of the Cascades, is usually not attained until January, and heavy storms generally do not begin to cause a reliable or consistent infiltration response until January. Therefore, the MMWWF is expected to occur in January. The five-year January accumulation of 14.63 inches is indicated in the Climatography report based on rainfall probability data for Seaside. When plotted with actual recorded events, the current five-year MMWWF is calculated to be 0.94 MGD as shown in Figure 5.1.3, above.

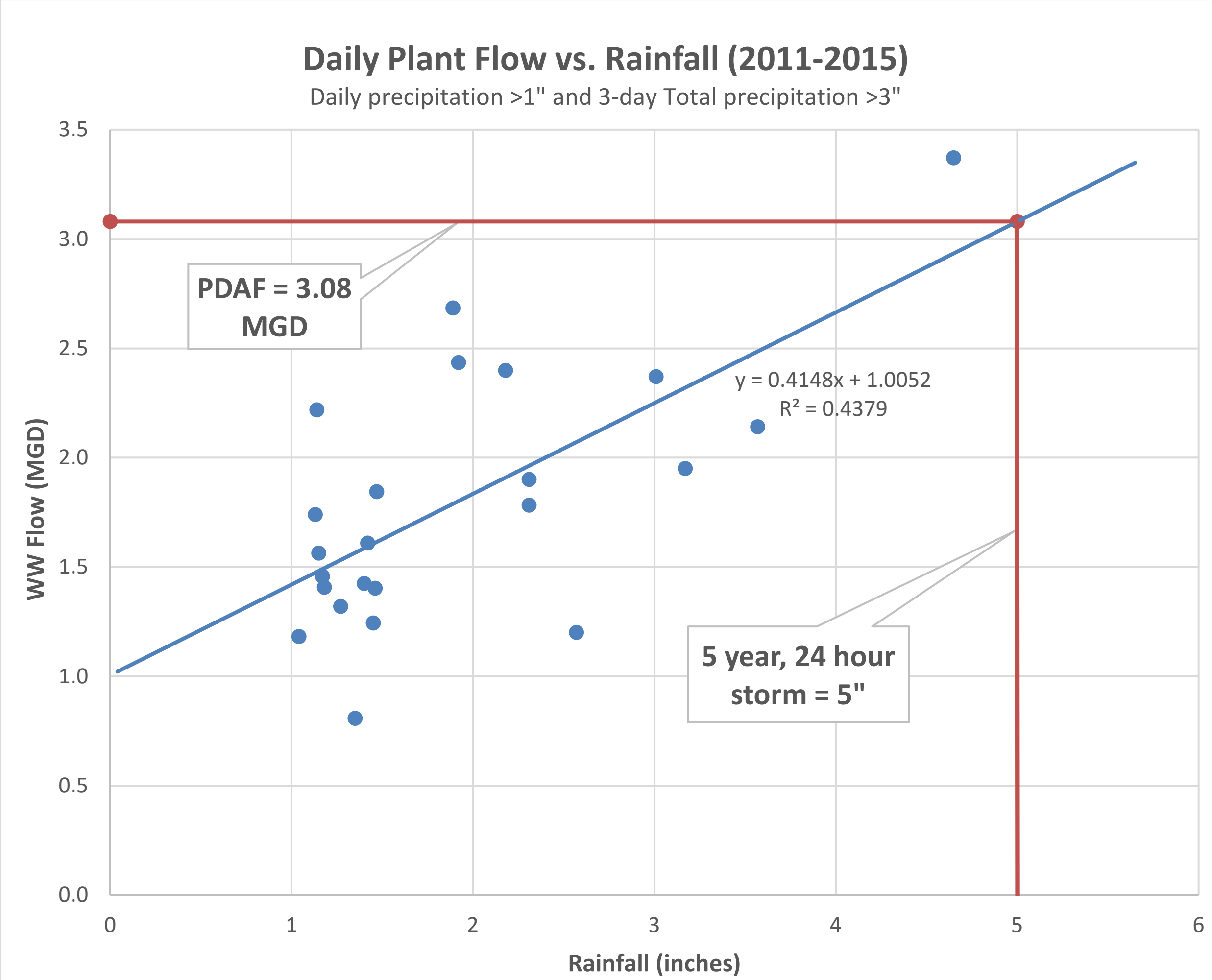
The Peak Day Average Flow ($PDAF_5$) corresponds to the five-year 24-hour storm event as defined by the NOAA isopluvial maps. Based on the NOAA maps, the five-year 24-hour event for the Cannon Beach area is 5.0 inches of rain.

To determine the $PDAF_5$ using the DEQ methodology, actual events are plotted and a best-fit trendline is used to approximate the character of the system under different rainfall events. As in the graph above, rainfall data from the years 2011 through 2015 is used in the $PDAF_5$ calculation. Data points were selected based on the criteria that the daily rainfall was >1.0 inch and the 3-day cumulative (including event) total rainfall was >3.0 inches. These criteria ensure scenarios with significant daily rainfall during a period of high ground saturation. A summary of the data points used are included in Table 5.1.4 below. Results are graphed in Figure 5.1.4a.

Table 5.1.4 – Significant Wet-Weather Rainfall and Flow Data

Significant Rainfall Events – Daily total >1.0", Cumulative 3-day total of >3.0"						
DATE	WW Flow (MGD)	Rainfall (inches)		DATE	WW Flow (MGD)	Rainfall (inches)
1/15/2011	1.20	2.57		12/1/2012	1.74	1.13
1/16/2011	2.37	3.01		12/20/2012	2.22	1.14
11/23/2011	1.43	1.4		9/29/2013	1.61	1.42
11/24/2011	1.32	1.27		2/18/2014	1.46	1.17
1/19/2012	1.40	1.46		10/25/2014	1.18	1.04
3/14/2012	1.24	1.45		1/5/2015	2.69	1.89
3/15/2012	1.56	1.15		2/7/2015	1.78	2.31
3/31/2012	1.41	1.18		11/14/2015	3.37	4.65
10/15/2012	0.81	1.35		11/16/2015	1.90	2.31
10/30/2012	1.95	3.17		12/8/2015	2.14	3.57
10/31/2012	2.44	1.92		12/20/2015	1.85	1.47
11/19/2012	2.40	2.18				

Figure 5.1.4a – PDAF Calculation



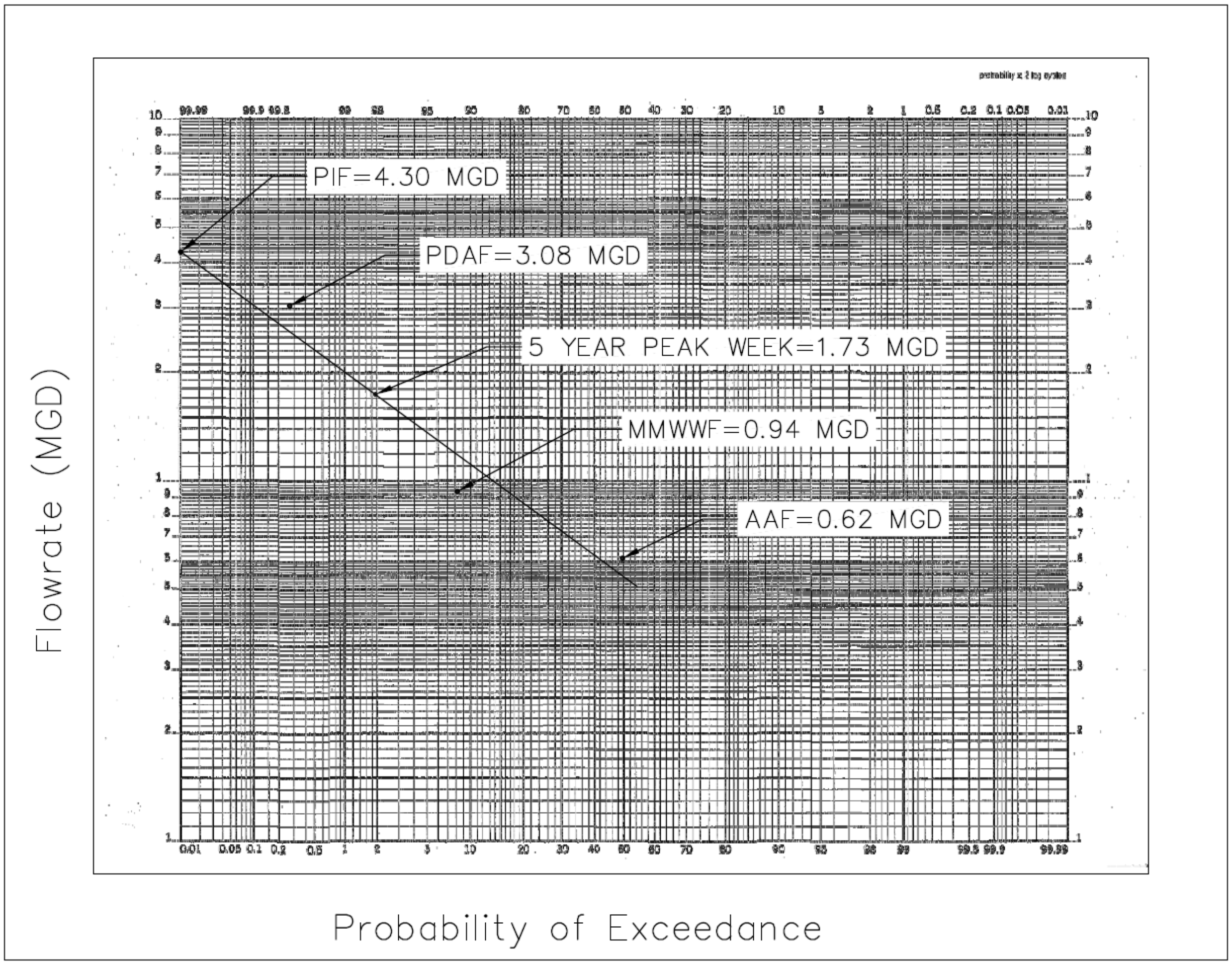
Based on Figure 5.1.4a, the current $PDAF_5$ is approximately 3.08 MGD (2140 gpm).

DEQ guidelines for wastewater treatment plant design require critical plant and lift station components to be sized for the projected peak instantaneous flow (PIF_5). The current PIF_5 and 5-year peak week flow for the City of Cannon Beach has been estimated using a probability graph on logarithmic probability paper based on the data summarized below:

- The average annual flow (AAF) has a probability of exceedance on any given day of 50%.
  AAF = 0.62 MGD
- The $MMWWF_5$, as determined in Figure 5.1.3, has a probability of exceedance of 1/12, or 8.33%.
  $MMWWF_5$ = 0.94 MGD.
- The peak week flow occurs one week out of the year, for a probability of exceedance of 1/52, or 1.92%.
- The $PDAF_5$ is the daily flow associated with the 5-year storm. The probability of exceeding the PDAF is 1/365, or 0.27%. As determined in Figure 5.1.4a, the
  $PDAF_5$ = 3.08 MGD.
- The PIF, or "peak hourly flow" occurs once per year for a probability of exceedance of: $\frac{1\text{ hour}}{\text{year}} * \frac{1\text{ year}}{365\text{ days}} * \frac{1\text{ day}}{24\text{ hours}} = \frac{1}{8760} = .011\%$

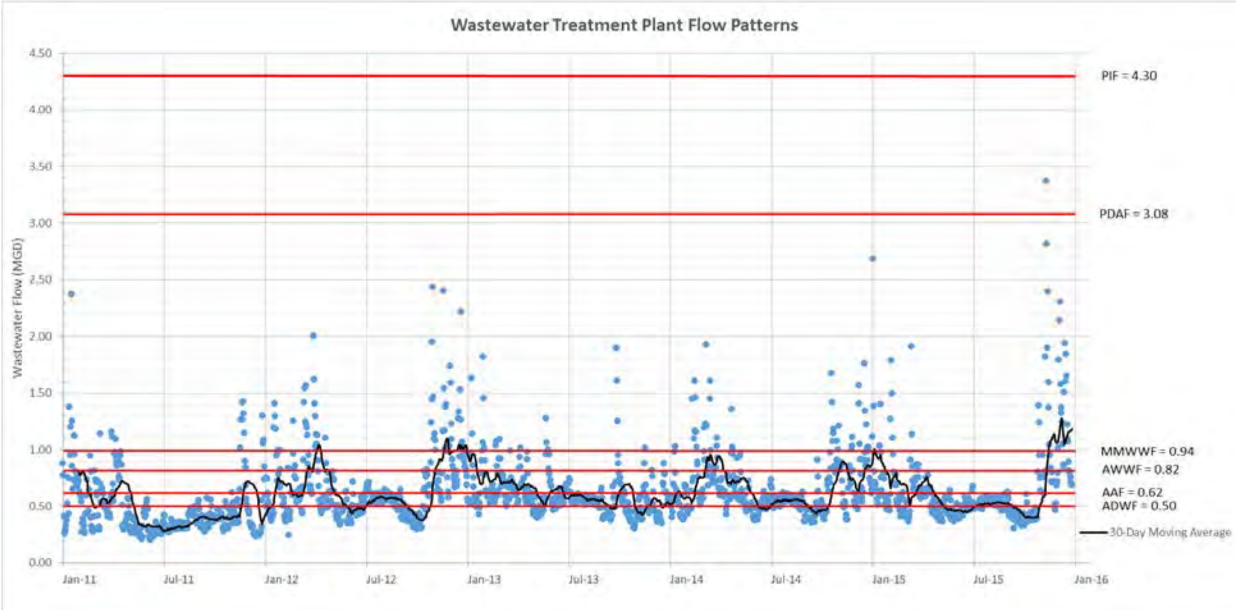
Assuming, as allowed by the DEQ guidelines, that the maximum PIF occurs during the peak day, peak week and peak month, we can create the graph shown below in Figure 5.1.4b.

Figure 5.1.4b - PIF Calculation



As shown above, when the known flow amounts and probabilities are plotted on a probability x 2 logarithmic graph, and a best fit trendline is added, unknown flows can be interpolated. In this way, the 5-year Peak Week Flow (1.73 MGD) and the PIF (4.30 MGD) are determined.

Figure 5.1.4c – Wastewater Treatment Plant Flow Patterns (2011-2015)



5.1.5 Infiltration and Inflow

Nearly all coastal communities in Oregon struggle with the issue of inflow and infiltration (I/I) within their wastewater collection systems. Inflow and infiltration are defined as follows:

> Infiltration: Flows that enter the collection system through underground paths. Infiltration can be caused by high groundwater levels, rain-induced groundwater, and other sources. Infiltration flows make their way into the collection system through cracks in pipe, open or offset pipe joints, broken piping sections, leaks in manholes, and other below-grade openings in the collection system.
>
> Inflow: Flows that enter the collection system through above ground paths. Inflow is often related to building downspouts being connected to sanitary sewer service laterals, cross connections with storm drain systems that have not been separated, water flowing over manholes and entering in through the openings in the lids, catch basins, or area drains being connected to the sewer system, and other surface water sources.

When combined, Infiltration and Inflow (I/I) can result in tremendous increase in flows during the winter, particularly during prolonged storm events. Comparison of the records of daily rainfall and the WWTP flows shows a marked increase in wastewater inflow rates during heavy rain events. Current I/I levels can be summarized in the following table.

Table 5.1.5 - Inflow / Infiltration Summary

Current I/I Flow Summary			
Item	**Calculation**	**I/I Flow**	**Per Capita**
AWW I/I	(AAWF - Base Sewerage) = 0.73 - 0.50 =	0.23 MGD	**135 gpcd**
MMWW I/I	(MMWWF - Base Sewerage) = 0.94 - 0.50 =	0.44 MGD	**285 gpcd**
PDAF I/I	(PDAF - Base Sewerage) = 3.08 - 0.50 =	2.58 MGD	**1,513 gpcd**
PIF I/I	(PIF - Base Sewerage) = 4.30 - 0.50 =	3.80 MGD	**2,229 gpcd**

The City of Cannon Beach commissioned an Inflow and Infiltration Study. The results of that study are presented in the City of Cannon Beach, Inflow and Infiltration Study, (2016, Civil West Engineering Services, Inc.). Two distinct survey projects were authorized by the City to pinpoint the major sources of I/I into the conveyance system. A flow mapping survey was completed during wet winter months to identify sections of pipe susceptible to infiltration. A smoke testing survey was conducted during the dry summer months to locate sources of inflow. The City conducts its own television survey by inserting a small robotic camera into selected sewage manholes and pipelines. Due to the lengthy geometry of the town, the City of Cannon Beach has a significantly larger amount of collection piping and manholes per area than would a town not as "long".

5.1.6 Summary of Existing Flows

Table 5.1.6 below summarizes the current dry and wet weather flows for the City of Cannon Beach. Figure 5.1.4c shows a graph of the historical daily flows for the investigated 5-year period with the peak flow values identified. Definitions for the different flow criteria are provided in Section 5.1.1.

Table 5.1.6 - Existing Wastewater Flow Summary

Summary of Current Wastewater Flows			
Parameter	**2011-2015 Ave. Flow (MGD)**	**Basis**	**Per Capita Flow (Gallons/Day)**
Dry Weather Flows			
ADWF	**0.50**	Analysis of 2011-2015 DMRs (May. – Oct.)	**293**
Base Sewerage	**0.50**	Assume no I/I (Jul. – Sept.)	**293**
Base Infiltration	**0.00**	ADWF - Base Sewerage	**0**
$MMDWF_{10}$	**0.66**	Figure 5.1.3 (DEQ Graph No. 1)	**387**
Wet Weather Flows			
AWWF	**0.73**	Analysis of 2011-2015 DMRs (Nov. – Apr.)	**428**
$MMWWF_5$	**0.94**	Figure 5.1.3	**551**
Peak Week	**1.73**	Figure 5.1.4b (DEQ Graph No. 3)	**1,015**
PDAF	**3.08**	Figure 5.1.4a	**1,806**
PIF	**4.30**	Figure 5.1.4b (DEQ Graph No. 3)	**2,522**
Inflow and Infiltration			
AWW I/I	**0.23**	AWWF – Base Sewerage	**135**
MMWW I/I	**0.44**	MMWWF – Base Sewerage	**258**
Peak Day I/I	**2.58**	PDAF – Base Sewerage	**1,513**
PI I/I	**3.80**	PIF – Base Sewerage	**2,229**

5.1.7 Projected Wastewater Flows

Projected wastewater flows are developed based on the assumption that flow per capita will hold constant. This results in the increase in projected flows being proportional to the population growth. Per Section 3.1, the population is expected to increase by only 3.7% from 2016 data to the end of the 20-year planning cycle (2036). There are no current nor projected significant industrial contributions.

Projecting peak flows at the same rate of community growth results in the assumption of I/I flows increasing at a similar rate. Since the City is currently addressing I/I issues and has a plan in place to continue monitoring and repairing the worst areas, we will assume no population-based increase in I/I flows and assume that I/I will be constant throughout the planning period. This will be the approach taken to flow projections.

Table 5.1.7 Summary of Current and Projected Wastewater Flows

Summary of Current and Projected Wastewater Flows						
Parameter	**2011-2015 Average Flow**	**Basis**	**2016 Pop.***	**Per Capita Flow (Gallons/Day)**	**2036 Pop.****	**2036 Flow (MGD)**
Dry Weather Flows						
ADWF	**0.50**	Analysis of 2011-2015 DMRs (May. – Oct.)	1,705	293	1,768	**0.52**
Base Sewerage	**0.50**	Assume no I/I (Jul. – Sept.)		293		**0.52**
Base Infiltration	**0.00**	ADWF – Base Sewerage		0		**0.00**
$MMDWF_{10}$	**0.66**	Figure 5.1.3 (DEQ Graph No. 1)		387		**0.68**
Wet Weather Flows						
AWWF	**0.73**	Analysis of 2011-2015 DMRs (Nov. – Apr.)	1,705	428	1,768	**0.76**
$MMWWF_5$	**0.94**	Figure 5.14c, 5.1.6		551		**0.97**
Peak Week	**1.73**	Figure 5.1.4b (DEQ Graph No. 3)		1,015		**1.79**
PDAF	**3.08**	Figure 5.1.4c, 5.1.6		1,806		**3.19**
PIF	**4.30**	Figure 5.1.4b (DEQ Graph No. 3)		2,522		**4.46**

* 2016 Population based on Certified Population Estimate.
** 2036 Population per Oregon Office of Economic Analysis, Department of Administrative Services.

5.1.8 Lift Stations Projected Wastewater Flows

Total number of sewer connections were counted from each lift station service area and used to generate a factor for each basin. This factor was then multiplied by the PIF to yield a value for PDAF at each lift station to determine if the lift stations are operating within specified DEQ redundancy.

Table 5.1.8a – Connection Based PIF

Basin PIF – Connection Based – 2015			
Basin	Daily Ave. Flow	Factor	Peak Day (gpd)
Ecola	55,944	5.033	
Main	386,904	x 5.033 =	1,947,415
Pacific	308,461	x 5.033 =	1,552,586
Elkland	20,568	5.033	
Haystack	10,717	5.033	
Matanuska	189,065	5.033	
Suislaw	50,238	5.033	
Midway	14,573	5.033	
Sitka	6,220	5.033	
		Total:	4,300,000

The second analysis of the lift station flows used the existing collection system piping as the basis for the flow determination. This investigation recognizes that the major contributor to system flows is I&I. Table 5.1.8.b summarizes the estimated total length of all the gravity sewer lines by size within the Cannon Beach waste water collection network and normalizes them into inch-diameter-mile based on the existing basins.

Table 5.1.8.b - Collection System Summary

Sewer Pipe Summary (Feet)									
Basin	Pipe Size (Inches)								Inch-Diameter-Mile
	4	6	8	10	12	14	15	18	
Ecola			14,470’						21.92
Main			16,395’		3,105’				53.82*
Elkland			2,135’						3.23
Pacific			18,000’						82.59*
Haystack			1,780’						2.70
Matanuska			21,316’	2,234’					49.39*
Suislaw			2,350’						3.56
Midway			3,290’						4.98
Sitka			2,850’						4.32

*Note that the Inch-Diameter-Mile totals for each lift station include any sub-basins that feed a larger basin, Main is the sum of Main and Ecola, Pacific is the sum of Elkland, Pacific, Haystack, and Matanuska, Matanuska is the sum of Matanuska, Suislaw, Midway, and Sitka.

The breakdown of the wastewater collection network provided in Table 5.1.8.b was then coupled with a total system peak instantaneous flow of 4.3 MGD, identified in Table 5.1.7 to calculate total peak flow for each lift station. Table 5.1.8.c summarizes the PIF for each lift station within the Cannon Beach wastewater collection network based on the existing collection network.

Table 5.1.8.c - Collection System Based Flow Analysis

Collection System Based Flow Analysis				
Lift Station	Primary Basins Served	Lift Stations Served	Total Basins Served	PIF at Lift Station (MGD)
Ecola	Ecola		1	0.67
Main	Main, Ecola	Ecola	2	1.70
Elkland	Elkland		1	0.10
Pacific	Pacific, Elkland, Haystack, Matanuska, Suislaw, Midway, Sitka	Elkland, Haystack, Matanuska, Suislaw, Midway, Sitka	7	2.60
Haystack	Haystack		1	0.09
Matanuska	Matanuska, Suislaw, Midway, Sitka	Suislaw, Midway, Sitka	4	1.56
Suislaw	Suislaw		1	0.11
Midway	Midway		1	0.16
Sitka	Sitka		1	0.14

The current calculated flows at Cannon Beach’s lift stations discussed above when compared appear to be reasonable and accurate given the information available. Table 5.1.8.d and Table 5.1.8.e a summary of the current and projected flows within the system at each lift station is provided. When reviewing the current and future capacity of each lift station within the Cannon Beach wastewater collection system it is recommended that the Adjusted Average Lift Station Flows provided in Tables 5.1.8.d and 5.1.8.e be used.

Table 5.1.8.d - 2016 (Current) Lift Station Flows

2016 (Current) Lift Station Flows						
Lift Station	Population Based PIF (MGD)	Collection System Based PIF (MGD)	Average Lift Station Based PIF (MGD)	Lift Station Design Pumping Capacity (gpm)	Lift Station Design Pumping Capacity (MGD)	Lift Station Pumping Capacity/Average PIF
Ecola	0.66	0.69	0.68	400	0.58	0.85
Main	1.77	1.70	1.73	1400	2.02	1.16
Elkland	0.11	0.10	0.10	250	0.36	3.45
Pacific	2.53	2.60	2.57	1430	2.06	0.80
Haystack	0.14	0.09	0.11	260	0.37	3.39
Matanuska	1.50	1.56	1.53	1190	1.71	1.12
Suislaw	0.16	0.11	0.14	300	0.43	3.20
Midway	0.10	0.16	0.13	400	0.58	4.47
Sitka	0.16	0.16	0.16	435	0.63	3.92

Table 5.1.8.e – 2036 (Projected) Lift Station Flows

2036 (Projected) Lift Station Flows						
Lift Station	2016 Average Lift Station Based PIF (MGD)	2016-2036 Population Increase Factor	2036 Average PIF (MGD)	Lift Station Design Pumping Capacity (gpm)	Lift Station Design Pumping Capacity (MGD)	Lift Station Pumping Capacity/Average PIF
Ecola	0.68	1.037	0.70	400	0.58	0.82
Main	1.73	1.037	1.80	1400	2.02	1.12
Elkland	0.10	1.037	0.11	250	0.36	3.32
Pacific	2.57	1.037	2.66	1430	2.06	0.77
Haystack	0.11	1.037	0.11	260	0.37	3.27
Matanuska	1.53	1.037	1.59	1190	1.71	1.08
Suislaw	0.14	1.037	0.14	300	0.43	3.08
Midway	0.13	1.037	0.13	400	0.58	4.31
Sitka	0.16	1.037	0.17	435	0.63	3.78

Prior to establishing a formal facility improvement project at the existing lift stations within the collection system it is recommended that the City install flow meters at each of its primary lift stations (Main, Pacific, Matanuska) to validate the calculated flows provided above for at least one year.

5.2 Wastewater Composition

Wastewater composition refers to the solids, chemicals, organics, and other materials that make up municipal wastewater. Because wastewater is generated by residential, commercial and industrial sources, the constituents within the wastewater can vary greatly. However, the treatment requirements and treated water quality remains consistent, based upon NPDES Permit requirements.

A detailed analysis of the City of Cannon Beach's DMRs from January 2011 through December 2015 was conducted to aid in establishing a basis for long term projection of organic loading and wastewater composition for the planning period. This information will be utilized in proposing treatment processes and operations to reduce unwanted constituents in the wastewater and to ensure the City can meet the requirements of the NPDES discharge permit.

5.2.1 Analysis of Plant Records

Analysis of the most recent five (5) years (2011 – 2015) of Discharge Monitoring Reports (DMRs) from Wastewater Treatment Plant has identified parameters which characterize the City's wastewater. Plant records include influent measurement of BOD and TSS for both concentration and loading a minimum of twice per week. Figures 5.2.1a through 5.2.1.d below summarize the concentration and loading of these primary constituents.

The following represents an outline of the BOD/TSS testing:

- Monday- Take BOD test out.
- Tuesday- Wash BOD bottles.
- Wednesday- Put BOD test on and take a BOD test off. Suspended solids test.
- Thursday- Wash BOD bottles. Ecoli test on effluent.
- Friday- Put BOD test on. MLSS test. Suspended solids test.

Wednesdays BOD test comes out Monday.
Fridays BOD test comes out Wednesday.

Twice a week suspended solids test, once a week MLSS and Ecoli test.
Once a month samples send to lab in Portland to test for TKN, Ammonia, Phosphates, Nitrate and Nitrite.
Once a month alkalinity on effluent and Ecola Creek, pH and temp on the Ecola Creek.
Once a year samples sent to Portland to test for oils and grease, and total dissolved solids.
Once a year all the lab equipment is calibrated.

Figure 5.2.1a BOD Concentration

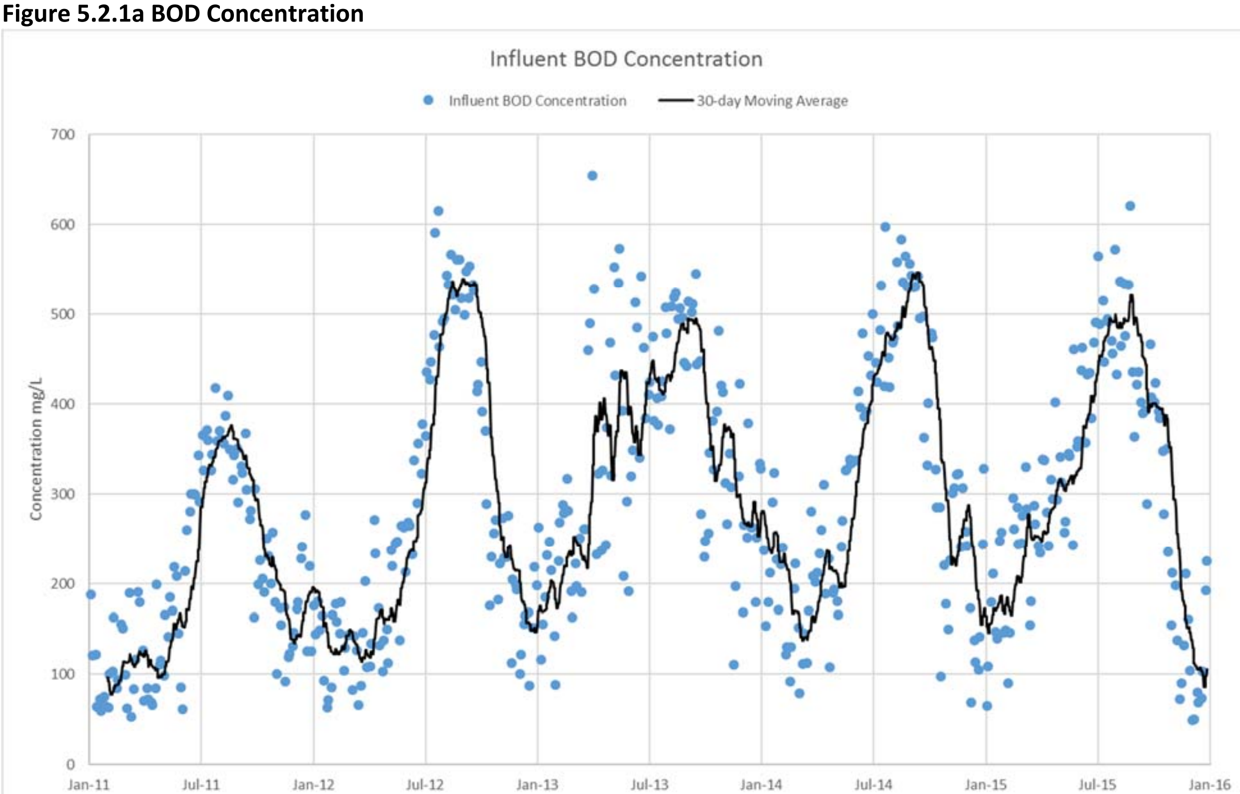


Figure 5.2.1b BOD Influent Loading

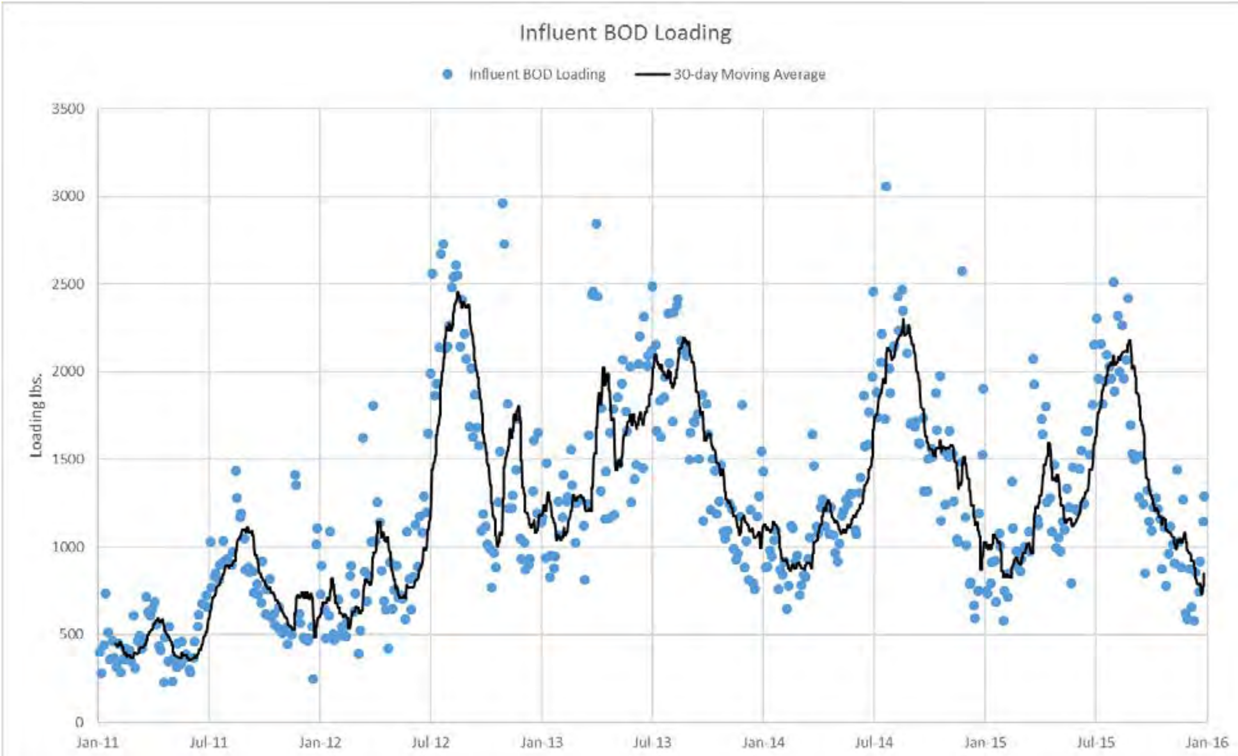


Figure 5.2.1c TSS Concentration

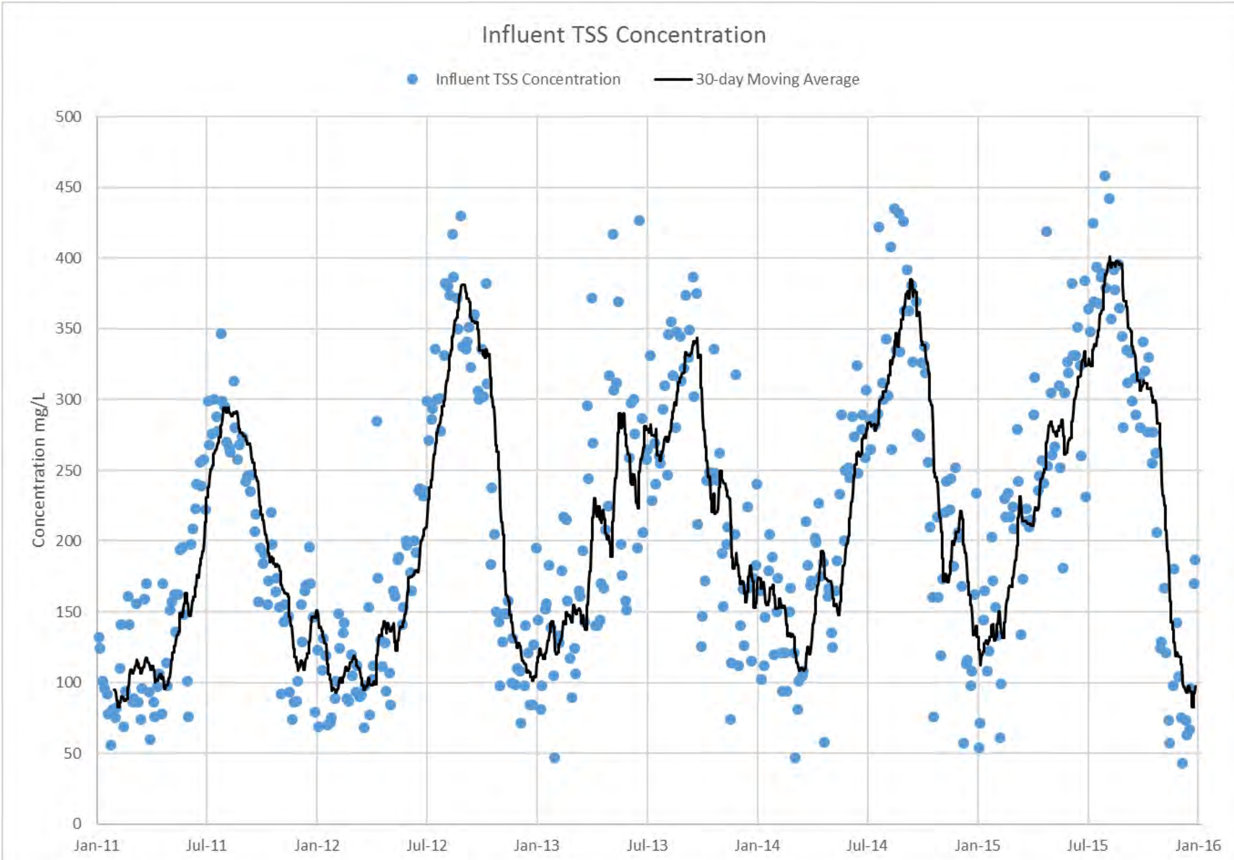
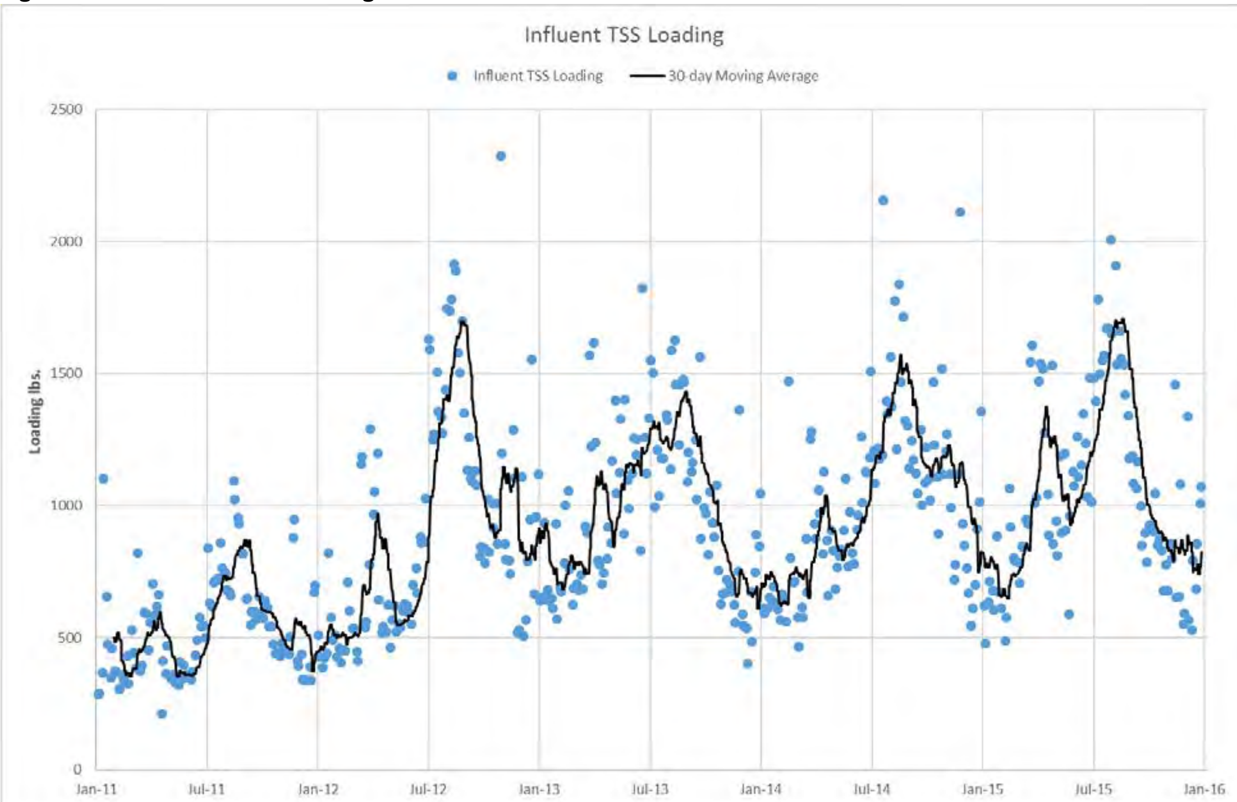


Figure 5.2.1d TSS Influent Loading



5.2.2 Wastewater Composition

Table 5.2.2a below identifies the composition of the influent in terms of BOD, TSS and pH.

Table 5.2.2a Current Influent Composition

Current Wastewater Composition Summary						
Flow Parameter	**BOD**		**TSS**		**pH**	
	Concentration (mg/L)	**Loading (lbs.)**	**Concentration (mg/L)**	**Loading (lbs.)**	**min**	**max**
Annual Average	287	1228	211	901	7.1	
Winter Average	192	990	144	748	5.0	8.1
Summer Average	381	1462	277	1051	5.8	8.9
Maximum Month	534	2365	396	1660	6.1	8.3
Maximum Day	655	3057	458	2326	5.0	8.9

As seen above, summer flows have significantly higher loading of BOD and TSS, as would be expected due to the population increase during the summer months due to tourism. BOD and TSS concentrations are also nearly double in the summer than the winter due to both the population increase and the I/I experienced in the winter months.

Typical concentrations of contaminants within untreated domestic wastewater are identified in the text, Wastewater Engineering, Treatment and Resource Recovery, Metcalf & Eddy, 2014. Data given in the referenced text is summarized in Table 5.2.2b below for comparison to the average load concentrations shown in the table above, as measured at the Cannon Beach WWTP.

Table 5.2.2b Typical Composition of Untreated Domestic Wastewater

Typical Wastewater Composition				
Constituent	**Unit**	**Concentration**		
		Low Strength	**Medium Strength**	**High Strength**
Biochemical Oxygen Demand, 5-d, 20°C BOD	mg/L	133	200	400
Total Suspended Solids (TSS)	mg/L	130	195	389
Fecal Coliform	No./100mL	10^3 - 10^5	10^4 - 10^6	10^5 - 10^8
Free Ammonia Nitrogen (NH3-N)	mg/L	14	20	41

Source: Table 3-15, "Wastewater Engineering, Treatment and Resource Recovery," Metcalf & Eddy, 2014.

By comparing the typical values in the above table to the overall average constituent concentrations presented in Table 5.2.2a, average influent BOD and TSS values for Cannon Beach are considered medium strength.

5.3 Projected Wastewater Characteristics

As developed in section 3.3.2, the current population, as of 2016, served by the City of Cannon Beach is 1,705 persons. Based on growth projections discussed in section 3.3, the population served at the end of the design period will be approximately 1,768 persons. This population growth is nearly negligible. The true indicator of the need to upgrade the wastewater system would be any appreciable increase in the tourist population, which by nature is difficult to measure. We can look at the peak tourism season BOD/TSS loading numbers to give a rough approximation of the need to upgrade or expand the wastewater system.

Projected population-based BOD and TSS loading for Cannon Beach in the year 2036 are summarized in Table 5.3, below, including the unit loading presented in units of pounds per person per day. The values presented have been determined by dividing the average and peak loads determined from the DMRs by the existing population to obtain unit loads (design factors) in terms of pounds per capita day. The unit design factors were then multiplied by the projected population to determine projected loading.

Table 5.3 Summary of Current and Projected Wastewater Loads

Current and Projected Loading								
Parameter	**2015 Loading** (lbs./day)		**2015 Pop.**	**Unit Loading** (lbs./capita/day)		**2036 Pop.**	**2036 Loading** (lbs./day)	
	BOD	TSS		BOD	TSS		BOD	TSS
Annual Average	1304	1054	1,705	0.765	0.618	1,768	1353	1093
Winter	1062	903		0.623	0.530		1101	937
Summer	1550	1208		0.909	0.709		1607	1254
Maximum Month	2178	1660		1.277	0.974		2258	1722
Maximum Day	2509	2009		1.472	1.178		2602	2083

As developed in section 3.3.2, the current population of Cannon Beach is 1,705. Based on growth projections in section 3, the population served at the end of the planning period will be 1,768. Population in Cannon Beach is not expected to grow appreciably during the planning period, as the City is nearly completely "built out" and does not have plans for urban growth boundary expansion. At this time, no significant change to the current ratio of residential to commercial to industrial sources is expected.

6 Basis of Planning

Section

6

6.1 Basis for Design

6.1.1 Regulatory Requirements

The Clean Water Act (CWA) as delegated to the State of Oregon and enforced through Oregon Revised Statues (ORS 468B.050), requires permits for all discharges of wastewater to waters of the state. The City of Cannon Beach operates its wastewater system under the jurisdiction of the Oregon Department of Environmental Quality (DEQ), with a National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit (Permit No. 102237) which was issued on November 4, 2011 (See Appendix A). NPDES permits are generally issued for terms of 5 years, at which time any changes to the rules will be included in the renewed permit. When a facility's permit reaches the expiration date and a new permit is not issued, the current permit is administratively extended and the permit requirements remain in effect if the permittee has made timely application for renewal. An NPDES Permit application was submitted to DEQ in December of 2015, the City of Cannon Beach has not yet received a new NPDES Permit.

The 2011 NPDES permit allows the City to discharge treated wastewater to the Ecola Creek via unnamed wetlands under the prescribed effluent limitations and other requirements. These effluent limits are developed to protect the beneficial uses for the North Coast Basin (Oregon Administrative Rules 340-041-0230).

Oregon Administrative Rules (OAR) also contain both statewide and basin specific minimum design criteria and rules regarding sanitary sewage overflows. These rules are discussed below.

6.1.1.1 Minimum Design Criteria for Wastewater Treatment and Control of Wastes

OAR 340-041-0007 (Statewide Narrative Criteria) includes minimum design criteria for treatment and control of wastes. Generally, wastewater from a municipal wastewater treatment system must be treated and controlled in facilities designed in accordance with the following minimum criteria:

- In designing treatment facilities, average conditions and a normal range of variability are generally used in establishing design criteria. A facility once completed and placed in operation should operate at or near the design limit most of the time but may operate below the design criteria limit at times due to variables which are unpredictable or uncontrollable. This is particularly true for biological treatment facilities. The actual operating limits are intended to be established by permit pursuant to ORS 468.740 and recognize that the actual performance level may at times be less than the design criteria.
- Effluent BOD concentrations in mg/l, divided by the dilution factor (ratio of receiving stream flow to effluent flow) may not exceed one unless otherwise approved by the Commission;
- Sewage wastes must be disinfected, after treatment, equivalent to thorough mixing with sufficient chlorine to provide a residual of at least 1 part per million after 60 minutes of contact time unless otherwise specifically authorized by permit;
- Positive protection must be provided to prevent bypassing raw or inadequately treated sewage to public waters unless otherwise approved by the Department where elimination of inflow and infiltration would be necessary but not presently practicable; and
- More stringent waste treatment and control requirements may be imposed where special conditions make such action appropriate.

OAR 340-041-0235 (Water Quality Standards and Policies for the North Coast Basin) includes minimum design criteria for treatment and control of wastes. These are as follows:

- pH values by not fall outside the range of 6.5 to 8.5.

- During periods of low stream flows (approximately May 1 to October 31), treatment resulting in monthly average effluent concentrations not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control;
- During the period of high stream flows (approximately November 1 to April 30), a minimum of secondary treatment or equivalent control and unless otherwise specifically authorized by the Department, operation of all waste treatment and control facilities at maximum practicable efficiency and effectiveness to minimize waste discharges to public waters.

New or expanded wastewater systems must meet the requirements described above.

6.1.1.2 Sanitary Sewage Overflows (SSOs)

OAR 340-041-0009 (6) and (7) prohibit discharging of raw sewage to wastewaters of the state in the winter and summer, respectively. During the summer (May 22 through October 31), raw sewage discharges are prohibited, except during a storm event greater than the one-in-ten year 24-hour duration storm. Since January 1, 2010, raw sewage discharges are prohibited during the winter (November 1 through May 21), except during a storm event greater than the one-in-five year, 24-hour duration storm.

6.1.2 Water Quality Status of Receiving Waterbody

Per OAR 340-041-0004, the Antidegradation Policy guides decisions that affect water quality such that unnecessary further degradation from new or increased point and nonpoint sources of pollution is prevented and enhances existing surface water quality to ensure the full protection of all existing beneficial uses.

6.1.2.1 Clean Water Act, Section 303(d), 2012

Section 305(b) of the Clean Water Act (CWA) requires DEQ to assess water quality in Oregon and report on the overall condition of waters. DEQ assigns an assessment status category to each water body where data are available to evaluate. Water bodies that do not meet water quality standards are Water Quality Limited and are assigned Category 4 or Category 5. Water bodies in Category 5 need pollutant Total Maximum Daily Loads (TMDLs) developed and comprise the Section 303(d) list.

Table 6.1.2.1 below summarizes the water quality status of the Ecola Creek near the City of Cannon Beach.

Table 6.1.2.1 Ecola Creek Water Quality Status

Parameter	Season	Status	Assessment Year	Assessment Action
Chlorine	Year Around	Cat 4B: Water quality limited, other control measures	2010	No 2010 action
Iron	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed	2010	No 2010 action

In the area of the discharge (River Mile 1.0) the Ecola Creek is Water Quality Limited, 303(d) list, for Chlorine (2010) and Iron (2010) per the Oregon 2010 Integrated Report.

6.1.2.2 Temperature

Water temperatures affect the biological cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations throughout the state. It is the policy of the Environmental Quality Commission (EQC) to protect aquatic ecosystems from adverse warming caused by anthropogenic activities. The purpose of the temperature criteria listed in OAE 340-041-0028 is to protect designated temperature sensitive beneficial uses, including salmonid life cycle stages in waters of the State.

DEQ's Fish Use Designation maps identify the applicable temperature criteria for each basin. The North Coast sub-basin map is set out in 340-041-0230A and -0230B. According to the Fish Use Designation maps approved with the temperature standard, the Ecola Creek in this area is designated as a rearing and migration corridor. The biologically based criteria for the temperature of Ecola Creek are seven day average daily maximums (7DADM) as shown in Table 6.1.2.2 below.

Table 6.1.2.2 Ecola Creek Temperature Criteria

Ecola Creek Temperature Criteria		
Salmonid and Trout Fish Use	**Date Range**	**Temperature Criteria**
Spawning through Emergence	October 15 – May 15	13°C (55.4°F) 7DADM
Rearing and Migration	May 16 – October 14	18°C (64.4°F) 7DADM

Ecola Creek is not listed as water quality limited for temperature, meaning that this creek meets the standards for temperature. The 2003 TDML for the North Coast for temperature does not assign a waste load allocation for temperature to the Cannon Beach Wastewater Treatment Plant, but does note that the allowable effluent temperature effect is “no significant increase over natural background temperatures” (North Coast Sub-Basins Total Maximum Daily Load, June 2003 Table 13, page 57).

6.1.2.3 Total Chlorine Residual

Disinfection of the effluent with chlorine is the process the plant used up until the 2007 wastewater treatment plant upgrade when the plant switched from chlorine disinfection to a new UV disinfection system. Since the plant no longer uses chlorine for disinfection, chlorine is no longer required to be tested for.

6.1.2.4 Iron

The Ecola Creek is listed as “Category 5: water quality limited, TDML needed” for iron. The listing has been maintained, but shows no further action in the 2010 Integrated report.

6.1.2.5 Ammonia

Ammonia is a substance normally found in wastewater. The wastewater treatment processes, particularly aeration and biological treatment, can convert a large portion to nitrate and nitrite but the treated effluent still contains some ammonia. After discharge, the continued process of oxidizing the ammonia removes dissolved oxygen from the ambient water.

Unionized ammonia is also a toxic agent and may have to be limited to prevent toxicity. If ammonia is discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard (dissolved oxygen or toxicity), it must be limited by the permit.

The Biolac WWTP at Cannon Beach has tested ammonia levels averaging 0.13mg/L over the 5-year DMR data set used for this report. The highest ammonia effluent reading was 1.4mg/L during wintertime. If future ammonia regulations are lowered even by a factor of 10, we are confident that the WWTP would be able to meet the new regulations.

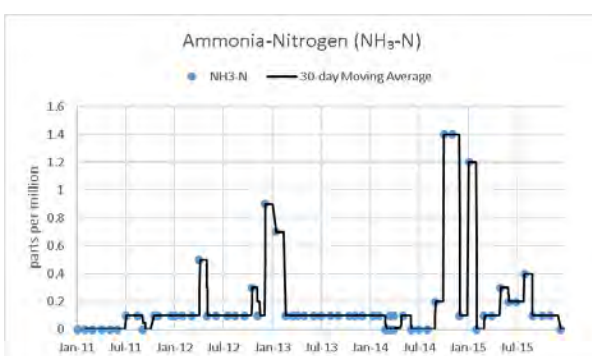


Table 6.1.3 - NPDES Permit Schedule A - Waste Discharge Limitations not to be exceeded

(1) Waste discharge limitations not to be exceeded for Outfall 003 (effluent discharge to wetlands).

A	**May 1 – October 31 (SUMMER):**					
		Average Effluent Concentrations		Monthly Average	Weekly Average	Daily[1] Maximum
	Parameter	Monthly	Weekly	lb./day	lb./day	lbs.
	BOD_5	10 mg/L	15 mg/L	73	110	140
	TSS	10 mg/L	15 mg/L	73	110	140
	Ammonia-Nitrogen (NH_3-N)	2 mg/L		14		28
	[1] Summer mass load limits based upon average dry weather design flow to the facility equal to 0.87 MGD.					
B	**November 1 – April 30 (WINTER):**					
		Average Effluent Concentrations		Monthly* Average	Weekly* Average	Daily* Maximum
	Parameter	Monthly	Weekly	lb./day	lb./day	lbs.
	BOD_5	20 mg/L	30 mg/L	190	280	380
	TSS	20 mg/L	30 mg/L	190	280	380
	Ammonia-Nitrogen (NH_3-N)	20 mg/L		190		380
	[2] Winter mass load limits based upon average wet weather design flow to the facility equal to 1.13 MGD.					
C	**YEAR ROUND limitations:**					
	Other parameters (year-round)			Limitations		
	E. coli Bacteria			Must not exceed 126 organisms per 100mL monthly geometric mean. No single sample may exceed 406 organisms per 100 mL. [3]		
	pH			Shall be within the range of 6.5 – 8.5		
	BOD_5 and TSS Removal Efficiency			Must not be less than 85% average for BOD_5 and 85% monthly average for TSS.		
	[3] If a single sample exceeds 406 organisms per 100 mL, the five consecutive re-samples may be taken at four-hour intervals beginning within 28 hours after the original sample was taken. If the geometric mean of the five re-samples is less than or equal to 126 organisms per 100 mL, the bacteria limit is not exceeded.					

(2) Permittee must not discharge wastes or conduct activities that violate water quality standards adopted in OAR 340-041 for the North Coast Basin.

(3) Permittee's activities must not cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater must be managed and disposed of in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

6.1.3 Treatment Effectiveness

A minimum level of percent removal for BOD5 and TSS for municipal dischargers is required by the Code of Federal Regulations (CFR) secondary treatment standards (40 CFR, Part 133). An 85 percent removal efficiency limit is included in the permit to comply with federal requirements. Evaluation of the past DMRs shows that the standard removal efficiency is 97.4% for BOD and 94.7% for TSS.

6.1.4 System Reliability and Redundancy Requirements

New or expanding wastewater treatment plants should be designed to meet minimum reliability standards as described in EPA's technical bulletin, Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, EPA 430-99-74-001, 1974. These standards shall be achieved to ensure effective operation of treatment facilities on a day-to-day basis as well as during emergencies including power failures, flooding, peak flows, and equipment failures. These reliability standards are critical to protect the receiving water body against degradation during maintenance shutdowns and emergencies.

These guidelines are based on a "design flow" which is generally annual average flow. DEQ requires Class I reliability for all sewage lift stations. However, for treatment plants, DEQ requires Class I reliability during the low flow season and Class II reliability during high flow season. Additionally, the primary purpose for redundancy is for the treatment plant to have the ability to meet permit limits with any unit removed from service for periodic maintenance. DEQ expects that major maintenance activities will be performed during low flow periods. Therefore, redundancy requirements apply to maximum month dry weather conditions, not peak flow conditions. However, the plant must also have capacity to treat peak flows with all units in service.

The above referenced EPA technical bulletin identifies the following three reliability classes:

> Reliability Class I – Works which discharge into navigable waters that could be permanently or unacceptably damaged by effluent which was degraded in quality for only a few hours. Examples of Reliability Class I works might be those discharging near drinking water reservoirs, into shellfish waters, or in close proximity to areas used for water contact sports.
>
> Reliability Class II – Works which discharge into navigable waters that would not be permanently or unacceptably damaged by short-term effluent quality degradations, but could be damaged by continued (on the order of several days) effluent quality degradation. An example of a Reliability Class II works might be one which discharges into recreational waters.
>
> Reliability Class III – These are works not otherwise classified as Reliability Class I or Class II.

6.2 Basis for Cost Estimate

The cost estimates presented in this report will typically include four components: construction cost, engineering cost, contingency, and legal and administrative costs. Each of the cost components is discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Study. The goal of these planning level cost estimates is to establish a reasonably conservative budget and to allow fair cost-comparisons of alternatives. As projects proceed and more detailed, site-specific information becomes available, the estimates will require updating.

6.2.1 Construction Costs

Construction costs are based on competitive bidding as public works projects with Davis-Bacon prevailing wage rates. The estimated construction costs in this report are based on actual construction bidding results from similar work, published cost guides, budget quotes obtained from equipment suppliers, and other construction cost experience. Construction costs are preliminary budget level estimates prepared without design plans and details.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the cost estimates presented herein. For this reason, common engineering practices usually tie the cost estimates to a particular index that varies in proportion to long-term changes in the national economy. The Engineering News Record (ENR) construction cost index (CCI) is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past 17 years are summarized in Table 6.2.1 below.

Table 6.2.1 ENR Construction Cost Index History

Year	CCI Index	% Change/Year
2000	6221	2.67
2001	6343	1.96
2002	6538	3.07
2003	6694	2.39
2004	7115	6.29
2005	7446	4.65
2006	7751	4.10
2007	7967	2.78
2008	8310	4.31
2009	8570	3.13
2010	8801	2.69
2011	9070	3.06
2012	9309	2.64
2013	9547	2.56
2014	9807	2.72
2015	10036	2.34
2016	10248	2.11
	Average since 2000:	3.16%

Cost estimates presented in this report are based on average 2016 dollars with an ENR CCI of 10248. For construction performed in later years, estimated costs should be projected based on the then current year ENR Index using the following method:

Updated Cost = Report Cost Estimate x (current ENR CCI / 10248)

6.2.2 Contingencies

A contingency factor equal to twenty percent (20%) of the estimated construction cost has been added to the budgetary costs estimated in this report. SCADA projects have been assigned a contingency of thirty-five (35%) due to the nature of the work and high probability of unknown factors. In recognition that the cost estimates presented are based on conceptual planning, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen but may tend to increase final costs. Upon final design completion of any project, the contingency can be reduced to 10%. A contingency of at least 10% should always be maintained going into a construction project to allow for variances in quantities of materials and unforeseen conditions.

6.2.3 Engineering

Engineering services for major projects typically include surveying, preliminary and final design, preparation of contract/construction drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 18 to 25% of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small or complicated projects.

Engineering costs for basic design and construction services presented in this report are estimated at 20% of the estimated total construction cost. Other engineering costs such as specialized geotechnical explorations, hydro-geologic studies, easement research and preparation, pre-design reports, and other services outside the normal basic services will typically be in addition to the basic engineering fees charged by firms. When it was suspected that a specific project in this report may need any special engineering services, an effort has been made to include additional budget costs for such needs. Specific efforts required for individual basic engineering tasks such as surveying, design, construction management, etc. vary widely depending on the type of project, scheduling and timeframes, level of service desired during construction, and other project/site-specific conditions however an approximate breakdown of the 20% engineering budget is as follows:

Surveying and Data Collection – 0.5%
Civil/Mechanical Design – 8%
Electrical/Controls Design – 1.5%
Bid Phase Services – 1%
Construction Management – 4%
Construction Observation (Inspection) – 5%

6.2.4 Administrative Costs

An allowance of five percent (5%) of construction cost has been added for legal and other project management services. This allowance is intended to include internal project planning and budgeting, funding program management, interest on interim loan financing, legal review fees, advertising costs, wage rate monitoring, and other related expenses associated with the project that could be incurred.

6.2.5 Land Acquisition

Some projects may require the acquisition of additional right-of-way, property, or easements for construction of a specific improvement. The need and cost for such expenditures is difficult to predict and must be reviewed as a project is developed. Effort was made to include costs for land acquisition, where expected, within the cost estimates included in this report.

Section 7

7 Development and Evaluation of Alternatives

Section 7 will identify various alternatives for each sector and component of the wastewater system. Cost estimates will be provided for specific alternative improvements. Discussion will be provided to outline the advantages and disadvantages of the various alternatives. Finally, a recommendation will be provided as to which alternative is most appropriate.

The planning pattern described above will be used to analyze and develop recommendations for the conveyance/collection systems, components at the treatment plant, and the integration of the entire wastewater system with SCADA driven technology. Detailed costs will be utilized to develop and present the final recommendations for wastewater system improvements in Cannon Beach.

7.1 System Integration Alternatives

For more efficient use of operator resources, the City of Cannon Beach's Wastewater System, we recommend that the City develop an integrated Supervisory Control and Data Acquisition (SCADA) system to provide both monitoring and control of the Wastewater System components. At the bare minimum, an integrated SCADA monitoring system should be in place.

With increasing government regulations, increasing output and heightened security awareness, many municipalities have seen the benefit of installing or upgrading a SCADA system. The function of a SCADA system is to monitor, operate, and control remote systems that area located over a large geographic area from a central location. Remote monitoring and control can provide data that can be used to significantly enhance operation efficiencies, reduce downtime, and increase security. Other benefits of remote monitoring include better regulatory record keeping and reporting, remote trouble shooting to reduce downtime and increase repair efficiency, reduce travel time and labor cost, and improved capability to instantly alert operators of alarms and undesirable events.

The City of Cannon Beach is particularly sensitive to potential wastewater overflows due to the proximity of most lift stations to the beach and potential human contact. A SCADA system can help to prevent this occurrence by monitoring pump run-time in real time and recognizing when pumps are running too much, a sign that pumps are clogged, worn, or there is a significant source of I/I in that section of the system. SCADA systems can help identify and locate I/I by logging pump run-times.

SCADA will reduce time spent by operators traveling to and from lift stations, freeing them up for more critical work such as reducing I/I. Existing communication with lift stations consists of an auto-dialer for alarms.

7.1.1 SCADA Integration with Monitoring only

This Alternative will allow for full monitoring of all major wastewater components at the wastewater treatment plant and at all nine lift stations.

A monitoring only system will continuously monitor and provide data logging for all major components at the wastewater treatment plant and for all nine of the collection system's lift stations. The monitoring system will also provide a fully integrated alarm and reporting system for all users.

Alternative 1 - Complete SCADA Monitoring System					
Item	Description	Units	Quantity	Unit Cost	Total Cost
1	SCADA Computers, Software and Accessories	LS	1	$31,900	$31,900
2	MTUs/RTUs, Dialers and Telemetry	LS	1	$160,700	$160,700
3	Control Panels, Level Controls, PLCs and UPSs	LS	1	$79,000	$79,000
4	Programming and Installation	LS	1	$308,000	$308,000
		Cost			$579,600
		Contingency (35%)			$202,860
		Total Project Cost			**$782,460**

7.1.2 SCADA Integration with Monitoring and Control

This Alternative will allow for full monitoring and control of all major wastewater components at the wastewater treatment plant and at all nine lift stations.

A monitoring and control system will continuously monitor, have the ability of operator remote control, and provide data logging for all major components at the wastewater treatment plant and for all nine of the collection system's lift stations. The monitoring and control system will also provide a fully integrated alarm and reporting system for all users.

Alternative 2 - Complete SCADA Monitoring and Remote Control System					
Item	Description	Units	Quantity	Unit Cost	Total Cost
1	SCADA Computers, Software and Accessories	LS	1	$31,900	$31,900
2	MTUs/RTUs, Dialers and Telemetry	LS	1	$141,900	$141,900
3	Control Panels, Level Controls, PLCs and UPSs	LS	1	$97,800	$97,800
4	Rack Mount for Server	EA	1	$1,800	$1,800
5	Panelview Upgrades	LS	1	$21,300	$21,300
6	VFDs	LS	1	$54,700	$54,700
7	UV Control Interface	LS	1	$14,700	$14,700
8	IP Camera for Aeration Basins	LS	1	$3,500	$3,500
9	Soft Start Replacements	EA	3	$5,300	$15,900
10	Single Enclosure Upgrade	EA	4	$22,600	$90,400
11	Remote Control	LS	1	$40,400	$40,400
12	Programming and Installation	LS	1	$308,000	$308,000
		Cost			$822,300
		Contingency (35%)			$287,805
		Total Project Cost			**$1,110,105**

7.2 Conveyance System Alternatives

As identified in Chapter 4, the conveyance system is composed of gravity sewer piping and manholes, as well as nine wastewater lift stations and their associated force mains. In this report, the conveyance system has been divided into nine sewer basins.

The following subsections will investigate various alternatives for improvements to wastewater lift stations, collection system improvements and alternatives to consider for servicing areas within the UGB that are currently not serviced.

7.2.1 Collection System Improvements and Alternatives

The City has been working on collection system improvements and I/I reduction for well over a decade. As a result, very few new collection system piping projects need to be independently identified and discussed as a part of this Facilities Planning effort.

Pipe replacement is the most invasive type of repair work, where a new trench must be dug and a plan to maintain or bypass sewer service during construction must be implemented.

For smaller repairs; lining, bursting, and patching projects can often be done in several hours after preparation work. They are non-invasive and result in little ground disturbance, short interruptions to sewage flows, and are generally less costly. Consequently, non-invasive projects are preferred when judged feasible.

Collection system piping replacement projects will be considerably more costly than simple repairs. There can be significant savings in replacing longer lengths of pipe over doing shorter runs of pipe replacement. The City should budget for 300 feet of replacement per year, and accumulate funds for a period of years to fund one large project. For example, doing one large replacement project every five years will give a better “bang for the buck” than five small annual projects would.

Collection System - Funds for 300' of 8" PVC per Annum					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$9,060	$9,060
2	Construction Facilities, Temporary Systems and Bypass Provisions	LS	1	$20,000	$20,000
3	Install new 8" PVC Pipe	LF	300	$80	$24,000
4	Removal and Disposal of Old Pipe	LF	300	$65	$19,500
5	Site Work	LS	1	$18,000	$18,000
		Construction Total			$90,560
		Contingency (20%)			$18,112
		Subtotal			$108,672
		Engineering (20%)			$21,734
		Administrative Costs (5%)			$5,434
		Total Project Cost			**$135,840**

7.2.2 Lift Station Alternatives

As with the wastewater treatment plant, the two main lift station alternatives are the integration of SCADA monitoring, or the integration of SCADA monitoring and control for the lift stations.

The City has also expressed the desire to have on-site backup generators at all nine lift stations. The five largest lift stations already have on-site dedicated backup generators, leaving the four smallest lift stations to be upgraded.

Lift Stations - Dedicated Emergncy Generators					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$26,450	$26,450
2	Construction Facilities, Temporary Systems and Bypass Provisions	EA	4	$2,000	$8,000
3	80kW Generator, Enclosure, ATS and Accessories	EA	4	$52,500	$210,000
4	Site Work	EA	4	$5,000	$20,000
		Construction Total			$264,450
		Contingency (20%)			$52,890
		Subtotal			$317,340
		Engineering (20%)			$63,468
		Administrative Costs (5%)			$15,867
		Total Project Cost			**$396,675**

The Pacific lift station pumps to an unusually configured force main that employs a split and runs two parallel pipes for approximately 400 feet. It is believed that both legs of the split section are 6” concrete. It is recommended that one leg be abandoned and the other leg replaced with 10” PVC.

With pumps rated at 1430 gpm the Pacific lift station is also currently undersized to meet DEQ redundancy requirements. It is estimated that with existing pumps and the restrictive force main split in place this lift station is at best is achieving 900 gpm firm pumping capacity. This lift station will need force main and pump upgrades to meet redundancy requirements (1900 gpm) through the 20-year design period.

Collection System - Remove Split in Pacific Forcemain					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$15,650	$15,650
2	Construction Facilities, Temporary Systems and Bypass Provisions	LS	1	$20,000	$20,000
3	Remove Wyes and Install Spools	EA	2	$8,000	$16,000
4	Install New 10" PVC Forcemain	LF	400	$100	$40,000
5	Refurbish Air Relief System and Install New Air Relief Valves	EA	3	$15,000	$45,000
6	Drain/Cap/Abandon Smaller Pipe	LS	1	$1,800	$1,800
7	Site Work	LS	1	$18,000	$18,000
		Construction Total			$156,450
		Contingency (20%)			$31,290
		Subtotal			$187,740
		Engineering (20%)			$37,548
		Administrative Costs (5%)			$9,387
		Total Project Cost			**$234,675**

Pacific Lift Station - Upgrade Pumps					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$12,510	$12,510
2	Construction Facilities and Temporary Systems	LS	1	$10,000	$10,000
3	Pump Upgrades/VFDs/Electrical	EA	2	$53,800	$107,600
		Construction Total			$130,110
		Contingency (20%)			$26,022
		Subtotal			$156,132
		Engineering (20%)			$31,226
		Administrative Costs (5%)			$7,807
		Total Project Cost			**$195,165**

At 400 gpm the Ecola lift station is also currently undersized to meet DEQ redundancy requirements. This lift station is also physically undersized from an ease of maintenance standpoint. This lift station will need pumping upgrades to meet redundancy requirements (500 gpm) through the 20-year design period.

Ecola Lift Station - Upgrade Pumps, New Building					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$19,980	$19,980
2	Construction Facilities and Temporary Systems	LS	1	$6,500	$6,500
3	Pump Upgrades/VFDs/Electrical	EA	2	$37,400	$74,800
4	Electrical Controls and Generator Building, 300 sq ft, w / Rollup Door	LS	1	$93,500	$93,500
5	Site Work, Cleanup	LS	1	$5,000	$5,000
		Construction Total			$199,780
		Contingency (20%)			$39,956
		Subtotal			$239,736
		Engineering (20%)			$47,947
		Administrative Costs (5%)			$11,987
		Total Project Cost			**$299,670**

The current lift station control building is undersized for lift station routine maintenance. Currently the onsite backup generator at Matanuska is unprotected from the elements. It is recommended that a larger building be built to replace the old, undersized building and to also cover and protect the onsite backup generator. Design of new building must match the existing architecture of the nearby "Stephanie Inn".

Matanuska Lift Station - New Building					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$19,970	$19,970
2	Construction Facilities and Temporary Systems	LS	1	$7,500	$7,500
3	Electrical Controls and Instruments Relocate/Reinstall	LS	1	$23,700	$23,700
4	Electrical Controls and Generator Building, 300 sq ft, w / Rollup Door	LS	1	$143,500	$143,500
5	Site Work, Cleanup	LS	1	$5,000	$5,000
		Construction Total			$199,670
		Contingency (20%)			$39,934
		Subtotal			$239,604
		Engineering (20%)			$47,921
		Administrative Costs (5%)			$11,980
		Total Project Cost			**$299,505**

7.3 Wastewater Treatment Plant

As discussed in section 4.3, due to the significantly diminished loading outside of the summer tourism season, one of the two treatment units is regularly off-line.

7.3.1 Headworks

The existing headworks are sized to handle the current expected peak flow (4.30 MGD). As calculated in section 5.1.6 the 20-year projected peak flows are only slightly larger (4.46 MGD) and would not pose a problem for the current headworks. The projected flow is based on population growth but does not account for recent and planned I/I improvements. The recent and future I/I repair work will likely decrease peak flows, although the amount of reduction is unknown. To be conservative in design of the facilities, it is assumed that there will be no reduction. It is likely that the projected peak flows will not be realized even if the expected growth occurs. Peak flows in Cannon Beach are typically four times greater during high rainfall events compared to seasonal flow spikes due to tourism. The largest peak flow in the last five years was just under 3.50 MGD, the current headworks is designed to accommodate flows up to 4.84 MGD. It is recommended that the headworks not be enlarged at this time.

The City has expressed the desire to cover the headworks area with either a simple roof structure or a roof and three-sided enclosure to protect both personnel and the equipment from the elements.

WWTP - 3-Sided Building for Headworks					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$8,600	$8,600
2	Construction Facilities & Controls	LS	1	$3,500	$3,500
3	Structural Concrete	CY	5	$1,200	$6,000
4	3/4" Fill	CY	5	$100	$500
5	Framing	LS	1	$12,000	$12,000
6	Roof	SF	800	$60	$48,000
7	Siding	LF	75	$65	$4,875
8	De-mobilization/Clean-up	LS	1	$2,500	$2,500
		Construction Total			$85,975
		Contingency (20%)			$17,195
		Subtotal			$103,170
		Engineering (20%)			$20,634
		Administrative Costs (5%)			$5,159
		Total Project Cost			**$128,963**

7.3.2 Grit Chamber

The City has expressed the desire to add a grit classifier/chamber to the headworks after the fine screens. Cannon Beach being a beach community, it is assumed there is a fair amount of sand that gets into the collection system. The sand settles in the aeration basins and also adds volume to their sludge wasting totals. Removal of settled solids from the aeration basins can be costly and the City would also like to minimize the amounts of sludge wasted. The addition of a grit classifier would eliminate solids settling in the aeration basins and achieve some reduction in material wasted to the sludge storage basins.

WWTP - Grit Chamber					
Item	**Description**	**Units**	**Quantity**	**Unit Cost**	**Total Cost**
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$17,560	$17,560
2	Vortex Grit Separator, Hydrocyclone, Washer, Conveyor and Installation	LS	1	$158,000	$158,000
		Construction Total			$175,560
	*45% Contingency placed for possible subsurface unforeseen	Contingency (45%)*			$79,002
		Subtotal			$254,562
		Administrative Costs (5%)			$12,728
		Total Project Cost			**$267,290**

7.3.3 Aeration Basins/Clarifiers

The aeration basins and integrated clarifiers are relatively new and have no need for major repairs or replacement. It has been noted that the fan guards on the clarifier rake motors are severely deteriorated and should be replaced and possibly covered with some type of protective cover.

7.3.4 Magmeter

The meter is oversized for expected flows and is likely not recording flows under 100 gallons per minute accurately. The meter should be downsized or supplemented with another meter or method to capture lower flow volumes.

7.3.5 UV Area

The City has expressed the desire to enclose the UV area to create a three-sided enclosure to both protect workers and the equipment from the elements. Currently there is a free-standing roof covering the UV area and associated equipment.

WWTP - Fully Enclose UV Area					
Item	Description	Units	Quantity	Unit Cost	Total Cost
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$11,850	$11,850
2	Construction Facilities & Controls	LS	1	$3,500	$3,500
3	Siding/Insulation/Interior Finishw ork	LF	90	$385	$34,650
4	Interior Ceiling/Insulation	SF	300	$50	$15,000
5	Roll Up Door	EA	1	$16,000	$16,000
6	HVAC/Ventilation	LS	1	$24,000	$24,000
7	Misc. Electrical	LS	1	$11,000	$11,000
8	De-mobilization/Clean-up	LS	1	$2,500	$2,500
		Construction Total			$118,500
		Contingency (20%)			$23,700
		Subtotal			$142,200
		Engineering (20%)			$28,440
		Administrative Costs (5%)			$7,110
		Total Project Cost			**$177,750**

7.3.6 Sludge Storage Ponds

The City has expressed the desire to add freeboard and slope protection to certain areas of the sludge storage ponds to eliminate the possibility of overtopping/erosion due to wind waves generated during storm conditions that regularly occur during the winter months. This work will likely be done with the City's own in-house contractor, but should still be budgeted for on placed on the CIP list.

Sludge Basins - Raise Banks					
Item	Description	Units	Quantity	Unit Cost	Total Cost
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	1	$18,170	$18,170
2	Construction Facilities	LS	1	$20,000	$20,000
3	Clear and Grub	LF	900	$15	$13,500
4	Compacted Fill	CY	500	$33	$16,500
5	Rip Rap	LF	900	$90	$81,000
6	Fencing Demo and Install New Fencing	LF	900	$25	$22,500
7	Site Work	LS	1	$10,000	$10,000
		Construction Total			$181,670
		Contingency (20%)			$36,334
		Subtotal			$218,004
		Engineering (20%)			$43,601
		Administrative Costs (5%)			$10,900
		Total Project Cost			**$272,505**

Section 8

8 Funding Options

This section provides analysis of potential funding resources and a summary of the current rate structure of the City. For the City to plan for loan payment in conjunction with the improvements, a method of determining the cost per user is required. A comprehensive Rate Study is being conducted by Civil West Engineering Services, Inc. to calculate system user fees. This information will be utilized to determine the future rate structure required.

8.1 Sewer Rate Structure

Sewer system user rates in Cannon Beach are based on water meter size, volume of water purchased, and the average amount of residential water use. The base rates are set based on average residential water use. Present sewer user rates for a standard residential or small commercial customer consists of a base rate of $24.23 per month for the first 400 cubic feet plus $6.07 per hundred cubic feet of treated water used thereafter.

Average residential connections use 387 c.f. of water per month, which results in an average sewer bill to of $24.23 per month.

The information presented in the preceding subsections has been used to develop a proposed rate structure for the City of Cannon Beach based on the planned improvements. To proceed with the planned improvements, the City will need to secure funding. Some grant funding may be available to the City. However, loans will be required for a significant portion of the cost as well. The amount borrowed and the loan terms will have a direct effect on the resulting user rates.

Any grant funding awarded to the City should be considered when finalizing the rate structure. Also, the interest rates and terms of any loans taken out will play a part in the final rates users are required to pay.

The final rate structure will depend greatly on the funding package secured by the City, interest rates, current construction costs, and other potential variables.

8.2 Evaluation of Local Funding Resources

Several local funding sources are available to the City for sharing the cost of the planned wastewater system improvements. The amount and type of local funding obligations for infrastructure improvements will depend in part on the amount of grant funding anticipated and the requirements of potential loan funding. Local revenue sources for capital expenditures include various types of bonds, capital construction funds, system development charges, system user fees, and ad valorem taxes. Local revenue sources for operating costs include system user fees and ad valorem taxes. Each of these financing mechanisms is briefly described below along with the appropriateness of each for the improvements recommended in this Plan.

8.2.1 General Obligation Bonds

General Obligation (GO) bonds have the full faith and resources of the City behind them including property taxes, rate income, and other revenues to ensure that obligations are met. Because of this backing, GO bonds often have a lower interest rate and are generally considered to have lower risk and are a more attractive investment in the municipal bond market. For a community to undertake a project funded with a GO bond, they must pass a vote of the people to sell the bonds. In some cases, communities spend a great deal of time, money and effort only to have the electorate reject the project by denying the GO bond funding measure. Thus, many communities shy away from GO bond funding options.

8.2.2 Revenue Bonds

Revenue Bonds (RB) are retired through revenues obtained through user rates and charges. They do not have the full faith of the community behind them in that property taxes and other forms of revenue are not pledged to retire the debt. As such, they are considered as a higher risk and often have slightly higher interest rates associated with them. However, as property taxes are not obligated, a vote of the public is not required for selling revenue bonds to fund a project. This often makes revenue bonds a preferred choice for public improvements.

Bonds sales, regardless of type, have several requirements and processes that must be met for the bond sale to move forward. These requirements vary but generally include:

- Project documentation to prove feasibility of the project and the funding plan.
- Assistance from a bond counsel agent
- Retain a year of payments, in reserve, to provide a level of confidence that the City will not default on their debt payments.
- The bond process includes issuance costs that increase the overall cost of a project.
- Other requirements and steps to negotiate the process of obtaining funding.

8.2.3 Improvement Bonds

Improvement (Bancroft) bonds can be issued under an Oregon law called the Bancroft Act. These bonds are an intermediate form of financing that is less than full-fledged general obligation or revenue bonds. This type of bond is quite useful, especially for smaller issuers or for limited purposes.

An improvement bond is payable only from the receipts of special benefit assessments, not from generally tax revenues. Such bonds are issued only where certain properties are recipients of special benefits not accruing to other properties. For a specific improvement, all property within the improvement area is assessed on an equal basis, regardless of whether it is developed or undeveloped. The assessment becomes a direct lien against the property, and owners have the option of either paying the assessment in cash or applying for improvement bonds. If the improvement bond option is taken, the City sells Bancroft improvement bonds to finance the construction, and the assessment is paid over 20 years in 40 semiannual installments with interest. Cities and special districts are limited to improvement bonds not exceeding 3% of true cash value.

With improvement bond financing, an improvement district is formed, boundaries are established, and the benefiting properties and property owners are determined. The engineer usually determines an approximate assessment, either on a square foot or front-foot basis. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for making monthly payments to the contractor. Therefore, some method of interim financing must be arranged or a pre-assessment program based on the estimated total costs must be adopted. Commonly, warrants are issued to cover debts, with the warrants to be paid when the project is complete.

The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value at least equal to 50% of the total assessments to be levied. Thus, owners of undeveloped properties usually require a substantial cash payment. In addition, the development of an assessment district is very cumbersome and expensive when facilities for an entire community are contemplated. In comparison, general obligation bonds can be issued in lieu of improvement bonds and are usually more favorable.

8.2.4 System Development Charges

System development charges (SDC's) are fees collected as previously undeveloped property is developed. The fees are used to finance the necessary capital improvements and municipal services required by the development. Such fees can only be used to recover the capital costs of infrastructure improvements. Operating, maintenance, and replacement costs cannot be financed through SDC's.

Two types of charges are permitted under the Oregon Systems Development Charges Act: improvement fees, and reimbursement fees. SDC's that are charged before a project is undertaken are considered improvement fees and are used to finance capital improvements to be constructed. After construction, SDC's are considered reimbursement fees and are collected to recapture the costs associated with capital improvements already constructed or under construction. A reimbursement fee represents a charge for utilizing excess capacity in an existing facility paid for by others. The revenue generated by this fee is typically used to pay back existing loans for improvements.

Under the Oregon SDC Act, methodologies for deriving improvement and reimbursement fees must be documented and available for review by the public. A capital improvement plan must also be prepared which lists the capital improvements that may be funded with improvement fee revenues. The estimated cost and timing of each improvement also must be included in the capital improvement plan. Thus, revenue from the collection of SDC's can only be used to finance specific items listed in a capital improvement plan. In addition, SDC's cannot be assessed on portions of the project paid for with grant funding.

8.2.5 Ad Valorem Taxes

Ad valorem property taxes are often used as a revenue source for utility improvements. Property taxes may be levied on real estate, personal property, or both. Historically, ad valorem taxes were the traditional means of obtaining revenue to support all local governmental functions.

A major advantage of these taxes is the simplicity of the system. It requires no monitoring program for developing charges, additional accounting and billing work is minimal, and default on payments is rare. In addition, ad valorem taxation provides a means of financing that reaches all property owners that benefit from a wastewater system, whether a property is developed or not. The construction costs for a project are shared proportionally among all property owners based on the assessed value of each property.

Depending on the project, ad valorem taxation may result in property owners paying a disproportionate share of the project costs compared to the benefits received. Public hearings and an election with voter approval would be required to implement ad valorem taxation.

8.2.6 System User Fees

System user fees can be used to retire general obligation bonds and are commonly the sole source of revenue used to retire revenue bonds and to finance operation and maintenance of a system. System user fees represent charges of all residences, businesses and other users that are connected to the wastewater system. These fees are established by resolution and may be modified as needed to account for increased or decreased operating and maintenance costs. User fees may be based on a metered volume of water consumption and/or on the type of user (i.e. residential, commercial, industrial, etc.).

8.2.7 Assessments

Under special circumstances, the beneficiary of a public works improvement may be assessed for the cost of a project. For example, the City may provide some improvements or services that directly benefit a particular development. The City may choose to assess the developer to provide up-front capital to pay for the improvements.

8.3 Evaluation of Federal and State Funding Resources

Some level of outside funding assistance in the form of grants or low interest loans may be necessary to make the proposed improvement projects affordable for the City of Cannon Beach and its citizens. The amount and types of outside funding will dictate the amount of local funding that the City must secure. In evaluating grant and local programs, the major objective is to select a program or combination of programs that is available and the most beneficial for the planned project.

This section provides a brief description of the major Federal and State funding programs that are typically utilized to assist qualifying communities in the financing of infrastructure improvement projects. Each of the government assistance programs has certain prerequisites and requirements for a community to qualify. The assistance programs promote goals such as aiding economic development, benefiting areas of low to moderate income families, and providing for specific community improvement projects. Because each program has specific requirements, not all communities or projects will qualify for each of the programs.

8.3.1 Economic Development Administration Public Works Grant Program

The EDA Public Works Grant Program, administered by the U.S. Department of Commerce, is aimed at projects which directly create permanent jobs or remove impediments to job creation in the project area. Thus, to be eligible for this grant, a community must be able to demonstrate the potential to create jobs from the project. Potential job creation is assessed with a survey of businesses to demonstrate the prospective number of jobs that might be created if the proposed project is completed.

Projects must be located within an EDA designated Economic Development District. Priority is given to projects that improve opportunities for the establishment or expansion of industry and which create or retain both short-term and long-term private sector jobs. Communities that can demonstrate that the existing system is at capacity (i.e. moratorium on new connections) have a greater chance of being awarded this type of grant. EDA grants are usually in the range of 50 to 80 percent of the project cost. Therefore, some type of local funding also is required. Grants typically do not exceed one million dollars.

8.3.2 Water and Waste Disposal Loans and Grants (Rural Development)

The Rural Utilities Service administers a water and wastewater loan and grant program designed to improve the quality of life and promote economic development in rural America. The Rural Utilities Service programs provide needed facilities to ensure health and safety and stimulate local economy by allowing access to new and advanced services and job opportunities. Program funds can be used for water, sewer, solid waste, and storm drainage projects. The most common uses are to restore deteriorating water supplies, or to improve, enlarge, or modify inadequate water or waste facilities.

Eligible applicants for Rural Utilities funds include public bodies and Indian Tribes. Non-profit corporations with significant ties to the local rural community may also be eligible. Funding is targeted to rural areas with populations of 10,000 or less. Applicants must be unable to obtain commercial financing at reasonable rates and terms or finance the project from existing resources.

The proposed project must serve a rural area not likely to decline in population below that for which the project is designed. The project should serve the present population and provide for foreseeable growth.

Proposed projects should be necessary for orderly community development consistent with a comprehensive community or county development plan. Facilities must be modest in design, size, and cost. Water meters, a primary instrument for promoting conservation, are required by the agency. All water and wastewater systems must meet the standards set by the State Department of Environmental Quality.

The Rural Utilities staff review each project to determine need based on various priority points. Prioritization is necessary due to limited funding and to make sure the most deserving projects receive assistance.

When possible, loan funds are combined with other federal and state financing to reduce the end cost to users of the system. Depending on median household income (MHI) and need, communities may qualify for grant funds of up to 75% of the eligible project costs. These grants can help reduce water and waste disposal rates to reasonable levels. Rural Utilities loans have a term of up to 40 years or for the useful life of the facility, whichever is less.

There are three different interest rates available for Rural Utilities loans:

- **Poverty Line Rate.** The poverty line rate of 2.0% per annum applies to communities with a MHI below the state poverty level or 80% of the state non-metropolitan median household income (SNMHI). There must also be a health standard violation to receive the poverty loan rate (Rate is for quarter ending June 30, 2012).

- **Intermediate Rate.** The intermediate rate applies to projects in communities that are not eligible for the poverty rate and have a MHI between SNMHI and 80% of SNMHI. The intermediate interest rate is set halfway between the poverty line interest rate and the market rate.

- **Market Rate.** The market rate applies to projects in communities who do not qualify for the lower rates and who have MHI exceeding 100 % of the SNMHI for the state. The agency sets the intermediate and market rates quarterly, based on the bond market. The final rate for the project is the lowest rate in effect at the time of loan approval or closing.

To ensure the federal investment, the best security position practicable must be acquired. Acceptable forms of security for utility systems and public bodies include revenue bonds; other pledges of taxes or assessments; general obligation bonds; and assignment of income.

Grant fund eligibility is determined based on population, MHI, and user rates. Priority for grant funding is given to projects with populations of less than 5,500. Communities with low MHI may receive grant funding to reduce user costs to a reasonable level for rural residents. User rates are considered reasonable if they are less than or equal to existing prevailing rates in similar communities with similar systems.

Total grant funding cannot exceed the following percentages of eligible project development costs:

- 75% when the community meets poverty line interest rate criteria;
- 45% when the community meets intermediate interest rate criteria.

Maximum grant amounts based on MHI are provided in the following table.

Table 8.3.2 – Maximum Rural Development Grant Funds based on MHI

Median Household Income (MHI)	Meets Criteria for Health or Sanitary Concern	Maximum Grant	Interest Rate [a]
<$40,447	Yes	75%	2.0% (Poverty Rate)
<$40,447	No	45%	2.75% (Intermediate Rate)
$40,447 - $50,559	N/A	45%	2.75 % (Intermediate Rate)
>$50,559	N/A	0%	3.375% (Market Rate)

[a] Rates apply for quarter ending June 30, 2012.

The MHI of Cannon Beach reported from 2010-2014 by the American Community Survey 5-year Estimate was $44,423. At that time, the MHI statewide from the same survey was $50,521. Based on the cited MHI for Cannon Beach, it is estimated that the City would qualify for some grant assistance from Rural Development.

There are other restrictions and requirements associated with these loans and grants. If the City becomes eligible for grant assistance, the grant will apply only to eligible project costs. Additionally, grant funds are only available after the City has incurred long-term debt resulting in an annual debt service obligation equal to 0.5% of the MHI. In addition, an annual funding allocation limits the Rural Development funds. To receive a Rural Development loan, the City must secure bonding authority, usually in the form of general obligation bonds or revenue bonds.

8.3.3 Special Public Works Fund

The Special Public Works Fund program provides funding for the infrastructure that supports job creation in Oregon. Loans and grants are made to eligible public entities for the purpose of studying, designing and building public infrastructure that leads to job creation or retention.

The public entities or "municipalities" that are eligible to apply for Special Public Works Fund assistance include:

- Cities
- Counties
- Ports incorporated under ORS 777.005 to 777.725 and 777.915 to 777.953 and under 778.010
- Domestic water supply districts organized under ORS chapter 264
- Sanitary districts organized under ORS 450.005 to 450.245
- Sanitary authority, water authority or joint water and sanitary authority organized under ORS 450.600 to 450.989
- County service districts organized under ORS chapter 451
- Tribal Councils of Indian Tribes in Oregon
- Airport district organized under ORS Chapter 838
- A district as defined in ORS 198.010 (see Appendix B for the specific list)

To be eligible, the proposed project must be owned by a public entity that is an eligible applicant. Examples of the many types of eligible municipally owned projects are listed below, although this is not a comprehensive list.

- Airport facilities
- Telecommunications infrastructure
- Port facilities, wharves and docks
- Railroads
- Buildings and associated equipment
- Solid waste disposal sites
- Acquisition of land
- Mitigation of environmental conditions
- Purchase of rights of way and easements necessary for infrastructure
- Roadways, bridges, etc.
- Storm drainage systems
- Wastewater systems
- Water systems
- The acquisition or construction of related equipment and fixtures

The Special Public Works Fund is comprehensive in terms of the types of project costs that can be financed. As well as actual construction, eligible project costs can include costs incurred in conducting feasibility and other preliminary studies and for the design and construction engineering.

The Fund is primarily a loan program. Grants can be awarded, up to the program limits, based on job creation or on a financial analysis of the applicant's capacity for carrying debt financing.

The total loan amount per project cannot exceed $10 million. The department can offer very attractive interest rates that typically reflect low market rates. In addition, the department absorbs the associated costs of debt issuance thereby saving applicants even more on the overall cost of borrowing. Loans are generally limited to the usable life of the contracted project, or 25 years from the year of project completion, whichever is less.

For infrastructure projects, grants are offered to projects creating or retaining jobs and are eligible for up to $5,000 per job created or retained. If a grant is offered it cannot exceed 85 percent of the project cost or $500,000, whichever is less. Additional grants may be awarded if there is a gap between the grant for jobs plus the loan and the total project costs.

For more information on the Special Public Works Fund program, call (503) 842-4045, or visit the IFA website at http://www.orinfrastructure.org/Infrastructure-Programs/SPWF/.

8.3.4 Water/Wastewater Financing Program

The Water/Wastewater Fund was created by the Oregon State Legislature in 1993. It was initially capitalized with lottery funds appropriated each biennium and with the sale of state revenue bonds since 1999. The purpose of the program is to provide financing for the design and construction of public infrastructure needed to ensure compliance with the Safe Drinking Water Act or the Clean Water Act.

The public entities that are eligible to apply for the program include: Cities, Counties, County Service districts (organized under ORS Chapter 451), Tribal Councils of Indian tribes, Ports, and Special Districts as defined in ORS 198.010.

Eligible activities include reasonable costs for construction improvement or expansion of drinking water, wastewater or storm water systems. Eligible projects include those related to drinking water source, treatment, storage and distribution; wastewater collection and capacity; stormwater system; purchase of rights-of-way and easements necessary for construction; and design and construction engineering. All projects must ensure that municipal water and wastewater systems comply with the Safe Drinking Water Act or the Clean Water Act.

To be eligible a system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency, associated with the Safe Drinking Water Act or the Clean Water Act. Projects also must meet other state or federal water quality statutes and standards.

Ineligible projects include privately owned facilities and infrastructure; purchase of property not related to infrastructure construction; costs incurred prior to award, except costs for engineering and other support activities necessary to construction.

The Fund provides both loans and grants, but it is primarily a loan program. The loan/grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources and other factors).

The Water/Wastewater Financing Program's guidelines, project administration, loan terms and interest rates are similar to the Special Public Works Fund program. The maximum loan term is 25 years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10,000,000 per project through a combination of direct and/or bond funded loans. Loans are generally repaid with utility revenues or voter approved bond issues. A limited tax obligation pledge may also be required. "Credit worthy" borrowers may be funded through sale of state revenue bonds.

Grant awards can be awarded up to a maximum of $750,000 depending on a financial review. An applicant is not eligible for grant funds if the annual median household income in the affected area is equal or greater than 100 percent of the state average median household income for the same year.

Technical assistance funding for preliminary planning, engineering studies and economic investigations are available to municipalities with populations under 15,000 residents. Technical assistance projects must be done in preparation for an eligible construction project and can be awarded loans of up to $50,000 or grants of up to $20,000 per project.

8.3.5 Clean Water State Revolving Fund (CWSRF)

The Clean Water State Revolving Fund (CWSRF) Loan Program administered by the Oregon Department of Environmental Quality (DEQ) provides low-cost loans for the planning, design and construction of a variety of projects that address water pollution. The loans through the CWSRF program are available to Oregon's public agencies, including cities, counties, sanitary districts, soil and water conservation districts, irrigation districts and various special districts.

Congress established the CWSRF in 1987, to replace the Construction Grants program, which had provided direct grants to communities to complete sewer infrastructure projects. The CWSRF program provides several types of loans and varying interest rates. Currently, loans are available with terms of 5 years at 0.81% APR to 30 years at 1.30% APR.

There are six different types of loans available within the program. These include traditional planning, design and construction loans. There are also loans available for emergencies, urgent repairs and local community projects. Each of these loan types has different financial terms, and is intended to provide communities with choices when financing water quality improvements. Interest rates are based on the nation's bond buyer's index and fluctuate quarterly. The interest rates of various loans are substantially discounted from the bond rate. For example, with a quarterly bond rate of 5.0%, the CWSRF interest rates (depending on the type of loan) would range from 0.97% to 3.88%. Loan payback periods vary, ranging from 5 to 30 years. Loans do include an annual loan fee of 0.5% of the outstanding balance. Planning loans are exempt from this fee.

Eligible projects include:

- Wastewater system plans and studies
- Secondary or advanced wastewater treatment facilities
- Irrigation improvements
- Infiltration and inflow correction
- Major sewer replacement and rehabilitation
- Qualified storm water control
- Onsite wastewater system repairs
- Matching funds for some U.S. Department of Agriculture conservation programs
- Estuary management efforts
- Various nonpoint source projects (stream restorations, animal waste management, conservation easements)
- Qualified brownfields projects

All eligible proposed projects are ranked based upon their application information and entered on the program's Project Priority List. Points are assigned based on specific ranking criteria. Newly ranked projects are integrated into the priority list on a regular basis. The Project Priority List is incorporated within DEQ's annual Intended Use Plan which indicates the proposed use of the funds each year.

Projects are funded based on the availability of loan monies. If monies are insufficient to fund all the approved projects, funds are distributed to as many projects as possible based on the Project Priority List. Each time new monies become available, those monies are allocated to as many unfunded or partially funded projects as possible.

For additional information on the CWSRF loan program, call (503) 229-6814 or visit the DEQ website at http://www.deq.state.or.us/wq/loans/loans.htm.

8.3.6 Oregon Department of Energy, Small Scale Energy Loan Program (SELP)

The purpose of the Energy Loan Program (also known as SELP) is to promote energy conservation and renewable energy resource development. The Energy Loan Program can loan to individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes, and non-profits in Oregon.

The program offers low-interest loans for projects that:

- Save energy
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat
- Use recycled materials to create products
- Use alternative fuels

Current loan rates for cities vary depending on the bond market, term of loan. Loans also include an application fee of 0.1%, an underwriting fee of 0.5%, and a loan fee of 1.0% of the loan amount.

For more information on the SELP program, call (503) 503-2123 or visit the Oregon Department of Energy website at http://www.oregon.gov/ENERGY/LOANS/index.shtml.

8.4 Recommended Rate Structure and Financing Strategy

A financing strategy or plan must provide a mechanism to generate capital funds in sufficient amounts to pay for the proposed improvements over the relatively short duration in design and construction, generally two years. The financing strategy must also identify the manner in which annual revenue will be generated to cover the expense for long-term debt repayment and the on-going operation and maintenance of the system.

The objectives of a financial strategy include the following:

- Identify the capital improvement cost for the project and the estimated expenses for operation and maintenance.
- Evaluate potential funding sources and select the most favorable program.
- Identify the local cost share based on the amount of outside funding obtained.
- Determine the cost to system users to finance the local share and the annual cost for operation and maintenance.

8.4.1 Funding Sources

With any of the funding sources listed within Sections 8.2 and 8.3 the City is advised to confirm specific funding amounts with the appropriate agencies prior to making local financing arrangements. A one-stop meeting with funding agencies is recommended as soon as the City has made a firm commitment as to the schedule and extent of capital improvements.

Most of the grant programs require that the project address a DEQ issued violation or order before the project is eligible for funding. Rural Development will issue grants for projects without this requirement, but for a reduced amount and the project must pass strict scrutiny.

Section
9

9 Capital Improvement Plan and Project Financing

9.1 Introduction

Through the analyses and studies that were completed within this facility planning effort, numerous project recommendations have been developed. These recommendations include improvements to the wastewater treatment facilities in Cannon Beach as well as improvements to the City's wastewater collection system.

As the projects vary in their criticality, the projects have been divided into three separate and distinct priority groups. The priority groups are further described below:

Priority 1 Projects:

Priority 1 projects are the most critical and should be undertaken as soon as possible to meet DEQ requirements. Priority 1 projects should be considered as the most immediate needs for the City's wastewater system.

Priority 2 Projects:

Priority 2 projects should be undertaken within the first half of the planning period to restore aging facilities to newer operating conditions. While they do not have to be undertaken immediately, the City should include them in their capital improvement plans and obtain funding to undertake these projects.

Priority 3 Projects:

Priority 3 projects are projects that are primarily dependent on development and expansion of the collection system to provide sewer service to new areas. Priority 3 projects are most likely to be driven by development and the need to expand the collection system to service new properties and new subdivisions. Funding for Priority 3 projects are likely to be financed through a combination of City funds, SDC funds, and developer contributions. As these projects are likely to be development driven, they need not be scheduled for implementation.

With these priorities in mind, the remainder of this section will further describe the recommended projects, their costs and design criteria, and financing strategies for the recommended projects.

9.1.1 Project Selection

Within this section, project selection descriptions will be provided for each priority group. Additional information on each recommended project is available within Section 7 of this facilities plan.

Priority 1 Projects:

The following projects are identified as priority 1 projects:

- **System-wide SCADA Monitoring and Control (S1-S4):** It is recommended that the City integrate the wastewater system with a SCADA system capable of monitoring and controlling all major wastewater system components. Although the inclusion of a robust SCADA system does not directly address existing DEQ deficiencies, doing so will facilitate being able to meet current DEQ requirements more consistently. Per DEQ requirements, cities with high levels of I/I are required to implement I/I reduction efforts. A SCADA system will free up existing staff to be able to address the I/I reduction efforts without having to add additional staff. Current staff will also be better prepared to respond to emergencies by having complete data available at any time. The total benefits of a SCADA system are difficult to quantify, though we feel that including this as a priority 1 project is warranted due to the increased flexibility to address other deficiencies. The proposed SCADA system would provide:
    - DEQ required redundant level controls at all lift stations
    - DEQ required operator notification in the event of an alarm on all components
    - Continuous monitoring of lift station runtimes that can provide insight into areas of the collection system that may be experiencing higher instances of I/I
    - Power savings from aeration basin blowers controlled by O2 probe
    - Less operator hours required for lift station monitoring/maintenance
- **Wastewater Treatment Facility Improvements:** It is recommended that the City construct improvements to remedy the wastewater treatment facility deficiencies. There is only one Priority 1 improvement that needs to be done at the wastewater treatment plant at this time.
    - **Sludge Storage Lagoons (T1):** Portions of the sludge storage lagoon banks are susceptible to wind generated wave action. In the affected areas, the banks are showing signs of erosion and should be fortified and protected with quarry run rock to prevent future erosion. The sludge storage lagoons need to be drained periodically as rainfall accumulates. Generally, this is done during times of calm weather due to an increase in suspended solids (TSS) when high winds agitate the lagoons. Unfortunately, rainfall and wind often occur simultaneously. The City has violated TSS occasionally in late fall months when the lagoons were near overtopping and the City was forced to discharge some of the water. Raising the berms on the storage lagoons will provide the plant operators the flexibility to minimize the possibility of having to discharge the high TSS water. Increasing the berm heights will also enable a minimum water cap to be maintained above the biosolids as the levels slowly increase over the years of use. This project should be done as soon as possible to preserve the structural integrity of the lagoons.
- **Lift Station Improvements:** The next Priority 1 improvement projects involve completing improvements necessary at the City's wastewater lift stations. The following improvement projects should be done as soon as possible:
    - **Pacific Lift Station Improvements (C1):** Pumping capacity improvements need to be made to meet DEQ redundancy requirements. Based on flow analysis, this lift station is currently undersized and will only pump 77% of the projected flow at the end of the design period. It is recommended that larger pumps and motors be installed at the Pacific Lift Station to meet DEQ redundancy requirements.

- **"Small Four" Lift Station Onsite Generators (C3):** Currently the four smallest lift stations in the collection system do not have dedicated, onsite backup power generators. DEQ redundancy requirements state that each lift station must have a minimum of two power sources. Generally, this is met by having the primary (wired) power and a backup generator. The City has been able to technically meet the redundancy requirements by having a trailer-mounted generator that would be towed to each pump station and plugged in during power outages. This method of compliance is very risky. During a power outage (generally during high rain/wind), the mobility of the trailer may be compromised due to downed trees or even power lines. Also, during weather events such as these, wastewater staff are likely to be needed at the plant. This project would provide for generators and small structures to protect the generators from the elements.

- **Ecola Lift Station Improvements (C6):** Pumping capacity improvements need to be made to meet DEQ redundancy requirements. Based on flow analysis, this lift station is currently undersized and will only pump 82% of the projected flow at the end of the design period. It is recommended that larger pumps and motors be installed at the Ecola Lift Station to meet DEQ redundancy requirements. The building is also undersized and in disrepair and should be rebuilt.

Priority 2 Projects:

The following projects have been categorized as Priority 2 projects:

- **Wastewater Treatment Facility Improvements:** It is recommended that the City construct improvements to remedy the wastewater treatment facility deficiencies. The upgrades to the treatment facility should include several improvement components to improve operations of the facility. The treatment facility improvements should include the following major components:
    - **Headworks Structure (T2):** The headworks and related electrical systems are currently open to the environment and should be covered or enclosed. It is recommended that the headworks be enclosed to prevent degradation of electrical systems and to provide shelter for maintenance operations.
    - **UV Area Building (T3):** The UV area, sampler and related electrical systems are currently open to the environment and should be fully enclosed. It is recommended that the one-sided building that covers the current UV area be fully enclosed and climate controlled to prevent degradation of electrical systems and to provide shelter for maintenance operations.
    - **Grit Chamber (T4):** The wastewater treatment plant is currently operating without any grit removal system. With the collection system's proximity to the beach, there is an appreciable amount of sand that is conveyed to the wastewater treatment plant. The sand can accumulate in the aeration basins and is costly to remove. The sand can also contribute to sludge wasting, creating a sludge storage demand. It is recommended that a vortex style grit chamber be installed at the headworks to remove grit and sand after the fine screen.

- **Lift Station Improvements:** The following improvement projects have been identified as Priority 2 projects and are located at the following lift stations:
    - **Pacific Lift Station Force Main (C2):** As part of the Pacific Lift Station capacity upgrades, it is also recommended that the split (loop) portion of the existing force main be replaced with a new, single 10-inch force main.
    - **Matanuska Lift Station Control/Generator Building (C4):** The current lift station control building is undersized for lift station routine maintenance. Currently the onsite backup generator at Matanuska is unprotected from the elements. It is recommended that a larger building be built to replace the old, undersized building and to also cover and protect the onsite backup generator. Design of new building must match the existing architecture of the nearby "Stephanie Inn".
- **Gravity Collection System Improvements:** These projects are aimed at replacing portions of the aging collection system gravity piping. Below is a general description of the piping replacement projects.
    - **Pipe Improvements (C6):** These improvements will replace sections of 8" gravity collection piping identified and prioritized in the I&I investigation report which is provided in Appendix C. The City plans to budget for replacement of 300' of 8" gravity collection pipe per year.

Priority 3 Projects:

As the City of Cannon Beach has little growth expectations, there are no recommended projects that classify as Priority 3. Should development occur, any costs associated with providing collection service will be borne by the developer.

9.1.2 Project Cost Summary

Three project priority groups have been developed in Section 9. As mentioned previously, the projects vary in their criticality with some requiring that they be undertaken as soon as possible while others can be planned for and undertaken later in the planning period.

A summary of the recommended projects costs is provided in the table below. Detailed cost estimates are provided in Section 7.

Table 9.1.3 - Recommended Project Cost Summary

Recommended Improvement Cost Summary		
Priority 1 Projects:		
Facility	**Description**	**Total Cost**
System-Wide	SCADA Monitoring/Control	$1,110,105
WWTF	Sludge Storage Lagoon Banks	$272,505
Ecola Lift Station	Capacity and Building Upgrades	$299,670
Pacific Lift Station	Pumping Capacity Upgrades	$195,165
"Small 4" Lift Stations	Onsite Generators	$396,675
	Total Priority 1 Projects:	$2,274,120
Priority 2 Projects:		
Facility	**Description**	**Total Cost**
WWTF	Headw orks Structure	$128,963
WWTF	UV Area Building	$177,750
WWTF	Grit Chamber	$267,290
System-Wide	300' of 8" Dia PVC Replacement Annually (x20yrs.)	$3,040,962
Pacific Lift Station	Remove Split Section of Forcemain	$234,675
Matanuska Lift Station	Control/Generator Building	$299,505
	Total Priority 2 Projects:	$4,149,145
	Total Overall Plan Cost:	**$6,423,265**

9.2 Financing Strategy

The City of Cannon Beach will need to upgrade and improve their wastewater facilities to provide reliable wastewater conveyance and treatment for their system for upcoming planning period and beyond.

This wastewater facilities plan outlines a strategy for all necessary improvements and represents a significant investment for the City in new wastewater treatment facility upgrades and conveyance system improvements. The City must develop a strategy for financing the recommended improvements.

Section 8 of this facilities plan outlines several financing options that are available to the City for financing the recommended improvements. The financing options include local funding sources, state and federal loan and grant programs, tax programs, and others. While the ultimate financing package that the City will ultimately utilize depends on the results of coordination with the various funding agencies, this section will summarize the general direction the City should proceed with and provide some insight into the potential impacts to rate payers.

9.2.1 Project Expenses

As outlined earlier in this section, the improvement projects recommended in this plan total 6.4 million dollars. The projects have been grouped into two priority categories with Priority 1 projects being identified as having the most critical and immediate need.

Of the total project costs recommended, the Priority 1 projects total approximately 2.3 million dollars and includes: full system-wide SCADA monitoring and control, rehabilitating the sludge storage lagoon banks, Pacific lift station capacity upgrades, Ecola lift station capacity upgrades, and adding onsite, dedicated auxiliary power to the four smallest lift stations.

The recommended Priority 2 projects total 4.1 million dollars and includes: construction of the headworks building, enclosing the existing UV area building, a grit chamber at the headworks, 6000' of 8" PVC gravity piping replacement, Matanuska lift station upgrades, and removing the split in the Pacific lift station forcemain.

9.2.2 Financing Strategy

The City should proceed with the following steps as they move forward with the financing strategy for the wastewater improvement projects:

1. As soon as the City receives approval for the completed Cannon Beach Wastewater Facilities Plan, the City should contact IFA and DEQ to schedule a one-stop meeting. At this one-stop meeting, potential agencies who may be able to provide funding will send representatives to discuss the City's funding needs and develop a funding package for the improvement projects. The agencies will make recommendations and will discuss what each agency can offer. The result will be a funding package made up of grants and loans from typically a number of agencies to fund the project.

2. Following the one-stop meeting, the City should immediately process the necessary paperwork to apply for the funding included in the funding package recommended at the one-stop meeting. This will require numerous applications and other administrative efforts to apply for funding. The City should apply to any and all programs or agencies that have the potential to provide grant money to reduce the impact to rate payers.

3. Due to the magnitude of the required improvements, the City will not likely receive grants sufficient to cover all of the costs of the projects. In fact, the City will most likely be required to take out loans for a significant portion of the project costs. These loans will be paid back over a period of time that can likely be extended to as much as 40 years, though the final loan period will depend on the funding agency and their policies on payback. Because the City will have to pay back loan monies, a rate increase will be required to generate the revenue to pay back the loans. The City should immediately set up a timeline and plan for rate increases. The plan should include efforts to educate the public and provide for public meetings and other opportunities for the public to learn about the upcoming improvement projects, the project need, and the project costs.

4. Once the City receives notification that they have secured the necessary funding to complete the work, they can complete design activities in preparation for bidding and construction of the improvements.

9.2.3 Impact to Rate Payers

As mentioned above, the funding package for the recommended project will include a loan component that will necessitate a rate increase for the average rate payer. While the final funding package will not be known until after the one-stop meeting and not confirmed until the City receives notice that they have secured the necessary funding, it is important that the City be provided with some insight on the potential impact to rate payers so that they may begin educating the public and develop plans for increasing rates as needed to pay for the significant costs associated with these improvements.

To complete the Priority 1 Improvements, a loan is assumed with a 20-year payback at 2.50%. Select agencies may offer lower rates and/or longer a repayment period, but for this exercise the above assumption is made. Any lower rates or longer repayment period would lessen the required rate increases. Given the terms identified above, an additional $12,051 per month will be needed to repay the loan. According to the discussion on Section 3.4 there are 2,396 Equivalent Dwelling Units (EDU's) in the City which means that there needs to be an increase of approximately **$5.03 per EDU**.

To complete the Priority 2 Improvements, using the same loan assumptions as phase 1, but with expected project cost increases due to inflation (based on ENR Construction Cost Index) at an average rate of 3% per year for the pipe replacement alone, the required rate increase is an additional **$9.17 per EDU**.

To complete only the Priority 1 and 2 Capital Improvement Projects outlined in this plan, the total required rate increase is **$14.20 per EDU**.

This preliminary estimate represents the potential worst case scenario for the impact to rate payers in which no grant monies have been secured. It is possible that the City may qualify for and receive some grant monies for the project. It must be understood that grants have become increasingly difficult to obtain and the total awards to communities have decreased over the years.

As mentioned before, the final impact to rate payers will not be known until the final funding package is confirmed and all variables are set. Should interest rates rise significantly before the funding package is secured, the impact to rate payers will be greater.

A detailed Rate Study including the wastewater capital improvement projects outlined in this report will be completed in early 2017 for a more accurate assessment of the rate structure.

The City should begin in earnest in educating the public, developing a rate increase plan, and pursuing grant and loan monies.

9.2.4 CIP Timeline and Cost Summary

A summary of the recommended projects, their costs, and recommended design start dates is provided on the next page. Detailed cost estimates are included in Section 7.

CAPTIAL IMPROVEMENT PLAN 2016 - 2036

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
	SCADA System Projects																					
S1	SCADA Monitoring Big 5		$570,240																			
S2	SCADA Monitoring Small 4			$212,220																		
S3	SCADA Monitor/Control Big 5		$759,645																			
S4	SCADA Monitor/Control Small 4			$350,460																		
	Collection System Projects																					
C1	Design				$39,033																	
	Pacific Lift Station Pump Capacity Upgrade					$156,132																
C2	Design		$46,935																			
	Pacific Forcemain - Remove Parallel Section			$187,740																		
C3	Design						$79,335															
	Generator Sets and Enclosures							$317,340														
C4	Design								$59,901													
	Matanuska - Control/Generator Building									$239,604												
C5	Design										$59,934											
	Ecola - Control/Generator Building											$239,736										
C6	Design		$27,168	$27,847	$28,543	$29,257	$29,988	$30,738	$31,507	$32,294	$33,102	$33,929	$34,777	$35,647	$36,538	$37,451	$38,388	$39,347	$40,331	$41,339		
	Annual Budget for 300' of 8" Replacement			$108,672	$111,389	$114,174	$117,028	$119,954	$122,952	$126,026	$129,177	$132,406	$135,716	$139,109	$142,587	$146,152	$149,806	$153,551	$157,389	$161,324	$165,357	
	Wastewater Treatment Plant Projects																					
T1	Design			$54,501																		
	Raise Sludge Pond Banks				$218,004																	
T2	Design					$25,793																
	Headworks Building						$103,170															
T3	Design							$35,550														
	Encolse UV Structure								$142,200													
T4	Design									$53,458												
	Grit Chamber										$213,832											
	Fiscal Year Totals (SCADA Monitoring Only):		$644,343	$590,980	$396,969	$325,355	$329,522	$503,582	$356,560	$451,382	$436,044	$406,071	$170,494	$174,756	$179,125	$183,603	$188,193	$192,898	$197,721	$202,664	$165,357	
	Fiscal Year Totals (SCADA Full Control/Monitoring):		$833,748	$729,220																		

APPENDIX A

NPDES Discharge Permit

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Northwest Region – Portland Office
2020 SW 4th Ave., Suite 400, Portland, OR 97201
Telephone: (503) 229-5263

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:
City of Cannon Beach
PO Box 368
Cannon Beach, OR 97110

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated wastewater	003	R.M. 1.0

FACILITY TYPE AND LOCATION:
Biolac activated sludge
CANNON BEACH WWTP
295 E. 2nd St
CANNON BEACH, OR 97110
Collection System Class: Level II
Treatment System Class: Level III

RECEIVING STREAM INFORMATION:
Basin: North Coast
Sub-Basin: Necanicum

Receiving Stream: Ecola Creek via unnamed wetlands
LLID: 1239661458957 1.0 I
County: CLATSOP

EPA REFERENCE NO: OR0020222
Issued in response to Application No. 967768 received 2/11/2011.
This permit is issued based on the land use findings in the permit record.

Gregory L. Geist, Water Quality Source Control Manager
Northwest Region

Date 11/4/11

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge of waste is prohibited, including discharge to waters of the state or an underground injection control system.

SCHEDULE A
Waste Discharge Limitations

1. **Waste discharge limitations not to be exceeded for Outfall 003 (effluent discharge to wetlands).**

a. May 1- October 31 (SUMMER):

Parameters	Limitations				
	Average Effluent Concentrations		Mass Loading[1]		
	Monthly	*Weekly*	*Monthly Average lb./day*	*Weekly Averages lb./day*	*Daily Maximum lb.*
Biochemical Oxygen Demand (BOD5)	10 mg/L	15 mg/L	73	110	140
Total Suspended Solids (TSS)	10 mg/L	15 mg/L	73	110	140
Ammonia-Nitrogen (NH_3-N)	2 mg/L		14		28

[1]Summer mass load limits based upon average dry weather design flow to the facility equal to 0.87 MGD.

b. November 1 to April 30 (WINTER):

Parameters	Limitations				
	Average Effluent Concentrations		Mass Loading[2]		
	Monthly	*Weekly*	*Monthly Average lb./day*	*Weekly Averages lb./day*	*Daily Maximum lb.*
Biochemical Oxygen Demand (BOD5)	20 mg/L	30 mg/L	190	280	380
Total Suspended Solids (TSS)	20 mg/L	30 mg/L	190	280	380
Ammonia-Nitrogen (NH_3-N)	20 mg/L		190		380

[2] Winter mass load limits based upon average wet weather design flow to the facility equal to 1.13 MGD.

c. YEAR ROUND limitations:

Other parameters	Limitations
E. coli Bacteria	Must not exceed 126 organisms per 100 mL monthly geometric mean. No single sample may exceed 406 organisms per 100 mL.[3]
pH	Must be within the range of 6.5 – 8.5
BOD_5 and TSS Removal Efficiency	Must not be less than 85% monthly average for BOD_5 and 85% monthly average for TSS.

[3]If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 28 hours after the original sample was taken. If the geometric mean of the five re-samples is less than or equal to 126 organisms per 100 mL, the bacteria limit is not exceeded.

2. Permittee must not discharge wastes or conduct activities that violate water quality standards adopted in OAR 340-041 for the North Coast Basin.

3. Permittee's activities must not cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater must be managed and disposed of in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

SCHEDULE B
Minimum Monitoring and Reporting Requirements

1. **Minimum Monitoring Requirements**

The permittee must monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples must have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results must be included in the report, but not used in calculations required by this permit. When possible, the permittee must re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. INFLUENT
The sampling location is immediately after the headworks and before any return flows.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration (See Note 1)	Annually	Verification
BOD_5	2/Week	24-hour Composite
TSS	2/Week	24-hour Composite
pH	3/Week	Grab

b. Treated EFFLUENT Outfall 003
The sampling location is the UV effluent channel.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration (See Note 1)	Annual	Verification
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
E. coli	Weekly	Grab
UV Radiation Dosage	Daily	Measurement (See Note 2)
Pounds Discharged BOD and TSS	2/Week	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Nutrients: NH_3-N, NO_2+NO_3-N, and Total Phosphorus	Monthly	24-hour Composite
Pounds Discharged Ammonia NH_3-N	Monthly	Calculation
TKN	Once per year	24-hour composite
Oil and Grease	Once per year	Grab
Total Dissolved Solids	Once per year	24-hour composite
Dissolved Oxygen	Weekly	Grab
Temperature	3/Week	Grab

[1]Calibration records must be kept on site for review during site visits

[2]The intensity of UV radiation passing through the water column will affect the system's ability to kill organisms. To track the reduction in intensity, the UV disinfection system must include a UV intensity meter with a sensor located in the water column at a specified distance from the UV bulbs. This meter will measure the intensity of UV radiation in mWatts/cm2. The daily UV radiation dosage must be determined by reading the meter each day and calculating a dosage to be reported in mWatts-sec/cm^2. If more than one meter is used, the daily recording will be an average of all meter readings each day.

c. BIOSOLIDS MANAGEMENT

Biosolids monitoring must conform to an approved Biosolids Management Plan, including at a minimum:

Item or Parameter	Minimum Frequency	Type of Sample
Sludge analysis including: Total Solids (% dry wt.); Volatile solids (% dry wt.); Biosolids nitrogen for: NH_3-N; NO_3-N; & TKN (% dry wt.); Phosphorus (% dry wt.); Potassium (% dry wt.); pH (standard units); Sludge metals content for: As, Cd, Cu, Hg, Mo, Ni, Pb, Se & Zn, measured as total in mg/kg	Each time solids are removed from storage lagoon	Composite sample must be representative of the product to be land applied from the storage lagoon or pond (See Note 3).
Record of locations where biosolids are applied. Application to be on DEQ approved sites. (Site location maps to be maintained at treatment facility for review upon request by DEQ.)	Each Occurrence	Date, volume & locations where biosolids were applied recorded on site location map.

[3] Permittee must take composite samples from reference areas in the storage lagoon or pond pursuant to Test Methods for Evaluating Solid Waste, Volume 2; Field Manual, Physical/Chemical Methods, November 1986, Third Edition, Chapter 9.
Inorganic pollutant monitoring must be conducted according to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Second Edition (1982) with Updates I and II and third Edition (1986) with Revision I.

2. Monitoring Reporting Procedures

a. Permittee must report monitoring results on approved forms. The reporting period is the calendar month. Reports must be submitted to the Department's Northwest Region - Portland office by the 15th day of the following month.

b. State monitoring reports must identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports must also identify each system classification as found on page one of this permit.

c. Monitoring reports must also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. Report Submittals

a. The permittee must have in place a program to identify and reduce inflow and infiltration into the sewage collection system. Permittee must submit an annual report to the Department by February 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report must state those activities that have been done in the previous year and those activities planned for the following year.

b. For any year in which biosolids are land applied, Permittee must submit a report to the Department by February 19 of the following year that describes solids handling activities for the previous year and includes, but is not limited to, the required information outlined in OAR 340-050-0035(6)(a)-(e).

SCHEDULE D
Special Conditions

1. At least 60 days prior to anticipated removal of biosolids from the lagoon(s) for land application, the permittee must submit a new Biosolids Management Plan. The plan must undergo DEQ review, a public comment period and formal DEQ approval before any biosolids land application occurs. Permittee must manage all biosolids in accordance with the DEQ-approved biosolids management plan, and the site authorization letters issued by the DEQ. Any changes in solids management activities that significantly differ from operations specified under the approved plan require the prior written approval of the DEQ.

2. This permit may be modified to incorporate any applicable standard for biosolids use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for biosolids use or disposal is more stringent than limitations in the permit, or if the standards limit a pollutant or practice not limited in this permit.

3. The permittee must comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee must have its wastewater system supervised by one or more operators who are certified in a classification <u>and</u> grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means to be responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 3.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified in the proper classification <u>and</u> at grade level I or higher.

   c. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   d. The permittee must notify the Department of Environmental Quality in writing within thirty (30) days of replacement or re-designation of certified operators responsible for supervising wastewater system operation. Permittee must send the notification to DEQ, Water Quality Division, Operator Certification Program, 2020 SW Fourth Ave, Portland, OR 97201. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

e. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 3.b. above.

4. The permittee will not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and;

   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facility's impact on groundwater quality.

5. The permittee must notify the DEQ Northwest Region - Portland Office (phone: (503) 229-5263) in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the Department.

SCHEDULE F
NPDES GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

1. Duty to Comply with Permit
The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and the federal Clean Water Act and is grounds for an enforcement action. Failure to comply is also grounds for the Department to terminate, modify and reissue, revoke, or deny renewal of a permit.

2. Penalties for Water Pollution and Permit Condition Violations
The permit is enforceable by DEQ or EPA, and in some circumstances also by third-parties under the citizen suit provisions 33 USC §1365. DEQ enforcement is generally based on provisions of state statutes and EQC rules, and EPA enforcement is generally based on provisions of federal statutes and EPA regulations.

ORS 468.140 allows the Department to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit. The federal Clean Water Act provides for civil penalties not to exceed $32,500 and administrative penalties not to exceed $11,000 per day for each violation of any condition or limitation of this permit.

Under ORS 468.943, unlawful water pollution, if committed by a person with criminal negligence, is punishable by a fine of up to $25,000, imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense. The federal Clean Water Act provides for criminal penalties of not more than $50,000 per day of violation, or imprisonment of not more than 2 years, or both for second or subsequent negligent violations of this permit.

Under ORS 468.946, a person who knowingly discharges, places, or causes to be placed any waste into the waters of the state or in a location where the waste is likely to escape into the waters of the state is subject to a Class B felony punishable by a fine not to exceed $200,000 and up to 10 years in prison. The federal Clean Water Act provides for criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment of not more than 3 years, or both for knowing violations of the permit. In the case of a second or subsequent conviction for knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

3. Duty to Mitigate
The permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee must correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply
If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application must be submitted at least 180 days before the expiration date of this permit.

The Department may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions
This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:
   a. Violation of any term, condition, or requirement of this permit, a rule, or a statute
   b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts
   c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge
   d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a Total Maximum Daily Load (TMDL)

e. New information or regulations
f. Modification of compliance schedules
g. Requirements of permit reopener conditions
h. Correction of technical mistakes made in determining permit conditions
i. Determination that the permitted activity endangers human health or the environment
j. Other causes as specified in 40 CFR 122.62, 122.64, and 124.5
k. For communities with combined sewer overflows (CSOs):
   (1) To comply with any state or federal law regulation that addresses CSOs that is adopted or promulgated subsequent to the effective date of this permit
   (2) If new information, not available at the time of permit issuance, indicates that CSO controls imposed under this permit have failed to ensure attainment of water quality standards, including protection of designated uses
   (3) Resulting from implementation of the Permittee's Long-Term Control Plan and/or permit conditions related to CSOs.

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants
The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rules (OAR) 340-041-0033 and 307(a) of the federal Clean Water Act for toxic pollutants, and with standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights and Other Legal Requirements
The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

8. Permit References
Except for effluent standards or prohibitions established under Section 307(a) of the federal Clean Water Act and OAR 340-041-0033 for toxic pollutants, and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

9. Permit Fees
The permittee must pay the fees required by Oregon Administrative Rules.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance
The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Activity Not a Defense
For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities
   a. Definitions
      (1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b. and c. of this section.
      (2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
   b. Prohibition of bypass.
      (1) Bypass is prohibited and the Department may take enforcement action against a permittee for bypass unless:
         i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
         ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and
         iii. The permittee submitted notices and requests as required under General Condition B.3.c.
      (2) The Department may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Department determines that it will meet the three conditions listed above in General Condition B.3.b.(1).
   c. Notice and request for bypass.
      (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to the Department at least ten days before the date of the bypass.
      (2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D.5.

4. Upset
   a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.
   b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
   c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
      (1) An upset occurred and that the permittee can identify the causes(s) of the upset;
      (2) The permitted facility was at the time being properly operated;
      (3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and,
      (4) The permittee complied with any remedial measures required under General Condition A.3 hereof.
   d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Upset

For purposes of this permit, A Single Operational Upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational upset is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations
   a. Definitions
      (1) "Overflow" means any spill, release or diversion of sewage including:
         i. An overflow that results in a discharge to waters of the United States; and
         ii. An overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral), even if that overflow does not reach waters of the United States.
   b. Prohibition of overflows. Overflows are prohibited. The Department may exercise enforcement discretion regarding overflow events. In exercising its enforcement discretion, the Department may consider various factors, including the adequacy of the conveyance system's capacity and the magnitude, duration and return frequency of storm events.
   c. Reporting required. All overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5.

7. Public Notification of Effluent Violation or Overflow
   If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (e.g., public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B.8. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Emergency Response and Public Notification Plan
   The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses or upsets that may endanger public health. At a minimum the plan must include mechanisms to:
   a. Ensure that the permittee is aware (to the greatest extent possible) of such events;
   b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
   c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
   d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
   e. Provide emergency operations; and
   f. Ensure that DEQ is notified of the public notification steps taken.

9. Removed Substances
   Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from such materials from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling
   Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points may not be changed without notification to and the approval of the Department.

2. Flow Measurements
   Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures
Monitoring must be conducted according to test procedures approved under 40 CFR part 136, or in the case of sludge use and disposal, under 40 CFR part 503, unless other test procedures have been specified in this permit.

4. Penalties of Tampering
The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both.

5. Reporting of Monitoring Results
Monitoring results must be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports must be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee
If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR part 136, or in the case of sludge use and disposal, under 40 CFR part 503, or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency must also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value must be recorded unless otherwise specified in this permit.

7. Averaging of Measurements
Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

8. Retention of Records
Records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities shall be retained for a period of at least five years (or longer as required by 40 CFR part 503). Records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit and records of all data used to complete the application for this permit shall be retained for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of the Department at any time.

9. Records Contents
Records of monitoring information must include:

a. The date, exact place, time, and methods of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

10. Inspection and Entry
The permittee must allow the Department or EPA upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and
d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

11. Confidentiality of Information
Any information relating to this permit that is submitted to or obtained by DEQ is available to the public unless classified as confidential by the Director of DEQ under ORS 468.095. The Permittee may request that information be classified as confidential if it is a trade secret as defined by that statute. The name and address of the permittee, permit applications, permits, effluent data, and information required by NPDES application forms under 40 CFR 122.21 will not be classified as confidential. 40 CFR 122.7(b).

SECTION D. REPORTING REQUIREMENTS

1. Planned Changes
The permittee must comply with OAR chapter 340, division 52, "Review of Plans and Specifications" and 40 CFR Section 122.41(l) (1). Except where exempted under OAR chapter 340, division 52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and specifications are submitted to and approved by the Department. The permittee must give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance
The permittee must give advance notice to the Department of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

3. Transfers
This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit may be transferred to a third party without prior written approval from the Department. The Department may require modification, revocation, and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under 40 CFR Section 122.61. The permittee must notify the Department when a transfer of property interest takes place.

4. Compliance Schedule
Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting
The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to DEQ or to the Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.

(1) Oral Reporting within 24 hours.

i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to DEQ.
   a) The location of the overflow;
   b) The receiving water (if there is one);
   c) An estimate of the volume of the overflow;
   d) A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe); and
   e) The estimated date and time when the overflow began and stopped or will be stopped.

ii. The following information must be reported to the Department's Regional office within 24 hours, or during normal business hours, whichever is first:
   a) The OERS incident number (if applicable) along with a brief description of the event.

(2) Written reporting within 5 days.
   i. The following information must be provided in writing to the Department's Regional office within 5 days of the time the permittee becomes aware of the overflow:
      a) The OERS incident number (if applicable);
      b) The cause or suspected cause of the overflow;
      c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
      d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
      e) (for storm-related overflows) The rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

b. Other instances of noncompliance.
   (1) The following instances of noncompliance must be reported:
      i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
      ii. Any upset that exceeds any effluent limitation in this permit;
      iii. Violation of maximum daily discharge limitation for any of the pollutants listed by the Department in this permit; and
      iv. Any noncompliance that may endanger human health or the environment.
   (2) During normal business hours, the Department's Regional office must be called. Outside of normal business hours, the Department must be contacted at 1-800-452-0311 (Oregon Emergency Response System).
   (3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:
      i. A description of the noncompliance and its cause;
      ii. The period of noncompliance, including exact dates and times;
      iii. The estimated time noncompliance is expected to continue if it has not been corrected;
      iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
      v. Public notification steps taken, pursuant to General Condition B.7
   (4) The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee must report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports must contain:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. The estimated time noncompliance is expected to continue if it has not been corrected; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee must furnish to the Department within a reasonable time any information that the Department may request to determine compliance with the permit or to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit. The permittee must also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to the Department, it must promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department must be signed and certified in accordance with 40 CFR Section 122.22.

9. Falsification of Information

Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $100,000 per violation and up to 5 years in prison. Additionally, according to 40 CFR 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

10. Changes to Indirect Dischargers

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;
b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

SECTION E. DEFINITIONS

1. *BOD* means five-day biochemical oxygen demand.
2. *CBOD* means five day carbonaceous biochemical oxygen demand
3. *TSS* means total suspended solids.
4. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
5. *FC* means fecal coliform bacteria.
6. *Total residual chlorine* means combined chlorine forms plus free residual chlorine
7. *Technology based permit effluent limitations* means technology-based treatment requirements as defined in 40 CFR Section 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR Chapter 340, Division 41.
8. *mg/l* means milligrams per liter.
9. *kg* means kilograms.
10. m^3/d means cubic meters per day.
11. *MGD* means million gallons per day.
12. 24-hour *Composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow. The sample must be collected and stored in accordance with 40 CFR part 136.
13. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
14. *Quarter* means January through March, April through June, July through September, or October through December.
15. *Month* means calendar month.
16. *Week* means a calendar week of Sunday through Saturday.
17. *POTW* means a publicly owned treatment works

APPENDIX B

Inflow and Infiltration Study

City of Cannon Beach

CLATSOP COUNTY, OREGON

INFLOW AND INFILTRATION STUDY

December 2016

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Section 1

1.0 Executive Summary

1.1 Introduction

The City of Cannon Beach (the City) is a coastal community in northwest Oregon, and is home to approximately 1,700 year-round residents. The City provides utility services, including sanitary sewer and wastewater treatment, to these residents and the nearly 750,000 people who visit the City each year. The sanitary sewer system was first constructed in 1958 and has since been expanded to include nearly 67,000 linear feet of gravity sewer main.

Maintaining a properly functioning sanitary sewer system requires the routine measurement of inflow and infiltration (I/I), identifying I/I locations and sources, and making appropriate repairs. Inflow and infiltration represent inputs into the sanitary sewer system from sources other than service connections. Minimizing the amount of I/I in a sanitary sewer system is critical for ensuring sufficient capacity to convey wastewater and adequately treat it once at the wastewater treatment plant.

Civil West Engineering Services (CWES) was tasked by the City to conduct an inflow and infiltration study of the sanitary sewer system. CWES conducted a flow mapping survey in April 2016 and conducted a smoke test in September 2016 to identify potential locations and sources of I/I in the City. These results were then compared to television surveys of the pipe segments conducted in 2016 and between 2010 and 2012 to help develop a set of recommendations.

1.2 Investigative Methods

Flow mapping and smoke testing techniques were used to evaluate the integrity of the sanitary sewer system. Flow mapping identifies locations of infiltration within the sanitary sewer system by measuring flow rates. Pipe flow measurements are taken during periods of low rainfall, but high saturation of the subsurface surrounding the sewer pipes. High flow rates in the pipe suggest that upstream sections of pipe likely contain infiltration sources. Tracking changes in the flow rate helps to identify the area in which the infiltration source is located.

Smoke testing is performed by using positive pressure to force smoke into the underground conveyance systems. The process used in this survey included the use of smoke candles and a large, gasoline-powered fan forcing air into manholes. The smoke travels through pipes until it encounters voids or escape points in the system. A field observer can quickly locate deficiencies in underground systems by noting whether the presence of smoke, or return point, is an acceptable opening in the pipe network.

Visually inspecting pipes is important for identifying exact locations and causes of I/I. Television surveys use robot-mounted cameras to assess the interior conditions of pipes. Deficiencies and critical landmarks are logged with a description and their distance relative to the location where the camera was inserted into the pipe.

1.3 Results

Flow mapping of the system was conducted April 14-15, 2016. This survey identified five regions of pipe that may be contributing significant amounts of infiltration to the sanitary sewer system.

Smoke testing was conducted September 14-16, 2016. Smoke testing identified 35 total deficiencies including the following:

- 2 segments of mainline with breaks
- 8 unlocatable/ leaking manholes
- 2 cross connections between catch basins and the sanitary sewer
- 3 cross connections between drains on private property and the sanitary sewer
- 8 broken service laterals
- 11 loose/broken/missing cleanout caps

Television surveys of more than 24,200 linear feet of pipe were conducted in April and October 2016, and identified more than 220 deficiencies. Approximately 65% of the deficiencies were identified along mainline sections of the sanitary sewer system while the remainder were problems associated with service connections to the system. In regions of pipe identified by flow mapping and smoke testing as having likely I/I sources, these inspections revealed a variety of problems. In general, the source of I/I in the regions of pipe was not a single deficiency, but rather diffuse I/I sources contributing varying amounts of infiltration to the sanitary sewer system.

1.4 Recommendations

Based on the results of the flow mapping and smoke testing surveys, the following is recommended:

- Continue annual inspection and repair cycle. Focus upcoming repair work on areas of high I/I identified in this report. We recommend prioritizing the sanitary sewer pipe along East Jefferson Street during the next round of pipe repair and replacement projects.
- Conduct television inspections of the pipe segments identified as having significant I/I sources listed in this report. These inspections are critical for designing targeted, cost-effective repairs.
- Conduct television inspections of the pipe segments where suspected mainline breaks were identified by smoke testing.
- Locate manholes that were identified as obscured or hidden during the smoke test to confirm that smoke was due to holes in the manhole cover and not a break in the mainline or lateral.
- Perform grouting repair on manholes with identified leaks.
- Notify private property owners of issues deficiencies identified on their property so that they can conduct repairs.

Section

2

2.0 Background

2.1 City and Sanitary Sewer System Description

The City of Cannon Beach is located along US Highway 101 in Clatsop County, Oregon. The City provides utility services to approximately 1,700 year-round residents and more than 750,000 annual visitors. During peak tourism season, nearly 10,000 people are in the City daily, placing an increased burden on the City's infrastructure.

One of the utility services provided by the City is a sanitary sewer system and wastewater treatment facility. The City first constructed a sanitary sewer system and treatment facility in the late 1950's to service the downtown area between Ecola Creek and Sunset Boulevard. Since that time, the system has expanded to serve areas as far north as North Oak Street and as far south as Logan Lane. The current system consists of approximately 370 manholes and 67,000 linear feet of gravity sewer main and the activated sludge treatment plant has capacity to treat 3.4 MGD. While some sections of original sewer main remain in service, other sections have been replaced or changed to PVC pipe. The extents of the sewer system studied in this report are shown in Figure 2-1. Manhole and sewer line identification numbers used in this report correspond to the identification numbers shown on the City of Cannon Beach Geospatial Information System (GIS) website.

2.2 Study Description

In December 2015, the City tasked Civil West Engineering Services with conducting an inflow and infiltration study to evaluate the current state of the sanitary sewer system. The US Environmental Protection Agency (US EPA) defines inflow and infiltration as follows:

Inflow- "Water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins."

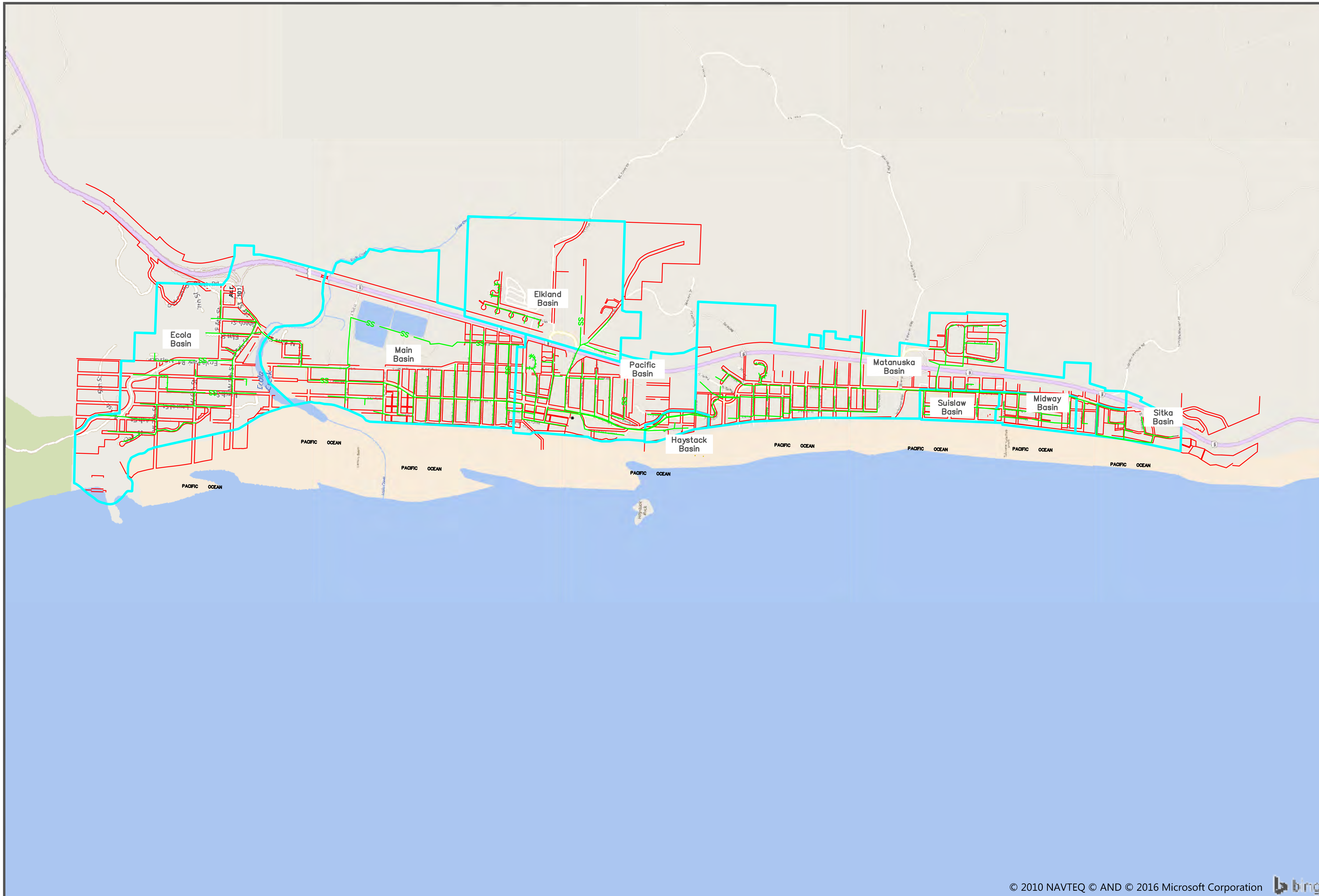
Infiltration- "Water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes."

Minimizing the sources and volume of inflow and infiltration is critical to ensuring that the sanitary sewer system has sufficient capacity to convey waste to the treatment plant, that the treatment plant can maintain adequate treatment during high flow events, and that costs for waste treatment are minimized. In addition to identifying sources of inflow and infiltration, this study recommends repairs that can be made to decrease water contributions from those sources and locations where further investigation is needed prior to undertaking repair work.

Flow mapping was used to identify pipe segments with potential sources of infiltration. Flow mapping was conducted after multiple days of rain in April 2016 to ensure a high groundwater level. Flow testing began on the north side of town along 5th Street and continued as far south as Umpqua Street.

Smoke testing was used to identify inflow sources to the sanitary sewer system. Smoke testing began in the southern area of the city along Logan Lane and continued as far north as Oak Court. This resulted in the testing of nearly all pipe segments in the sanitary sewer system.

Results from flow mapping and smoke testing were compared to television inspections of the sanitary sewer system conducted by TSR Corporation to identify causes of high flow measurements or smoke emerging above ground from unidentifiable sources. When possible, 2016 inspection reports were used; however, inspections performed between 2010 and 2012 were referred to when recent evaluations were unavailable. These older reports were used to understand existing conditions in the pipe rather than determine exact causes of I/I.



Civil West Engineering Services, Inc.

CITY OF CANNON BEACH
CLATSOP COUNTY, OREGON

SANITARY SEWER SYSTEM
INFLOW & INFILTRATION STUDY

0 1"
NOT TO SCALE

DRAWN BY: ADM
DATE: DECEMBER 2016

FIGURE 2-1

Section 3

3.0 Engineering Field Analysis

3.1 Flow Mapping

3.1.1 Flow Mapping Methodology

Flow mapping uses flow rate measurements through sanitary sewer system piping to identify potential sections of pipe where infiltration may be occurring. Flow mapping is accomplished using a flow meter (commonly called a “Flow Poke”) that can be quickly and easily inserted through a manhole into a pipeline as shown in Figure 3-1. The meter allows for an instantaneous flow measurement in gallons per minute of sewage flow through a sewer pipe. Another flow reading can then be made at an upstream manhole that allows for a comparison between the two manholes. If it is found that there is more flow in the downstream manhole than the upstream manhole, it can be concluded that an infiltration problem may exist between the two manholes.

Figure 3-1: Flow mapping using a flow poke flow meter.

The flow information is plotted on a map of the system to show the location and amounts of flows in the system at the time the measurements were made. This allows the engineer to review the entire system and determine where additional investigation is warranted. Flow mapping is completed during the mid-night hours when domestic flows are significantly reduced and the clear majority of flow in the collection system is I/I. Additionally, flow mapping should occur after a sustained period of rainfall has saturated the subsurface. Overall, the goal is to measure the consistent flows generated from underground leaks while not measuring the widely varying flows coming from sinks, toilets, and other residential uses.

3.1.2 Flow Mapping Procedure

Flow mapping of the sanitary sewer system in the City began on the night of April 14 and was completed early in the morning of April 15, 2016. During the period from April 12 at 12AM to April 14 at 12AM, more than 1.8 inches of rainfall was measured at Cannon Beach City Hall. This ensured there was water in the subsurface to identify infiltration sources.

A two-person team conducted the system assessment. The team used the following general procedure:

1. The team would remove the lid from a strategically selected manhole. A visual inspection of the manhole was made, noting any deficiencies.

2. At manholes where flow was visible, an appropriately-sized metering insert was selected for the ISCO/Teledyne Flow Poke flow measuring device. Due to relatively low flow rates, a v-notch weir plate was attached to the metering insert.
3. The assembled flow meter was inserted into the manhole and the manometer was zeroed.
4. The flow meter was inserted into the inflow pipe to the manhole and the rubber collar was inflated to create a seal.
5. The flow was allowed to stabilize prior to taking a measurement.
6. This process was repeated for each inflow line in a manhole prior to removing the flow meter and replacing the manhole lid.

After completing measurements at a given manhole, the process was repeated at manholes upstream and downstream of the first manhole. Dramatic differences in flow measurements are indicative of the presence of an infiltration source. Mapping of the system began in the northern area of town and proceeded south in a systematic fashion. Approximately 33 flow measurements were taken throughout the city.

3.2 Smoke Testing

3.2.1 Smoke Testing Methodology

Smoke testing is a tool used to locate, identify, and classify potential inflow sources to the sanitary sewer system. Smoke testing involves pumping large volumes of white smoke into the collection system through an open manhole. This is accomplished using a blower that sits directly over the open manhole. The blower consists of a custom mounting plate, large fan blades, and is powered by a small internal combustion engine. Smoke is generated using smoke candles.

The smoke travels inside the piping under the small amount of positive pressure created by the blower. The smoke-filled air seeks locations to escape the piping system. This may include “escape points” that are normal and acceptable such as:

- Roof vent pipes (plumbing stacks)
- Manhole lid holes

Other points where smoke escapes may be indicative of deficiencies in the system. These may include:

- Leaks in the piping and fissures leading to the ground surface
- Open cleanouts
- Cross-connections to the storm drainage system
- Downspouts on buildings

Table 3.1 is a table of the type of smoke returns that could be seen. The table lists if the corresponding smoke return should be observed during testing.

Figure 3-2: Smoke testing uses smoke injected into the sanitary sewer system to identify inflow sources.

Table 3-1: Potential smoke return locations during smoke testing.

Smoke Return Location	Acceptable Return Location?
Roof Vents	YES
Sanitary Sewer Manholes	YES
Storm Sewer Manholes	NO
Roof Gutters	NO
Culvert Openings	NO
Area Drains	NO
Municipal Catch Basins	NO
From Cracks in the Ground	NO

Smoke testing aims to locate the escape points or "smoke return" locations. "Smoke return" locations often indicate where inflow from rainfall can enter the system and occasionally reveal infiltration sources.

3.2.2 Smoke Testing Procedure

Flyers were hung on the doors of homes and businesses to notify residents in advance of the test. These flyers informed residents that the smoke would pose no danger to them and provided a phone number for reporting concerns or problems.

A four-person team completed the survey. Each team member was outfitted with a camera and clipboard with blank smoke testing result forms. The team utilized the following general pattern during smoke testing:

1. The team removed the manhole lid and placed the smoke blower on a specific and strategically selected manhole. The smoke candle was lit, and the blower was started.
2. Each member of the survey team began walking away from the manhole in a pre-determined direction following the piping runs shown on the sewer system map.
3. Each surveyor watched for smoke escaping from anticipated locations such as roof vents and other manholes.
4. Each surveyor also watched for smoke escaping from anywhere that would not be expected for the sanitary sewer. If there was unexpected smoke found, the surveyor would take a photograph of the smoke return, prepare a smoke testing result form, and continue recording any other problems until the smoke candle burned out.
5. If a surveyor was unsure of a smoke return or found other concerns, an additional smoke candle might be lit to spend more time evaluating the location.
6. The team would confer together and mark notes on field maps including deficiencies identified and other manholes where smoke should be injected.

Once this process was complete, the team packed up the materials, replaced the manhole lid, and moved to the next test location. The survey for the sanitary sewer system in the City of Cannon Beach was completed over three days. The survey started in the southern region of the City and proceeded systematically through downtown and areas north of Ecola Creek.

Upon completion of the field work, the team members prepared a digital smoke testing report of each identified deficiency. The reports are based upon data from the smoke testing results form and photos of the incident. The survey team conferred about deficiencies identified to ensure none of the issues noted were duplicated. Each report includes at least one digital photo of the observed smoke location, a map of the specific location where smoke was observed, and other information the City can use to locate and identify the problem in the field.

3.2.3 Types of Deficiencies

A wide variety of deficiencies were discovered during the smoke testing survey. While the individual reports provide detailed information about each problem, the issues discovered generally fell into the following categories:

1. Manholes
2. Cleanouts
3. Broken or Leaky Piping
4. Cross Connections
5. Plumbing Deficiencies

Manholes: Manholes are a common smoke return location and the location where smoke is introduced into the sanitary sewer system. While smoke emerging from the holes in the manhole lid is to be expected, smoke returns from manholes are indicative of a problem when smoke is observed around the outside edges of the manhole structure or from fissures in the ground near the manhole. Leaky manholes can be a large source of I/I.

Figure 3-3: Manhole cover with smoke emerging from around the edges.

Cleanouts: The cleanout is a vertical section of pipe leading from the surface of the ground down to the lateral underground. The cleanout connects to a “tee” or “wye” section of the pipe for flushing, cleaning, or clog removal. The most common problem with cleanouts is a broken or missing cap. Since the cleanout is typically set at ground level it can be a significant source of I/I.

Figure 3-4: Cap missing from cleanout.

Broken or Leaky Piping: Smoke returns from the ground indicate the buried piping sections have significant leaks due to separated joints, faulty connections, or breaks in the piping. Depending on the location, these deficiencies may be present in either the mainline or the service lateral. Damaged or deteriorated underground pipes will contribute to I/I during conditions of high groundwater.

Figure 3-5: Potential broken lateral resulted in smoke appearing from the ground.

Cross Connections: In a few instances, connections between roof and area drains and the sanitary sewer system were identified. These drains are intended to collect stormwater runoff and should connect to the storm sewer system rather than the sanitary sewer system. In addition to drains on private property, catch basins were identified as being connected to the sanitary sewer system rather than the storm sewer system. During a storm event, these connections could provide significant inputs into the sanitary sewer system.

Figure 3-6: Cross connection between the storm drain system and the sanitary sewer system.

Plumbing Deficiencies: Smoke leaking from building plumbing may also occur if the pipe joints aren't firmly connected. While these problems may not make significant inflow contributions to the sanitary sewer system, they could be exposing residents to gases from the sanitary sewer system and should be addressed.

3.3 Television Survey

While flow mapping and smoke testing are helpful methods for locating potential sources of I/I, they do not allow the Engineer to visually inspect the conditions inside the sewer pipe. To design proper rehabilitation methods, inspection of the conditions inside the pipe are critical and can be accomplished by a television survey. To conduct a television survey of the pipe, a robot-mounted camera is lowered into the sewer manhole and navigated into the pipe. As the robot moves, conditions and important features inside the pipe are documented by the operator. These features may include locations of service laterals, joints, cracks, and foreign debris. Additionally, a light mounted on the robot allows for pictures of the pipe conditions to be taken for additional review.

The City is currently using a five-year cycle for identifying and repairing I/I problems by television survey. Approximately 25% of the sanitary sewer system is television surveyed each year for four years. During the fifth year of the cycle, repair work is performed. For calendar year 2016, inspections were conducted by TSR Corporation (La Pine, OR) in April and October. These television surveys inspected pipe located in the northern half of the City.

Section

4

4.0 Results

4.1 Flow Mapping

Flow mapping was conducted at 18 different locations (31 flow measurements) within the City. Locations where flow measurements were taken are shown in Figures 4-1 through 4-4. The flow mapping survey revealed sections of pipe where infiltration is likely occurring. Pipe segments with likely infiltration sources are listed in Table 4-1.

4.1.1 East 5th Street

The pipe located between manholes A1 and A3 along East 5th Street was identified as a possible source of infiltration. A flow of 25 gpm was measured entering manhole A1 along East 5th Street. That flow dropped to 15 gpm entering manhole A3. This suggests that the pipe segments between manholes A1 and A3 and A2 and A3-1 were contributing approximately 10 gpm to the sanitary sewer system. Given the relatively low number of homes located along this section of pipe, it is unlikely that this flow was entirely due to residential sewer inputs.

4.1.2 South Hemlock Street

A flow of 90 gpm from the south was measured entering manhole M2-1 at the intersection of 2nd Street and North Hemlock Street. A flow of 80 gpm from the south was measured entering manhole M3-4 at the intersection of Washington Street and South Hemlock Street. This suggests that most of the flow measured at M2-1 originated in the pipe located south of Washington Street. Additional flow measurements were taken on streets with sanitary sewer lines that flow into the main line running along Hemlock Street. The following flows were measured entering the main line along Hemlock Street:

- 2 gpm along East Washington Street,
- 1 gpm along West Monroe Street,
- 5 gpm along East Monroe Street,
- 5 gpm along East Van Buren Street, and
- 8 gpm along East Harrison Street

These relatively small but significant flows suggest that the high flow measurement at Washington Street and South Hemlock Street is likely the result of multiple infiltration contributions.

4.1.3 South Spruce Street

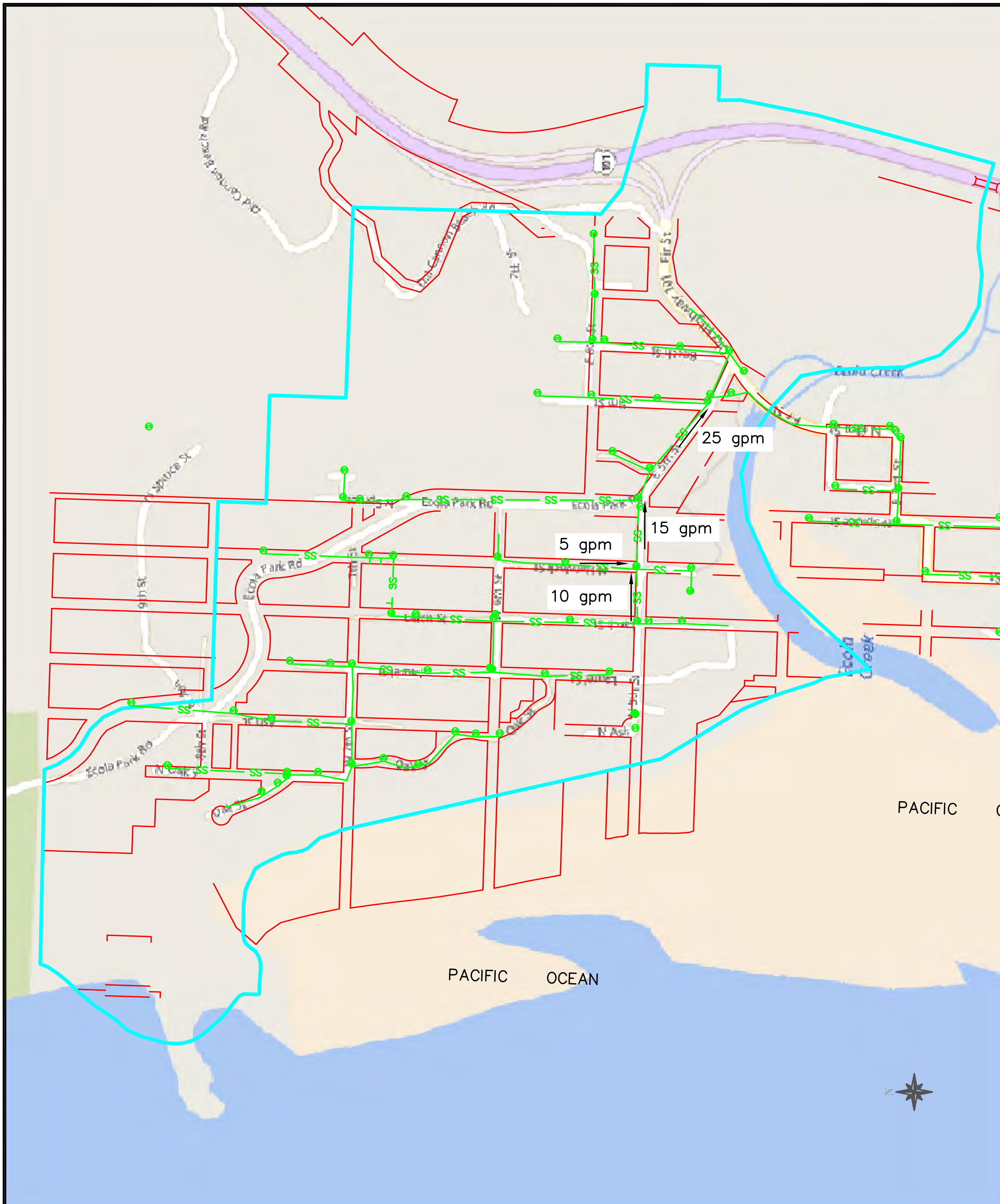
A flow of 7 gpm was measured entering manhole B6 from South Spruce Street at the intersection of South Spruce Street and Sunset Boulevard. Given the relatively small number of residences in this area it is likely that infiltration is a large component of that flow.

4.1.4 Sunset Boulevard

A flow of 7 gpm was measured entering manhole B6 from the east along Sunset Boulevard. Given the low number of homes in this section of sewer line, it is unlikely that the flow resulted from connection inputs.

4.1.5 South of Matanuska Lift Station

A flow of ~40 gpm was measured entering the Matanuska Lift Station from the south along Pacific Street. Secondary measurements taken at manhole TI-12, located approximately two blocks south of the lift station at the intersection of South Pacific Street and Chisana Street, showed a combined inflow of 25 gpm. This suggests that approximately 15 gpm was entering the sanitary sewer system from the pipe located between Matanuska Lift Station and manhole TI-12.



Civil West Engineering Services, Inc.

Drawn By: DCV/ ADM
Date: October 2016

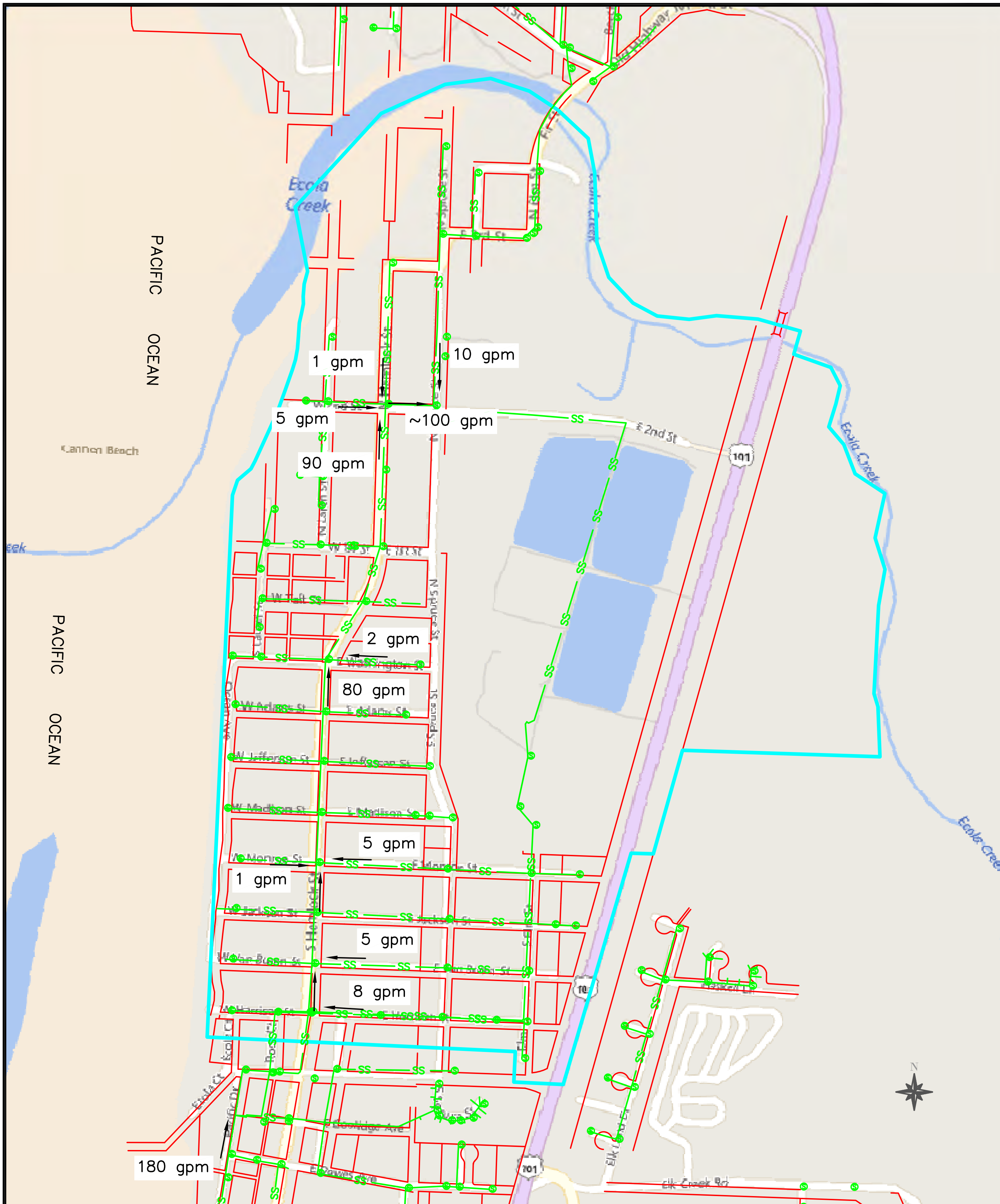
0 1"
Not to scale

INFLOW & INFILTRATION STUDY

Ecola Basin Map

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

FIGURE 4-1



Civil West Engineering Services, Inc.

DRAWN BY: DCV/ ADM
DATE: OCTOBER 2016

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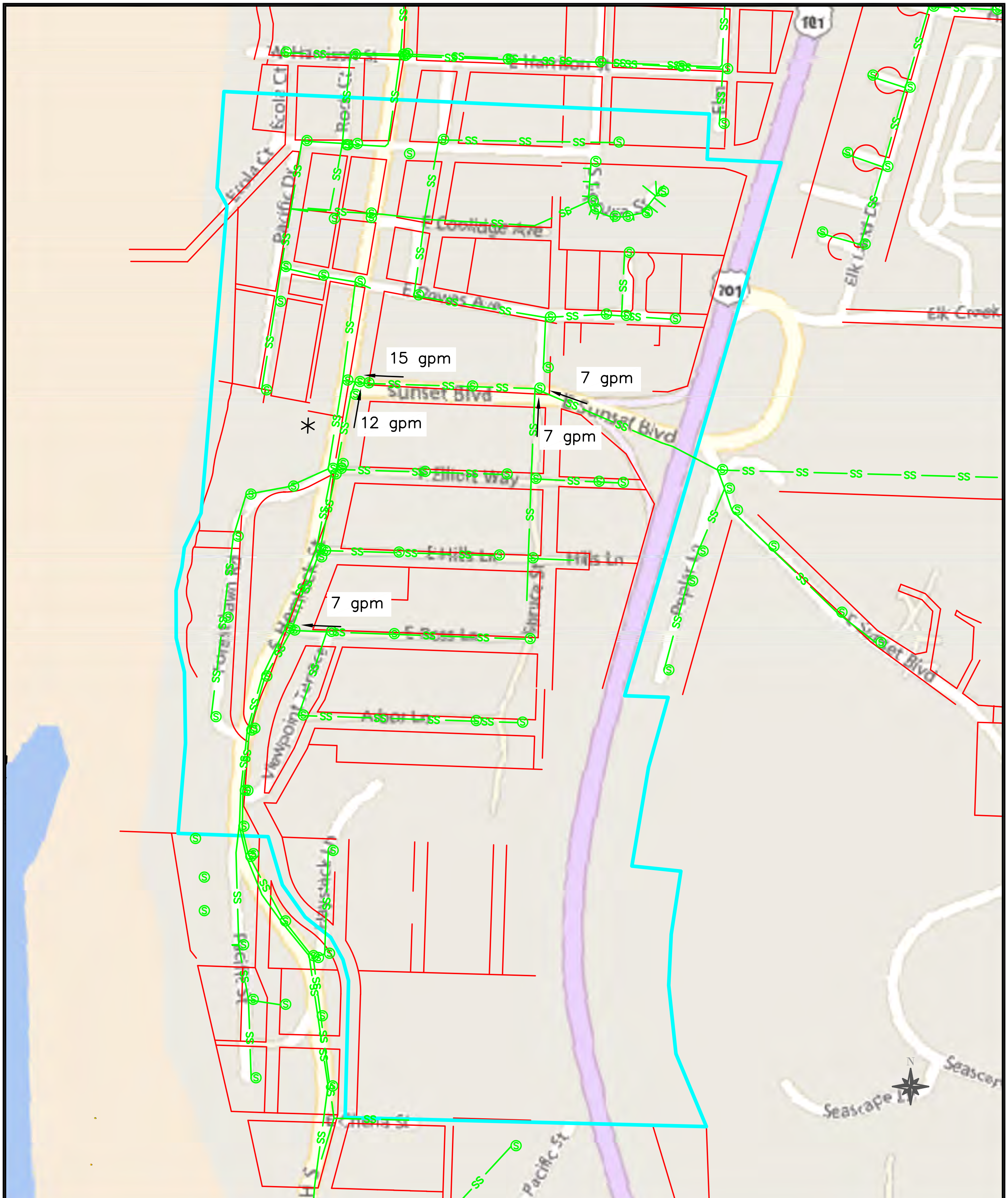
INFLOW & INFILTRATION STUDY

Main Basin Map

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

FIGURE
4-2



Civil West Engineering Services, Inc.

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Date: OCTOBER 2016

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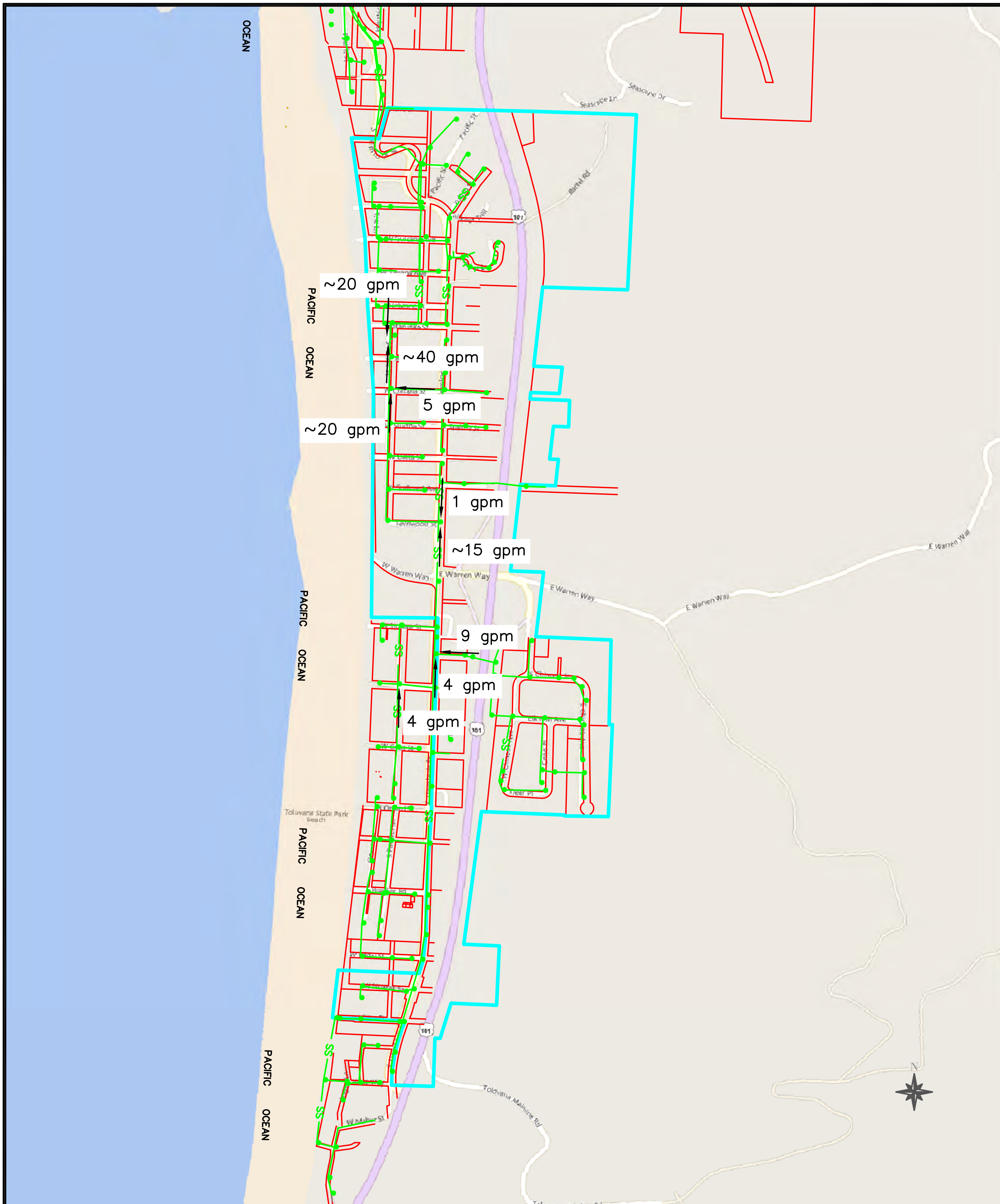
INFLOW & INFILTRATION STUDY

Pacific Basin Map

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

FIGURE
4-3



Civil West Engineering Services, Inc.

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Date: OCTOBER 2016

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Matanuska Basin Map

FIGURE 4-4

INFLOW & INFILTRATION STUDY

CITY OF CANNON BEACH
CLATSOP COUNTY, OR

Table 4-1: Locations of infiltration locations identified by flow mapping.

Street Location	Manholes	Indicator
E 5th St and Antler Ave	A1 to A3, A3-1	10 gpm flow increase between A3 and A1
S Hemlock St between Washington St and Harrison St and all arterials	M3-4 to M3-11, F1 to F1-1, G1 to G1-1, H1 to H1-1, J1 to J1-1, K1 to K1-4, L1 to L1-4, N1 to N1-3, M3-11 to O1-4	80 gpm flow measured entering M3-4 along S Hemlock St
S Spruce St south of Sunset Blvd	B6 to B3-2, B3-1-1	7 gpm flow measured entering B6 along S Spruce St
Sunset Blvd east of Spruce St and Poplar Rd south of Sunset Blvd	B6 to B12, B8 to B-8A2	7 gpm flow measured entering B6 along Sunset Blvd
S Pacific St between Matanuska Lift Station and W Chisana St, Nelchena St between S Pacific St and S Hemlock St, and S Hemlock St between Matanuska St and Nelchena St	Matanuska Lift Station to TI-12, TI-11 to I-2	15 gpm increase between TI-12 and Matanuska Lift Station

4.2 Smoke Testing

A total of 72 manholes were used to identify inflow sources to the sanitary sewer system during smoke testing. The smoke test revealed 35 documented issues, ranging in severity from leaky cleanout caps to potential breaks in mainlines. The locations where deficiencies were observed are indicated in the documentation of each deficiency provided in Appendix A. Table 4-2 provides a summary of the locations where smoke returns were observed during the smoke test survey. Observation points shown in red are locations where smoke was observed and should not have been observed.

Table 4-2: Observed smoke return locations during smoke test survey.

Smoke Return Location	Smoke Observed?
Roof Vents	YES
Sanitary Sewer Manholes	YES
Storm Sewer Manholes	NO
Roof Gutters	YES
Culvert Openings	NO
Area Drains	YES
Municipal Catch Basins	YES
From Cracks in the Ground	YES

Figure 4-5 shows a distribution of the different types of deficiencies identified during smoke testing. The number shown next to the deficiency represents the number of times the deficiency was observed during the survey. Of the 35 observed deficiencies, more than 30% were issues related to missing, broken, or poorly-fitted cleanout caps.

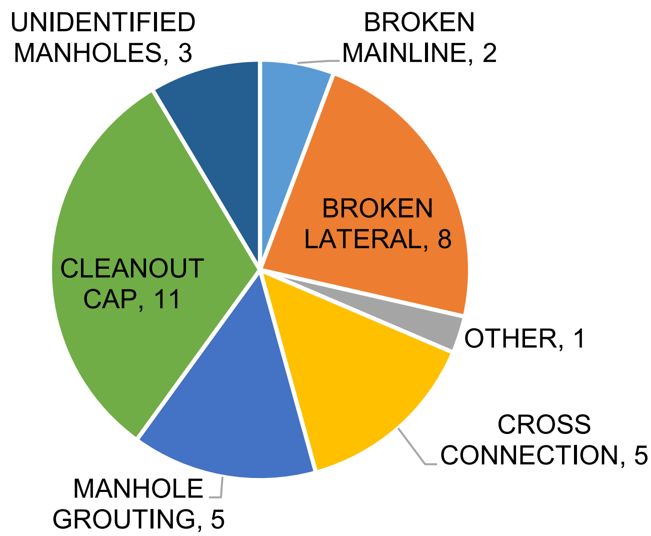

Figure 4-5: Distribution of deficiencies identified by smoke testing. A total of 35 deficiencies were identified.

The party responsible for repairs identified in this report depends on the location of the deficiency. In cases where the deficiency is located on private property and is not part of the system mainline, the repair will likely be the responsibility of the property owner. Issues identified on public lands or that are considered part of the mainline will need to be repaired by the City. Figure 4-6 shows the breakdown of repairs based on likely responsible party. Of the 35 deficiencies identified by the smoke test survey, 37% will likely need to be repaired by the City.

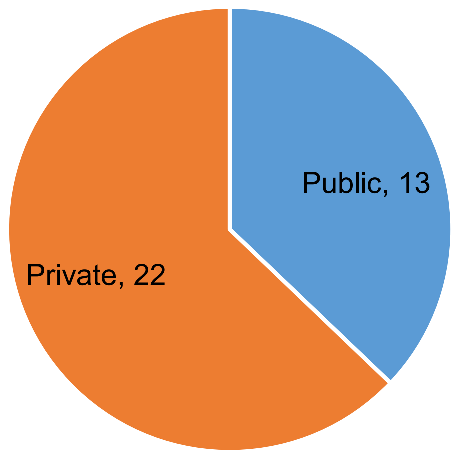

Figure 4-6: Breakdown of deficiencies by party responsible for repair.

The deficiencies were categorized by the level of severity. The categorization was broken into two sub-categories: mainline and lateral.

The following ranks the deficiencies in order of severity.

Mainline Deficiencies:

1. Storm and sanitary sewer cross connection
2. Broken mainline pipe
3. Leaking manhole

Lateral Deficiencies:

1. Connections of roof and area drains to the sanitary sewer
2. Broken lateral pipe
3. Broken or missing cleanout cap

4.2.1 Mainline Deficiencies

4.2.1.1 *Storm and Sanitary Sewer Cross Connections*

Smoke testing identified two locations where the storm sewer catch basins were cross connected to the sanitary sewer system rather than the storm sewer system. During storm events, these catch basins likely collect large volumes of storm water that is then conveyed to the wastewater treatment plant. Cross connections were identified at the following locations:

- 3887 Ocean Avenue (West of Midway Lift Station)

- 1200 Pacific Street (West of Pacific Lift Station)

Both locations are at low points in their respective basins and likely to receive significant amounts of runoff. These are likely two large sources of inflow to the sanitary sewer system.

4.2.1.2 *Broken Mainline Pipe*

Breaks in the mainline may be allowing water to enter during periods of high groundwater or if a preferential pathway is established to the ground surface. Smoke testing identified two locations where breaks in the sanitary sewer mainline are likely:

- Umpqua Street between South Pacific Street and South Hemlock Street
- East Surfcrest Avenue on the east and west sides of Highway 101

Existing television survey data was used to confirm the likelihood of a mainline break (rather than a lateral break at these locations). Television Survey Report 12-2012 #7 indicated the presence of a root in the sewer pipe at approximately the same location where smoke was visible from the ground during smoke testing. It is possible that this root puncturing the pipe created a preferential pathway allowing smoke in the pipe to reach the surface. No television survey information was available for the section of sanitary sewer pipe along East Surfcrest Avenue that extends underneath US Highway 101. While the smoke test survey was unable to rule out that the smoke visible on both sides of the highway wasn't from obscured manholes, it seems unlikely given the position of the smoke relative to the expected route of the sewer pipe.

4.2.1.3 *Leaking Manholes*

Leaks at manholes can represent significant contributions to a sanitary sewer system's inflow. Given that many manhole leaks can be resolved by repairing grout, these repairs are relatively inexpensive ways to decrease inflow. The following manholes were identified by smoke testing as having potential grout failures:

- Manhole G3-2-1; Hemlock Street & Amber Lane
- Manhole G1-2; 1519 Nebesna Street
- Manhole G3-3-2; East of 238 Vista del Mar
- Manhole G11; Pacific Street & Gogona Avenue
- Unidentified Manhole; 168 Coolidge Avenue

4.2.1.4 *Unidentified Manholes*

During the smoke test survey, smoke was observed emerging from the ground in heavily vegetated areas. In some cases, these locations corresponded with the approximate locations of manholes shown on the City's GIS site; however, no visual confirmation of the manhole's presence could be made. The following locations should be checked for manholes to ensure that observed smoke was from holes in the manhole lid and not from a broken lateral or mainline.

- Between US Highway 101 & 3548 West Chinook Avenue
- North end of Yukon Street along LAT-G-3
- North end of Haystack Lane along MAIN-E

4.2.2 Lateral Deficiencies

4.2.2.1 *Connections of Roof and Area Drains to the Sanitary Sewer*

Occasionally, roof drains and area drains are improperly connected to the sanitary sewer system instead of the storm sewer system. During rain events, these connections can contribute significant volumes of water to the sanitary sewer system. Smoke testing identified three locations where drains on private property may be improperly connected to the sanitary sewer system:

- 232 Sitka Street
- 2566 Hemlock Street
- 1290 Cypress Court

4.2.2.2 *Broken Lateral Pipe*

Service laterals connect waste disposal points to the sanitary sewer system. Breaks in service laterals provide access points for water to enter the sanitary sewer system. Smoke testing indicated that the following locations have problems with the sanitary sewer lateral:

- 4587 Logan Lane (CC)
- Empty lot on Fernwood Street
- 3787 West Chinook Avenue
- Empty lot on Van Buren Street
- 159 Tanana Avenue (CC)
- 964 South Hemlock Street (CC)
- 188 Jackson Street (CC)
- 180 Taft Street (CC)

(CC) is used to indicate addresses where it was unclear whether smoke was due to a broken lateral or a broken/missing cleanout cap.

4.2.2.3 *Broken or Missing Cleanout Cap*

Cleanouts are vertical pipes that provide access to the sewer line in case the line needs to be inspected or becomes clogged and needs to be cleared. To prevent water from entering the cleanout line, caps are placed over the top of the pipe. During smoke testing, smoke emerging from a cleanout location indicates that the cleanout cap is loose, broken, or missing. This could allow water to enter the sanitary sewer via the cleanout line. In addition to the potential locations noted in Section 4.2.2.2, the following locations have problems with their cleanout caps:

- 147 West Way
- 4424 Watts Way
- 3775 Ocean Lane
- 3764 East Chinook Avenue
- 3063 South Pacific Street
- 256 Tanana Avenue
- 264 Hills Lane
- West end of Silverpoint Court*
- 3rd Street- Westwind Unit #3
- 364 Spruce Street
- 539 North Laurel Street

*Indicates that the cleanout cap is in the street and not on private property.

4.2.3 Other Deficiencies

During the smoke test survey, one deficiency was noted in the above ground piping at the following residence:

- 123 Coos Street

An exposed pipe at the rear of the house appeared to have smoke coming from the joint where an older pipe section was connected to new pipe. This deficiency is not likely a significant source of inflow to the sanitary sewer system; however, properly sealing this joint will ensure that sewer gases are not released into the area underneath or around the residence.

4.3 Television Survey

Television surveys of approximately 24,291 linear feet of pipe were conducted in April and October 2016. These inspections included pipe located in the downtown core of the City and areas to the north of Ecola Creek. The inspections uncovered 230 deficiencies in the system. As shown in Figure 4-7, approximately 65% of the issues were identified along the mainline of the sanitary sewer system, making their repair the responsibility of the City. The remainder of the problems were related to deficiencies in the services and likely to be the responsibility of the property owner.

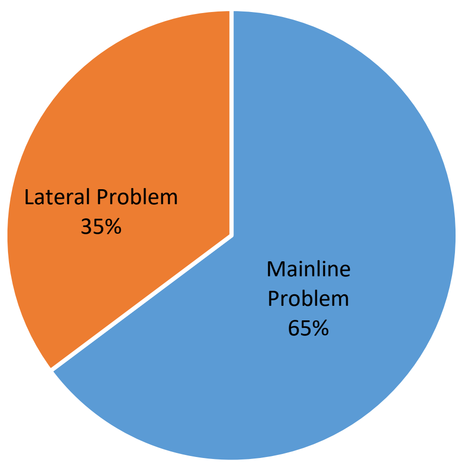

Figure 4-7: Percent distribution of sanitary sewer system deficiencies identified along the mainline of the pipe and related to service laterals.

Problems identified by the television survey ranged from pipe deterioration to infiltration with water appearing to enter under pressure. Along mainline pipe, problems at joints were the most commonly identified issues (27% of all deficiencies) with infiltration at the joint accounting for more than 72% of those documented joint issues. Leaking and other structural defects at service connections were also routinely observed. In the pipe surveyed, at least 80 service defects were identified, ranging in severity from visible pipe deterioration to broken pipe blocking the service.

4.3.1 2016 Television Survey

Flow mapping identified two regions of pipe with likely infiltration sources that were included in the television surveys for 2016. Listings of defects in the mainline sections of these pipes are listed in Appendix B.

4.3.1.1 *East 5th Street*

Televisions surveys conducted in April 2016 included inspections of the pipe between manholes A1 and A3 along 5th Street and between manholes A3-1 and A2. Flow mapping measurements collected in April 2016 found an increase in flow of 10 gpm originating from this stretch of pipe. The television surveys found no serious defects in these sections of pipe; however, they noted that leaks were present at manholes A2 and A3.

4.3.1.2 *South Hemlock Street*

Flow mapping measured a flow of 80 gpm from the south entering manhole M3-4 at the intersection of Washington Street and South Hemlock Street. During the television surveys conducted in 2016, the complete lengths of Washington Street, Adams Street, Jefferson Street, Madison Street, Monroe Street, Jackson Street, and Van Buren Street were inspected along with South Hemlock Street between Washington Street and Monroe Street. These sections make up the majority of the pipe believed to be contributing infiltration. These inspections found 123 possible defects, many of which could be contributing infiltration to the sanitary sewer system. Of the 123 defects identified, more than one third (44 out of 123) were located in pipe along Jefferson Street.

4.3.2 2010-2012 Television Surveys

Nearly all sanitary sewer pipes in the City were inspected by television survey between 2010 and 2012. This data set was used to assess the conditions of pipes in areas with potential I/I sources previously identified by flow mapping in this report that were not inspected in the 2016 television survey.

4.3.2.1 *South Spruce Street*

Television surveys were conducted on segments of this pipe in 2011. These surveys indicated that the pipe in this area was deteriorating and that tree roots had already punctured the pipe walls in places.

4.3.2.2 *Sunset Boulevard*

Television surveys conducted in 2011 studied the sections of pipe located to the east of manhole B8. These surveys identified a pipe joint that was severely offset, two leaking manholes, and one location where roots has entered the sewer line. No television survey data was available for the section of pipe between manholes B6 and B8 along Sunset Boulevard.

4.3.2.3 *South of Matanuska Lift Station*

Television surveys were conducted in this area in 2012. These reports identified multiple radial cracks in pipe, evidence of infiltration at pipe joints, and leaking manholes.

4.4 Limitations

4.4.1 Flow Mapping

Time constraints limited the ability of the mapping team to evaluate the total extents of the sanitary sewer system. The narrow window of time when system usage was low enough to allow for reliable data collection required the team to strategically select points of evaluation in the system. Thus, most of the data collection effort was focused near the downtown area of the City where the system receives the largest inputs. Data collection from the extreme northern and southern areas of town was limited; however, the low flows from these areas suggested that no further mapping was necessary.

4.4.2 Smoke Testing

In some instances, smoke returns were visible in an area that was not readily accessible to the survey team. In cases where this occurred, the location of the smoke return was documented along with the possible source of the smoke return. Additional access to these sites would be necessary to accurately characterize all smoke returns observed during this smoke test survey.

4.4.3 Television Surveys

While television surveys allow for visual inspections of pipe interiors, they constrain the inspection to sections of pipe where the robotic camera can operate. To understand the nature of leaks in these laterals, additional inspections would be required in which a camera is directed towards the lateral.

This report includes analysis of the television survey results for those sections of pipe identified by flow mapping or smoke testing as potentially having I/I sources. While this report discusses major deficiencies identified in these sections of pipe during the television survey, this is not intended to serve as a comprehensive list of all deficiencies in the system. The City should refer to the television survey logs provided by TSR Corporation for a full listing of deficiencies identified during the 2016 television survey.

Section
5

5.0 Recommendations

5.1 Additional Investigation

5.1.1 Television Survey of Pipe

The results from flow mapping and smoke testing indicated locations of potential inflow and infiltration into the wastewater collection system. Prior to undertaking repair projects, sections of pipe with potential problems should be evaluated with television inspections. While television inspections were performed on many of these sections between 2010 and 2012 and were used during the data interpretation process for this report, updated inspections should be performed so that repairs can be designed and executed in a cost-effective manner. Based on the results in Section 4.0 of this report, we recommend television inspections of the pipe segments listed in Table 5-1. Maps showing the pipe segments requiring additional inspection can be found in Appendix B.

Table 5-1: Sections of pipe recommended for updated television inspection.

Street Location	Manholes	Approximate Length of Pipe (ft)
S Hemlock St between Monroe St and Harrison St and E Harrison St	M3-8 to M3-11, M3-11 to O1-4	1665
S Spruce St south of Sunset Blvd	B6 to B3-2, B3-1-1	1058
Sunset Blvd east of Spruce St and Poplar Rd south of Sunset Blvd	B6 to B12, B8 to B-8A2	2767
S Pacific St between Matanuska Lift Station and W Chisana St, Nelchena St between S Pacific St and S Hemlock St, and S Hemlock St between Matanuska St and Nelchena St	Matanuska Lift Station to TI-12, TI-11 to I-2	911
W Umpqua St between S Pacific St and S Hemlock St	P-1 to TI-22	271
E Surfcrest Ave on the east and west sides of US Highway 101	Unidentified on GIS maps	458

5.1.2 Locate Manholes

During the smoke test, smoke was observed in areas of heavy vegetation. In some cases, the location of the smoke aligned with the likely location of a manhole; however, the manhole could not be located. To ensure that the smoke viewed during the test originated from a manhole and not from a mainline or lateral break, an exhaustive search for manholes at the following locations should be conducted:

- Between US Highway 101 & 3548 West Chinook Avenue
- North end of Yukon Street along LAT-G-3
- North end of Haystack Lane along MAIN-E

5.2 Repairs

The City is encouraged to continue their current process of inspecting sanitary sewer lines and conducting repairs. Routinely performing television inspections will allow the City to effectively track changes in pipe conditions and perform repairs before problems arise. It is recommended that sections of pipe and manholes identified in this report as likely I/I contributors be considered for repair during the next repair cycle.

5.2.1 Issues on Public Property

5.2.1.1 *Pipe Repair and Replacement*

Flow mapping identified infiltration originating from the area along South Hemlock Street between Washington Street and Harrison Street. TV inspections were performed on the majority of these pipe segments in 2016, and they revealed a high concentration of deficiencies along East Jefferson Street between manholes M3-6 and H1-2. The City's GIS map of the sewer system indicates that there is approximately 480 linear feet of sewer pipe along East Jefferson Street, though the manhole indicated as H1-2 in the television inspection reports is not shown on the map. Based on the results of these investigations, we recommend prioritizing repair/replacement work along East Jefferson Street during the upcoming repair cycle. Budgeting for sanitary sewer pipe replacement and repair work has been included in the Wastewater Master Plan Capital Improvement Plan.

5.2.1.2 *Storm/Sanitary Sewer Cross Connection Repair*

Cross connections between the storm sewer and sanitary sewer can represent major sources of inflow to the sanitary sewer system. The following locations in the City were identified during the smoke testing survey as locations where storm sewer catch basins were connected to the sanitary sewer system:

- 3887 Ocean Avenue (West of Midway Lift Station)
- 1200 Pacific Street (West of Pacific Lift Station)

To correct these problems, the City should:

1. Visually confirm that the catch basins are connected to the storm sewer system at these locations.
2. Disconnect catch basins from the sanitary sewer to prevent flow between the systems.
3. Establish proper connections between the storm sewer catch basins and the storm sewer system if those connections do not currently exist.

5.2.1.3 *Manhole Repair*

Smoke testing and television inspections revealed the need for repairs in some manholes. While smoke returns through holes in the manhole lids is acceptable, no smoke should escape from around the edge of the manhole ring. The following manholes were determined to have leaks or possible grout failure:

- Manhole A2; 5th Street and Antler Avenue
- Manhole A3; 5th Street and Ecola Park Road
- Manhole G3-2-1; Hemlock Street and Amber Lane
- Manhole G1-2; 1519 Nebesna Street
- Manhole G3-3-2; East of Vista del Mar

- Manhole G11; Pacific Street and Gogona Avenue
- Unidentified Manhole; 168 Coolidge Avenue

5.2.1.4 *Cleanout Cap Repair*

Sewer cleanouts located in streets can provide access for storm water runoff to enter the sanitary sewer system. Caps covering these cleanouts must be properly fitted to limit gaps that allow water to pass. The cleanout cap at the following location should be replaced with a cap that fits correctly:

- West end of Silverpoint Court

5.2.2 Issues on Private Property

5.2.2.1 *Cross Connections*

Drains located on private lands are intended to collect stormwater and transport it to the storm sewer system. In some instances, drains are connected to the sanitary sewer system and represent an improper and illegal inflow source. Three potential cross connections on private property were identified during smoke testing. The following locations were identified as having potential cross connections between storm drains and the sanitary sewer system:

- 232 Sitka Street
- 2566 Hemlock Street
- 1290 Cypress Court

The city should notify homeowners of these potential cross connections and request they take corrective actions if necessary.

5.2.2.2 *Laterals*

Repairs of broken laterals are also the responsibility of property owners when not on public lands. Smoke testing identified eight locations of potential sewer lateral breaks. In some instances, obstructions prevented verification that the smoke was not indicating problems with a cleanout cap; therefore, the city is encouraged to notify homeowners and request homeowners conduct additional inspections and repairs. The following properties were identified by smoke testing as having potential breaks in the lateral connection between the sanitary sewer and the structure:

- 4587 Logan Lane (CC)
- Empty lot on Fernwood Street
- 3787 West Chinook Avenue
- Empty lot on Van Buren Street
- 159 Tanana Avenue (CC)
- 964 South Hemlock Street (CC)
- 188 Jackson Street (CC)
- 180 Taft Street (CC)

Locations marked with (CC) are locations where it was unclear whether the smoke was due to a broken lateral or a problem with the cleanout cap. The property owner should be informed that either could be the cause of the deficiency.

5.2.2.3 *Cleanouts*

A total of 10 locations on private property were identified by smoke testing to have broken, missing, or loose cleanout caps. Repair or replacement of the cleanout caps on private property is the responsibility of the homeowner. The following homeowners should be notified about the documented issues with their cleanouts and asked to perform repairs as needed:

- 147 West Way
- 4424 Watts Way
- 3775 Ocean Lane
- 3764 East Chinook Avenue
- 3063 South Pacific Street
- 256 Tanana Avenue
- 264 Hills Lane
- 3rd Street- Westwind Unit #3
- 364 Spruce Street
- 539 North Laurel Street

5.2.2.4 *Other*

In addition to the previously listed issues, one residence was identified as having an issue that is not likely a large contributor to inflow and infiltration but should still be addressed by the homeowner. This property owner should be notified of the leak in their piping so that they can have it properly repaired:

- 123 Coos Street

Section

6

6.0 Conclusions

Flow mapping and smoke testing were used to identify potential locations of inflow and infiltration into the sanitary sewer system for the City of Cannon Beach. Nearly 40 different locations throughout the City were identified by these methods as potential I/I sources. Television surveys of the sanitary sewer system revealed more than 200 deficiencies in the sections of pipe surveyed during the 2016 calendar year. These results suggest that inflow and infiltration in the City's sanitary sewer system is the result of numerous contributions from diffuse sources.

It is recommended that the City continue with its plan of evaluating ≥25% of the sanitary sewer system by television survey each year for four years and conducting repairs every fifth year. We suggest that the next round of television surveying includes the sections of pipe listed in Table 5-1. Based on the results of flow mapping and smoke testing, these pipe sections are likely contributors of inflow and infiltration to the sanitary sewer system. These areas need to be inspected by a television survey so that the likely sources of I/I can be identified and a cost-effective repair strategy can be developed.

During the upcoming pipe repair/replacement cycle, we recommend that the City prioritize the section of sanitary sewer pipe located along East Jefferson Street. Television inspections performed in 2016 identified several potential sources of I/I from these pipe segments. It is also recommended that the City locate the manholes indicated here to confirm that they are in satisfactory condition and repair manholes listed here. Confirming that the smoke observed during testing was due to a hidden manhole and not due to a broken mainline or lateral is vital for minimizing I/I contributions. Repairing grout at manholes will prevent water from easily entering the system via the manhole and represents a relatively inexpensive method for decreasing inflow.

Many of the deficiencies discovered during smoke testing were located on private property and their repair is the responsibility of the property owner. It's recommended that the City notify these property owners about the nature of the issue documented in this report and provide them with the suggestions discussed. It is also recommended that property owners with broken lateral connections, broken or missing cleanout caps, and other identified plumbing issues be notified of the deficiencies on their property and directed to make necessary repairs.

Appendix A- Smoke Test Survey Documentation

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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 02:13 ☐ a.m. ☑ p./ .

Street Address/Location: 4587 LOGAN LN **Smoke from Manhole No.** V5

Observer: JBJ **Location of Manhole:** LOGAN AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

SMOKE OBSERVED HERE

X

Observed Smoke Indicator:

SMOKE FROM GROUND NEAR THE DECK STAIRS

Probable Cause:

BROKEN LATERAL OR MISSING CLEANOUT CAP

Recommendations:

INFORM HOME OWNER OF THE ISSUE AND RECOMMEND STEPS TO RESOLVE.

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF THE ISSUE

Note:

STREET VIEW OF HOME FROM LOGAN LANE

Note:

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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 02:35 ☐ a.m. ☑ p.m.

Street Address/Location: 147 WEST WAY **Smoke from Manhole No.** V1-4

Observer: ANDREW MATSUMOTO **Location of Manhole:** WEST WAY NEAR S HEMLOCK ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE VISIBLE FROM GROUND
NEAR DOORWAY ACCOMPANIED BY
LOUD "WHISTLING" SOUND

Probable Cause:

HOLE IN CLEANOUT CAP

Recommendations:

NOTIFY HOMEOWNER

Inflow and Infiltration Study - Smoke Testing Report Form

STREET VIEW OF THE LOCATION OF ISSUE

Note:

Note:

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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

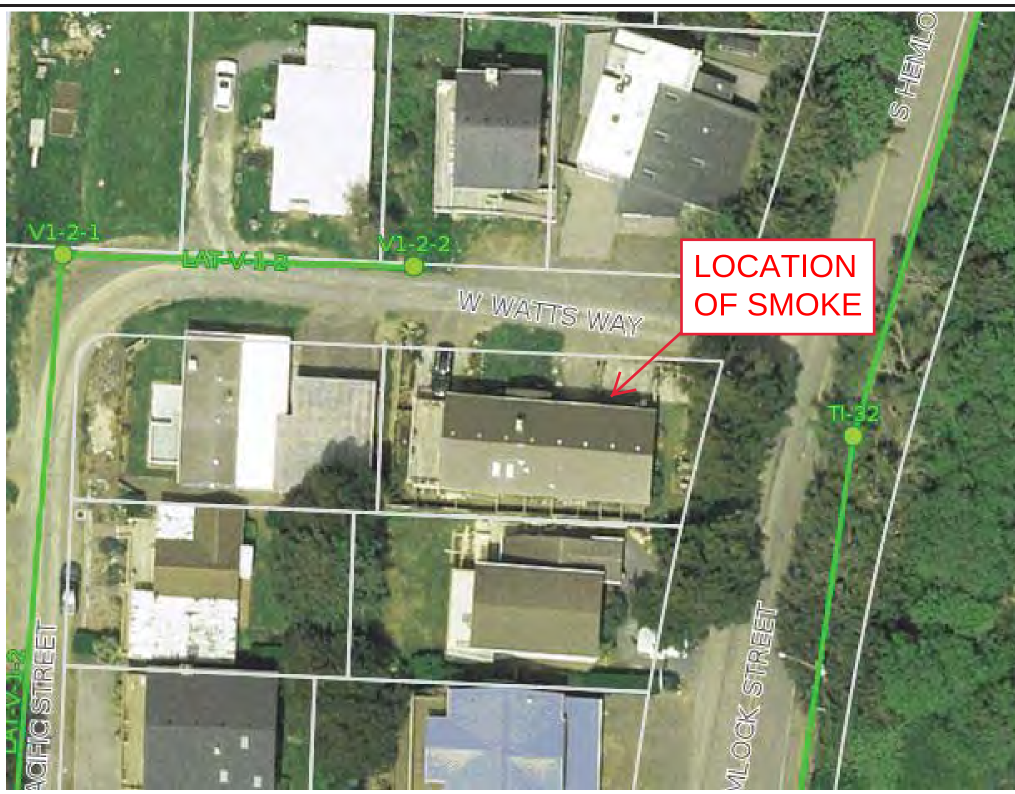
Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 02:47 ☐ a.m. ☑ p.m.

Street Address/Location: 4424 WATTS WAY **Smoke from Manhole No.** V1-2-1

Observer: ANDREW MATSUMOTO **Location of Manhole:** WATTS WAY & PACIFIC ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE COMING FROM GROUND
BEHIND FLOWER POTS

Probable Cause:

BROKEN/MISSING CLEANOUT CAP

Recommendations:

NOTIFY HOMEOWNER

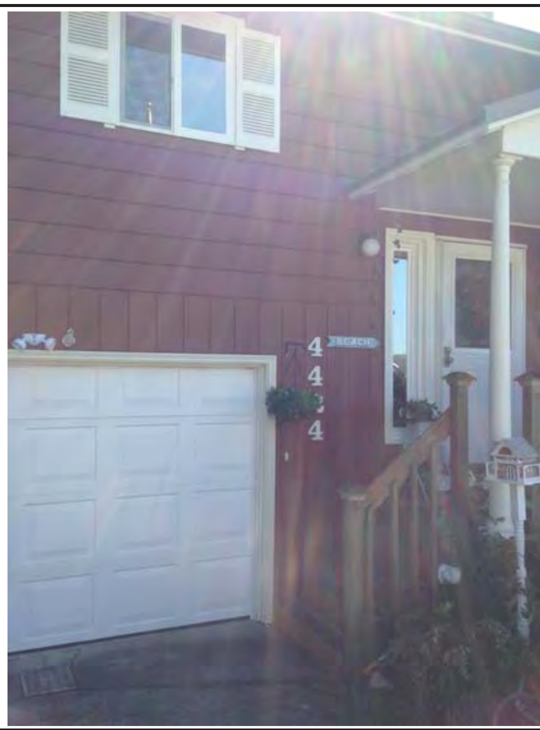
Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

FRONT OF LOCATION OF ISSUE

Note:



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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

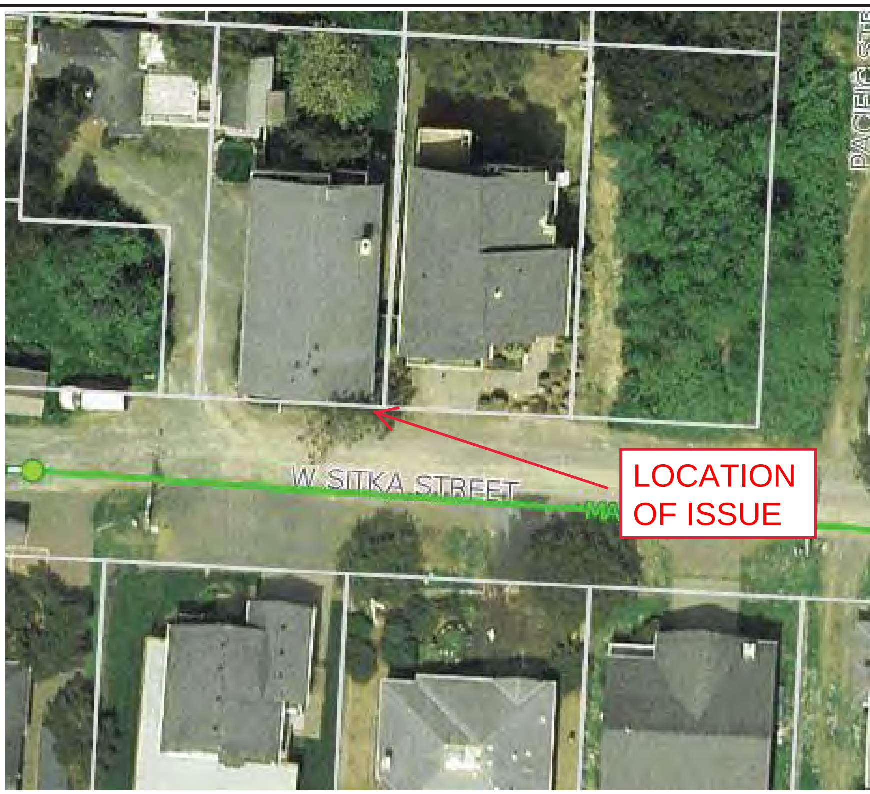
Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 03:04 ☐ a.m. ☑ p.m.

Street Address/Location: 232 SITKA ST **Smoke from Manhole No.** TI-31

Observer: ANDREW MATSUMOTO **Location of Manhole:** SITKA ST & S HEMLOCK ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE VISIBLE WHERE THE ROOF GUTTER MEETS THE DRAIN ON THE SE CORNER OF STRUCTURE

Probable Cause:

POSSIBLE CONNECTION BETWEEN THE ROOF DRAINS AND THE SANITARY SEWER

Recommendations:

NOTIFY HOMEOWNER TO INVESTIGATE AND RESOLVE

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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 04:04 ☐ a.m. ☑ p.m.

Street Address/Location: 3887 OCEAN AVE **Smoke from Manhole No.** Q1

Observer: DCV **Location of Manhole:** OCEAN AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE RISING FROM STORM DRAIN GRATE LOCAL TO MANHOLE Q1

Probable Cause:

CROSS-CONNECTION - POSSIBLE LARGE CONTRIBUTOR TO I/I DUE TO GEOGRAPHY

Recommendations:

REPAIR CROSS-CONNECTION

Inflow and Infiltration Study - Smoke Testing Report Form

LARGE AMOUNT OF SMOKE RISING FROM STORM DRAIN

Note:

LOCATION OF STORM DRAIN IN RELATION TO MANHOLE Q1 AND MIDWAY PUMP STATION

Note:

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Inflow and Infiltration Study - Smoke Testing Report

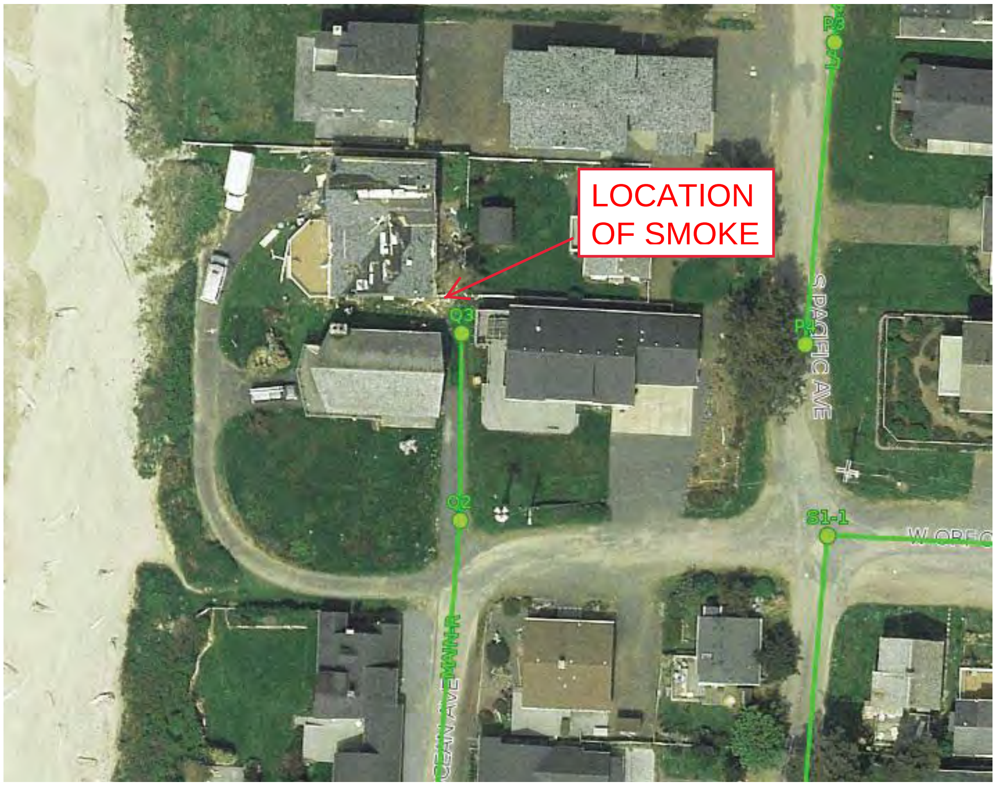
Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 04:10 ☐ a.m. ☑ p.m.

Street Address/Location: 3775 OCEAN LN **Smoke from Manhole No.** Q1

Observer: ANDREW MATSUMOTO **Location of Manhole:** MIDWAY ST & OCEAN AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE VISIBLE FROM GROUND
NEAR DECK

Probable Cause:

BROKEN CLEANOUT CAP

Recommendations:

NOTIFY HOMEOWNER

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

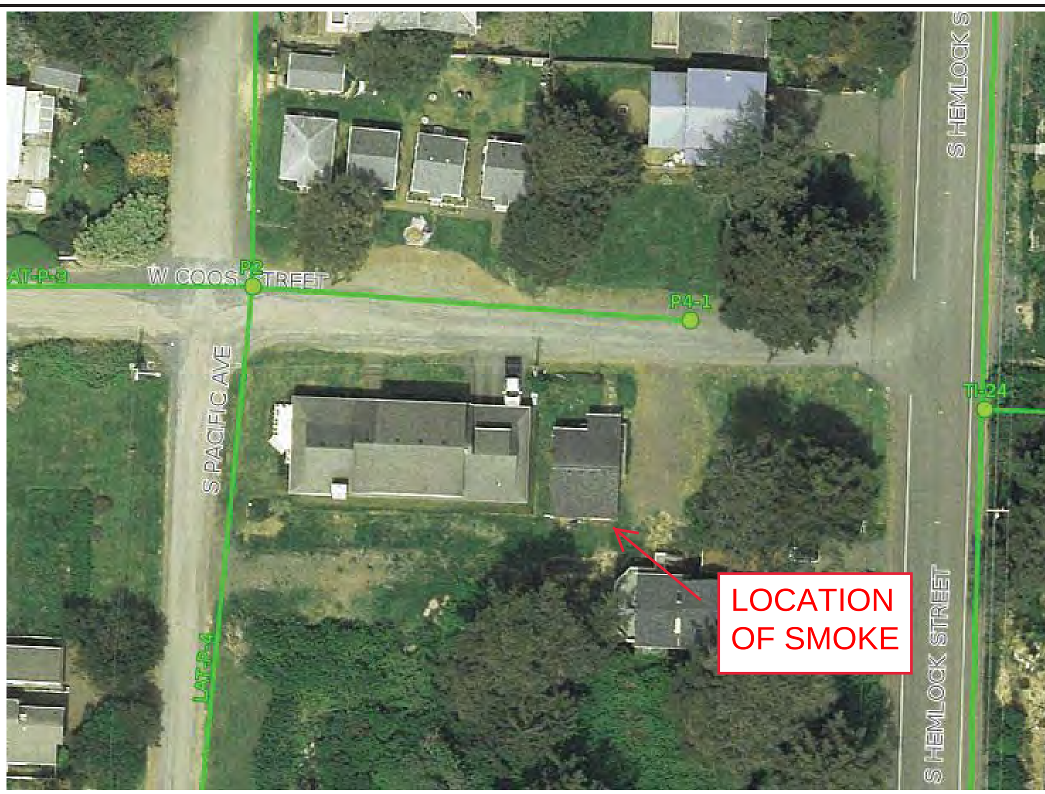
Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 04:30 ☐ a.m. ☑ p.m.

Street Address/Location: 123 COOS ST **Smoke from Manhole No.** P2

Observer: ANDREW MATSUMOTO **Location of Manhole:** COOS ST & PACIFIC AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE EMERGED FROM UNDERNEATH THE REAR OF THE HOUSE

Probable Cause:

LEAK IN THE CONNECTION BETWEEN OLD AND NEW PIPE

Recommendations:

NOTIFY HOMEOWNER

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

FRONT OF LOCATION OF ISSUE

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 05:00 ☐ a.m. ☑ p./ .

Street Address/Location: Upqua **Smoke from Manhole No.** P-1

Observer: JBJ **Location of Manhole:** S PACIFIC AVE/W UMPQUA ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM GROUND

Probable Cause:

BROKEN LATERAL OR MAINLINE

Recommendations:

TV LATERAL AND LOOK FOR
DAMAGE FROM TREE ROOTS

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF THE ISSUE

Note:

STREET VIEW OF HOME FROM W UMPQUA ST

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 05:32 ☐ a.m. ☑ p./ .

Street Address/Location: EMPTY LOT ON FERNWOOD **Smoke from Manhole No.** TI-19

Observer: JBJ **Location of Manhole:** WARREN WAY/ HEMLOCK ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM GROUND

Probable Cause:

BROKEN LATERAL

Recommendations:

TV LATERAL AND MAINLINE

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF THE ISSUE

Note:

STREET VIEW OF HOME ON NEIGHBORING PARCEL TO THE EAST

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 05:50 ☐ a.m. ☑ p./ .

Street Address/Location: 3787 W CHINOOK **Smoke from Manhole No.** W3-3

Observer: JBJ **Location of Manhole:** CHINOOK AVE/DEER PLACE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM GROUND

Probable Cause:

BROKEN LATERAL

Recommendations:

TV LATERAL AND MAINLINE

Inflow and Infiltration Study - Smoke Testing Report Form

STREET VIEW OF HOUSE

Note:

INTERSECTION OF MANHOLE LOCATION

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/14/16 **Time:** 06:25 ☐ a.m. ☑ p./ .

Street Address/Location: 3764 E CHINOOK AVE **Smoke from Manhole No.** W4-1-B

Observer: JBJ **Location of Manhole:** E CHINOOK AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM UNDER DECK

Probable Cause:

MISSING CLEANOUT CAP

Recommendations:

NOTIFY HOME OWNER TO INSTALL CLEAN OUT CAP

Inflow and Infiltration Study - Smoke Testing Report Form

STREET VIEW OF HOUSE

Note:

LOCATION OF ISSUE

Note:

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Inflow and Infiltration Study - Smoke Testing Report

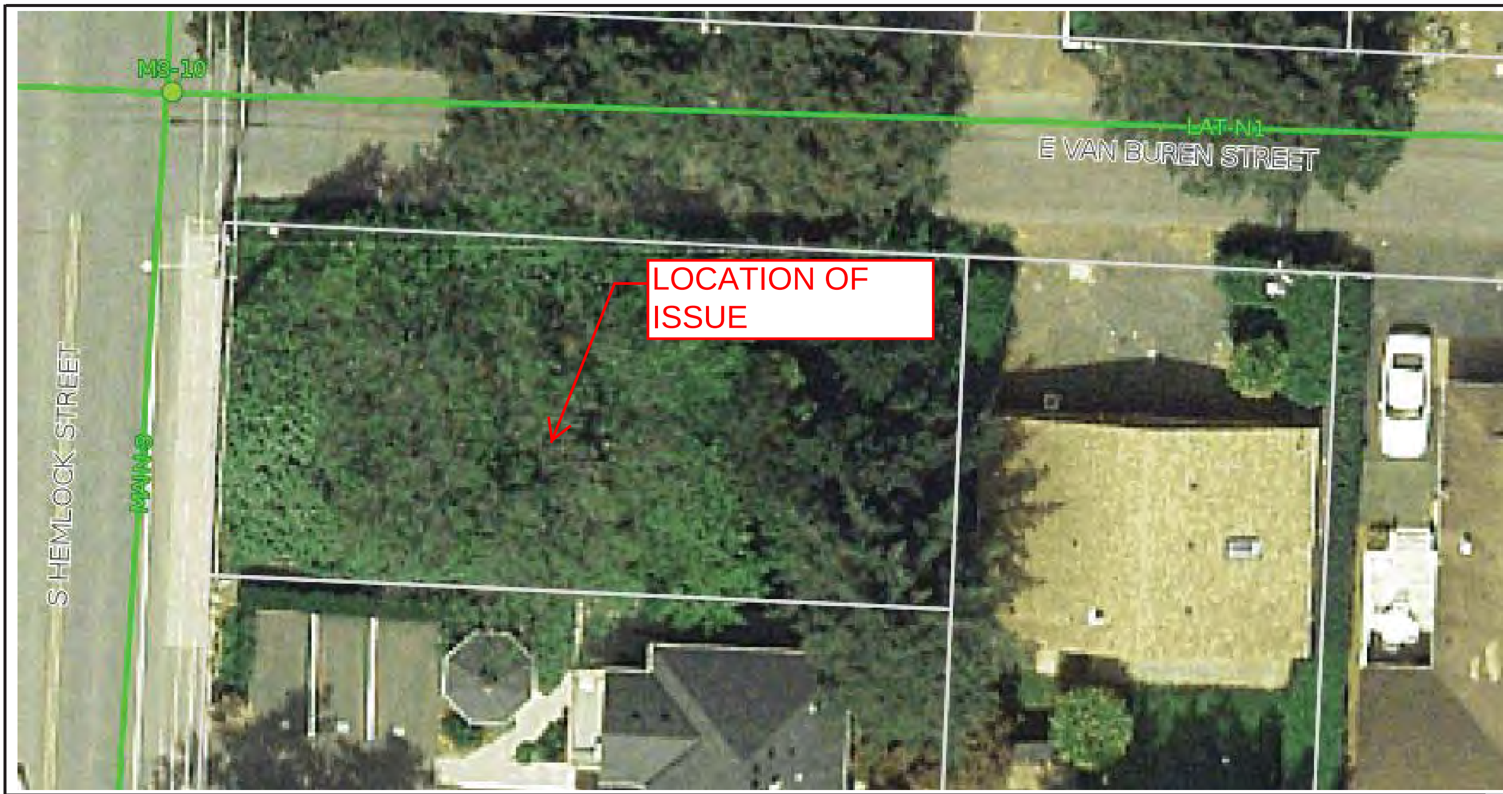
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 07:59 ☑ a.m. ☐ p./ .

Street Address/Location: EMPTY LOT ON VAN BUREN **Smoke from Manhole No.** M3-10

Observer: JBJ **Location of Manhole:** HEMLOCK/VAN BUREN

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM THE GROUND

Probable Cause:

BROKEN LATERAL

Recommendations:

TV LINE AND LOOK FOR DAMAGE FROM TREE ROOTS

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

CROSS STREET OF EMPTY LOT AND MANHOLE LOCATION

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 08:23 ☑ a.m. ☐ p./ .

Street Address/Location: 3063 S PACIFIC **Smoke from Manhole No.** TI-14

Observer: JBJ **Location of Manhole:** DELTA/PACIFIC

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

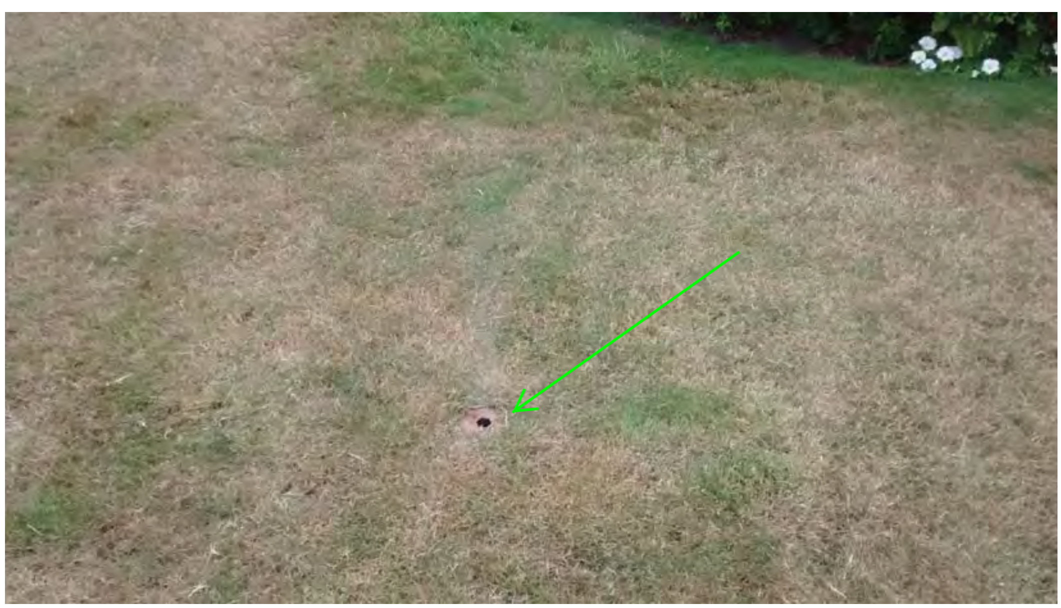
SMOKE FROM THE GROUND

Probable Cause:

MISSING CLEANOUT CAP

Recommendations:

CONTACT HOME OWNER TO
REPAIR/REPLACE CLEANOUT CAP



Inflow and Infiltration Study - Smoke Testing Report Form

HOUSE NUMBER OF LOT WITH THE ISSUE

Note:

STREET VIEW OF HOUSE FROM S PACIFIC ST

Note:

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Inflow and Infiltration Study - Smoke Testing Report

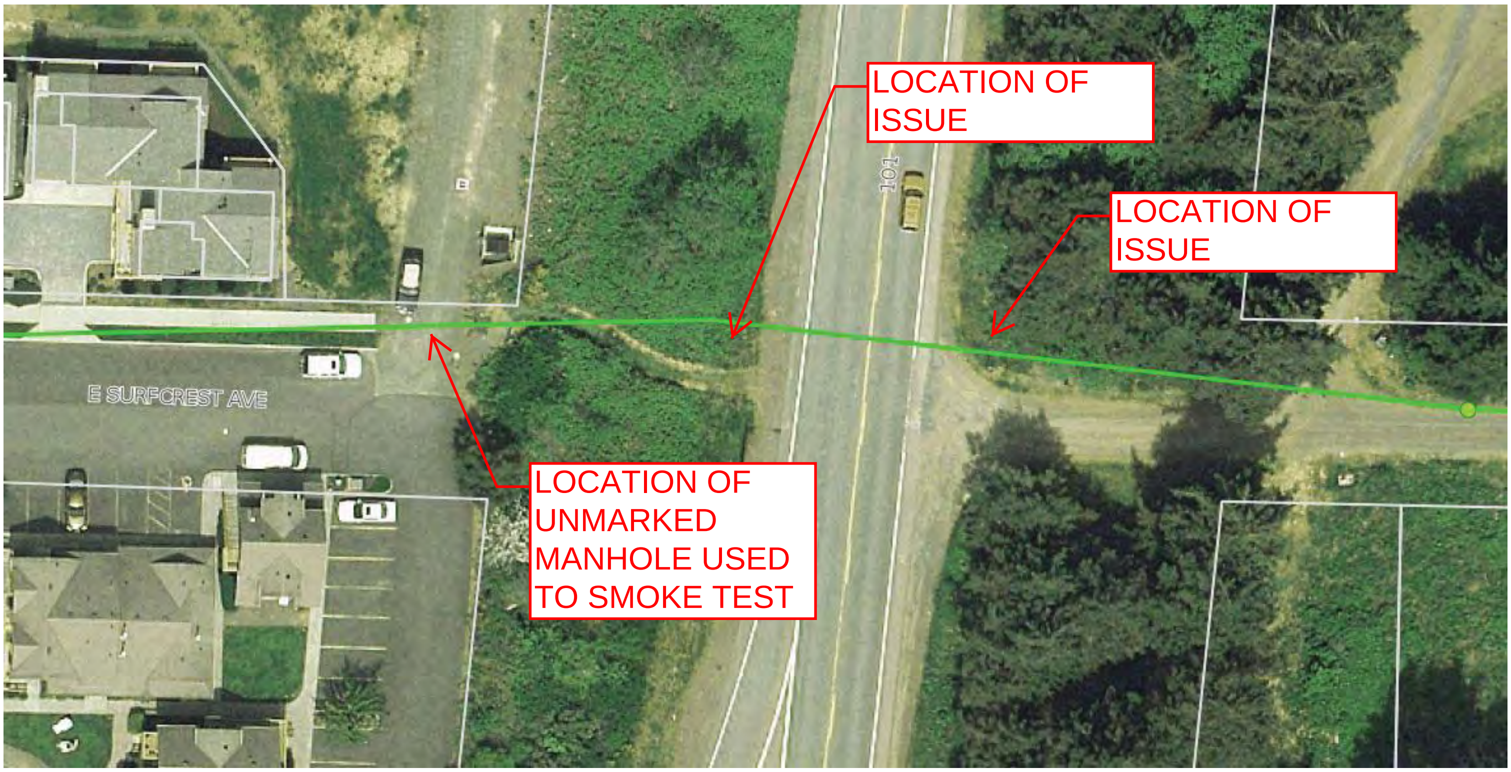
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 09:15 ☑ a.m. ☐ p./ .

Street Address/Location: HWY 101/ SURFCREST **Smoke from Manhole No.** UNKOWN

Observer: JBJ **Location of Manhole:** END OF SURFCREST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM THE GROUND ON BOTH SIDES OF HWY 101

Probable Cause:

POSSIBLE UNMARKED MANHOLE LOCATIONS OR BROKEN MAINLINE

Recommendations:

REMOVE VEGETATION TO LOCATE MANHOLES, TV LINES TO IDENTIFY MANHOLES AND POSSIBLE PIPE FAILURES

Inflow and Infiltration Study - Smoke Testing Report Form

SMOKE FROM GROUND AT THE CORNER OF HWY 101 AND SURFCREST

Note:

WEST SIDE OF HWY 101

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 09:45 ☑ a.m. ☐ p./ .

Street Address/Location: 3548 CHINOOK **Smoke from Manhole No.** W2-1

Observer: JBJ **Location of Manhole:** W CHINOOK/N CHINOOK AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM THE GROUND BEHIND THE HOME

Probable Cause:

MANHOLE COVERED IN VEGETATION

Recommendations:

REMOVE VEGETATION TO LOCATE MANHOLE

Inflow and Infiltration Study - Smoke Testing Report Form

STREET VIEW OF HOME, POSSIBLE MANHOLE IS LOCATED IN THE REAR OF THE HOME, ALTERNATIVE ACCESS FROM HWY 101

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 10:30 ☑ .m. ☐ p./ .

Street Address/Location: HEMLOCK ST./AMBER LANE **Smoke from Manhole No.** G-3-2-1

Observer: DCV **Location of Manhole:** HEMLOCK STREET

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM DIRT
CULVERT AREA - NEAR MANHOLE
G-3-2-1

Probable Cause:

POSSIBLE GROUT FAILURE AT
MANHOLE

Recommendations:

REPAIR/SEAL MANHOLE

Inflow and Infiltration Study - Smoke Testing Report Form

DETAIL OF LEAK IN RELATION TO MANHOLE G-3-2-1

Note:

Note:

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Civil West
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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 10:46 ☑ .m. ☐ p./ .

Street Address/Location: 2566 HEMLOCK STREET **Smoke from Manhole No.** H-3

Observer: DCV **Location of Manhole:** HEMLOCK STREET

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM LANDSCAPE AREA DIRECTLY BENEATH ROOF DRAIN DOWNSPOUT

Probable Cause:

POSSIBLE CROSS-CONNECTION

Recommendations:

MAKE SURE THERE IS NO CROSS-CONNECTION

Inflow and Infiltration Study - Smoke Testing Report Form

DETAIL SHOWING RAIN GUTTER ON EAST SIDE OF HOUSE AT 2566 HEMLOCK STREET

Note:

Note:

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Civil West Engineering Services, Inc.

Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 11:00 ☑ a.m. ☐ p./ .

Street Address/Location: 1519 NEBESNA ST **Smoke from Manhole No.** G3

Observer: JBJ **Location of Manhole:** NEBESNA ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM THE GROUND AROUND THE MANHOLE

Probable Cause:

THE GROUT IN THE MANHOLE HAS FAILED

Recommendations:

CHECK GROUT CONDITION IN MANHOLE AND REPAIR/REPLACE GROUT OR MANHOLE DEPENDING ON CONDITION

Inflow and Infiltration Study - Smoke Testing Report Form

MANHOLE IS LOCATED IN THE DRIVEWAY

Note:

STREET VIEW OF HOME

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 11:35 ☑ .m. ☐ p./ .

Street Address/Location: 256 TANANA AVE **Smoke from Manhole No.** G-5

Observer: DCV **Location of Manhole:** TANANA AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM BROKEN
CLEANOUT CAP IN LAWN AREA
WEST OF RESIDENCE

Probable Cause:

BROKEN CLEANOUT CAP

Recommendations:

REPLACE CAP

Inflow and Infiltration Study - Smoke Testing Report Form

DETAIL SHOWING CLEANOUT AREA ON WEST SIDE OF HOUSE AT 256 TANANA AVE

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

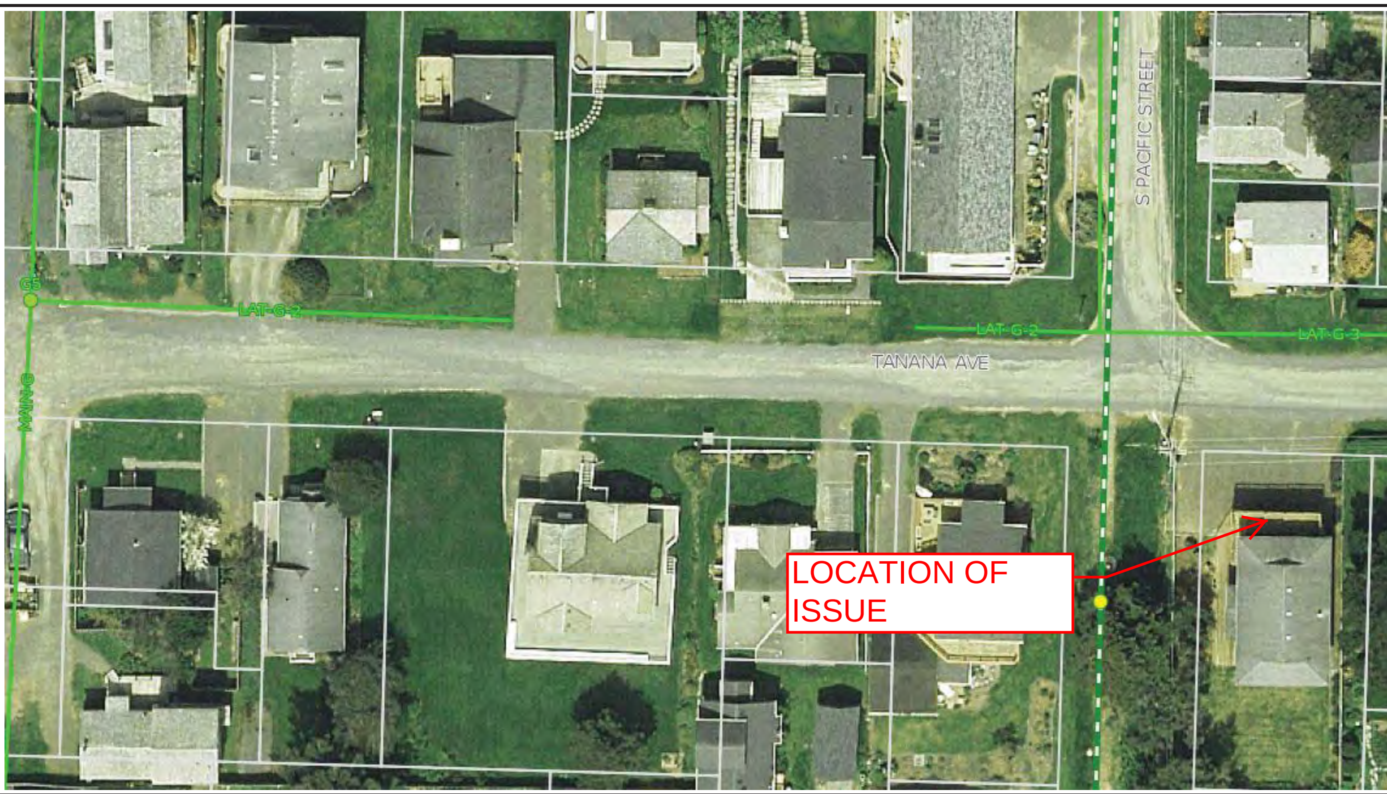
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 11:38 ☑ a.m. ☐ p./ .

Street Address/Location: 159 TANANA AVE **Smoke from Manhole No.** G5

Observer: JBJ **Location of Manhole:** TANANA AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM THE GROUND UNDER THE DECK

Probable Cause:

BROKEN LATERAL OR MISSING CLEAN OUT CAP

Recommendations:

CHECK FOR CLEANOUT CAP, VERIFY LOCATION OF LATERAL AND CHECK FOR LATERAL PIPE FAILURE

Inflow and Infiltration Study - Smoke Testing Report Form

SMOKE FROM THE DECK

Note:

STREET VIEW OF HOME

Note:

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Inflow and Infiltration Study - Smoke Testing Report

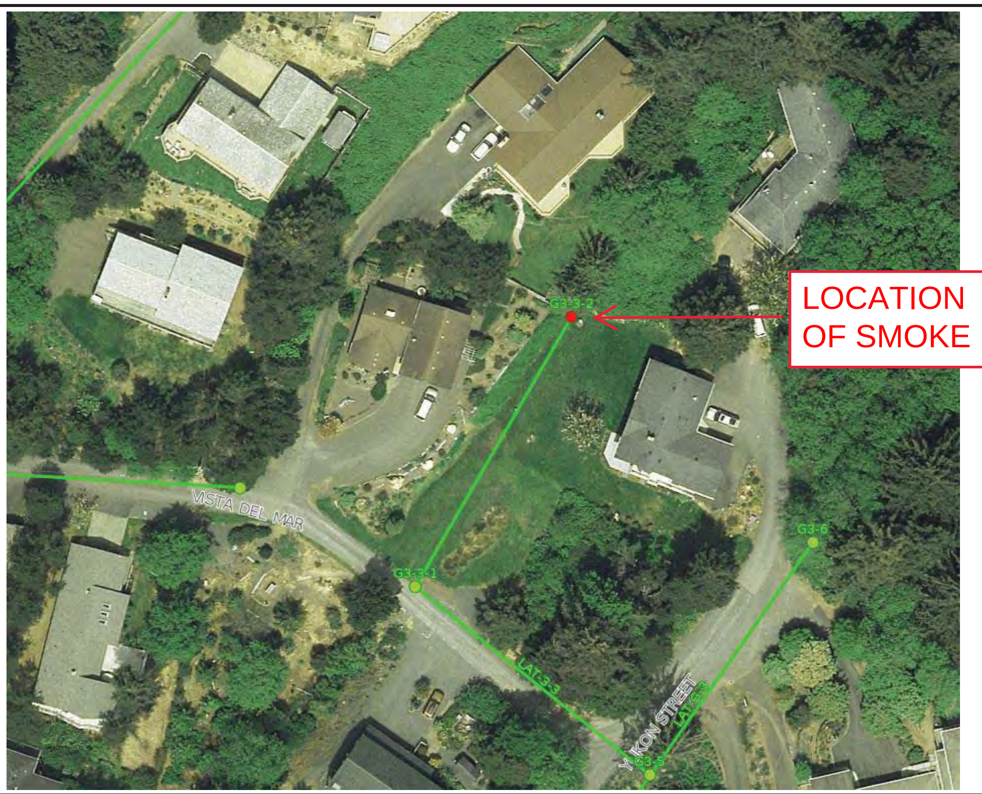
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 11:55 ☑ a.m. ☐ p.m.

Street Address/Location: EAST OF 238 VISTA DEL MAR **Smoke from Manhole No.** G3-3-1

Observer: ANDREW MATSUMOTO **Location of Manhole:** VISTA DEL MAR

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE EMERGED FROM AROUND THE EDGE OF THE MANHOLE WHERE THE MANHOLE RING MEETS THE CONCRETE

Probable Cause:

CHIPPED CONCRETE AROUND THE BASE OF THE MANHOLE RING

Recommendations:

PATCH/SEAL WHERE THE RING MEETS THE CONCRETE

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Inflow and Infiltration Study - Smoke Testing Report

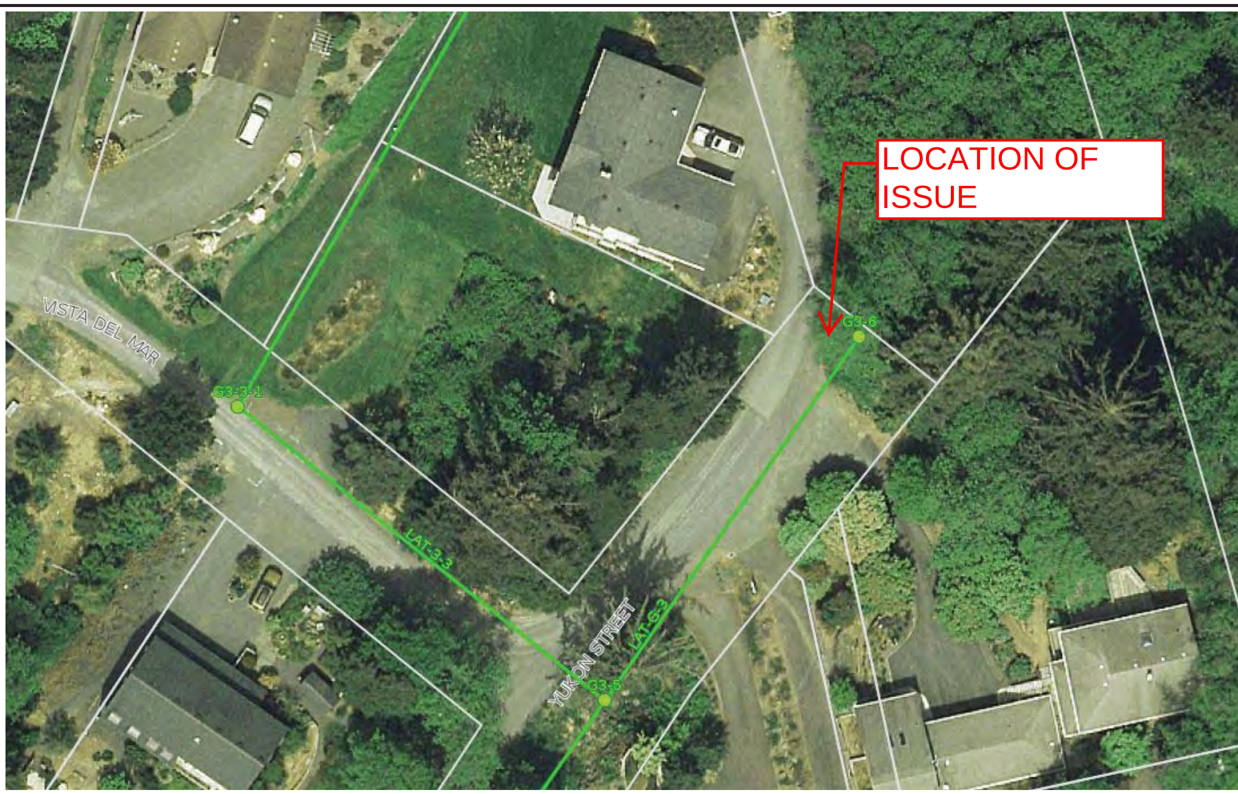
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 11:59 ☑ a.m. ☐ p./ .

Street Address/Location: YUKON STREET **Smoke from Manhole No.** G3-3-1

Observer: JBJ **Location of Manhole:** VISTA DEL MAR

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM THE GROUND

Probable Cause:

POSSIBLE MANHOLE BENEATH HEAVY VEGETATION

Recommendations:

VERIFY LOCATION OF MANHOLE, CHECK FOR FAILURE OF PIPE

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

STREET VIEW OF LOCATION FROM YUKON ST

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 01:53 ☐ a.m. ☑ p./ .

Street Address/Location: PACIFIC/GOGONA **Smoke from Manhole No.** G12

Observer: JBJ **Location of Manhole:** VISTA DEL MAR/PACIFIC

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM THE GROUND AROUND THE MANHOLE

Probable Cause:

THE GROUT IN THE MANHOLE IS FAILED

Recommendations:

CHECK THE GROUNT FOR SIGNS OF FAILURE, REPAIR/REPLACE AS NEEDED TO PROPERLY SEAL THE MANHOLE

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

INTERSECTION NEAR THE MANHOLE WITH THE ISSUE

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 02:15 ☐ .m. ☑ p./ .

Street Address/Location: NORTH END OF HAYSTACK LN **Smoke from Manhole No.** MANHOLE SW OF E1

Observer: DCV **Location of Manhole:** HAYSTACK LANE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM BRUSH AREA NEAR POWER POLE ON EAST SIDE OF THE STREET

Probable Cause:

POSSIBLY MANHOLE E2 OR A LEAK

Recommendations:

INVESTIGATE TO UNCOVER MANHOLE - FIND POSSIBLE SOURCE OF SMOKE

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 02:26 ☐ a.m. ☑ p./ .

Street Address/Location: 264 HILLS LANE **Smoke from Manhole No.** B3-1

Observer: JBJ **Location of Manhole:** ELLIOTT WAY/S SPRUCE ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE FROM THE CLEANOUT

Probable Cause:

THE CLEANOUT CAP IS MISSING

Recommendations:

NOTIFY BUILDING OWNER OF ISSUE, REPAIR/REPLACE MISSING CLEANOUT CAP

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

STREET VIEW OF BUIDING WITH ISSUE

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 04:00 ☐ .m. ☑ p./ .

Street Address/Location: WEST END OF SILVERPOINT CT **Smoke from Manhole No.** ELKLAND/SILVERPOINT

Observer: DCV **Location of Manhole:** ELKLAND DRIVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM SEWER CLEANOUT IN STREET

Probable Cause:

POORLY FITTING CLEANOUT CAP

Recommendations:

REPAIR/REPLACE CAP

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Inflow and Infiltration Study - Smoke Testing Report

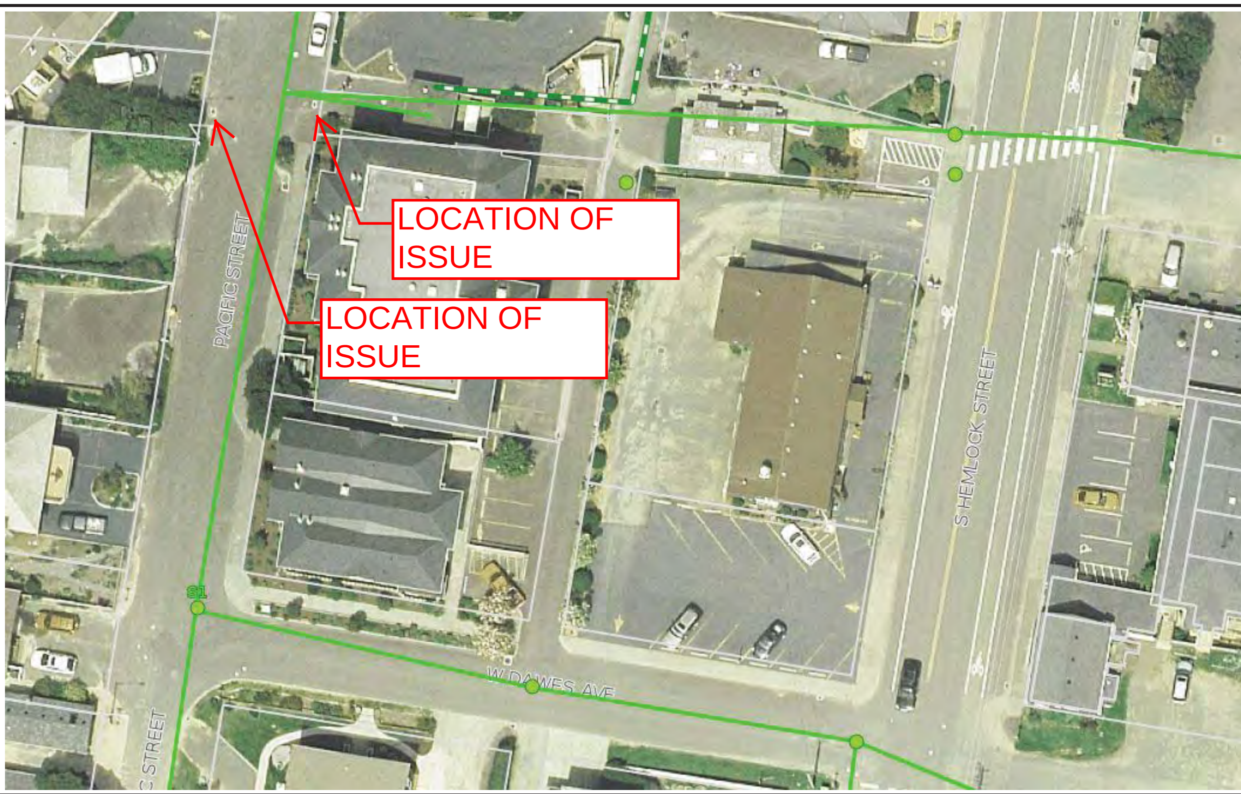
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 04:53 ☐ a.m. ☑ p./ .

Street Address/Location: 1200 PACIFIC **Smoke from Manhole No.** S1

Observer: JBJ **Location of Manhole:** PACIFIC ST/W DAWES AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM THE CATCH BASINS NEAR THE PACIFIC PUMP STATION

Probable Cause:

THE STORM LINE IS CROSS CONNECTED TO THE SEWER AT THIS POINT, A MAJOR SOURCE OF I/I

Recommendations:

CONNECT THE CATCH BASINS IN THIS AREA TO THE STORM SEWER LINES

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE IN FRONT OF THE PACIFIC PUMP STATION

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 05:00 ☐ .m. ☑ p./ .

Street Address/Location: 1290 CYPRESS CT **Smoke from Manhole No.** B-1-3-1

Observer: DCV **Location of Manhole:** E DAWES AVE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

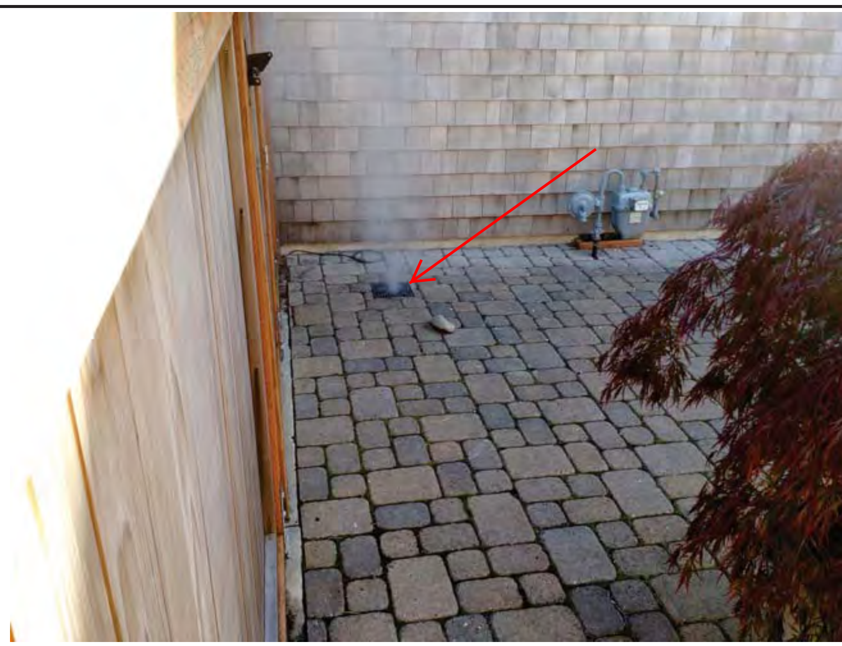
SMOKE COMING FROM PATIO AREA DRAIN IN YARD ON NOTH SIDE OF RESIDENCE

Probable Cause:

CROSS-CONNECTION

Recommendations:

NOTIFY HOMEOWNER - RESOLVE ISSUE



Inflow and Infiltration Study - Smoke Testing Report Form

FRONT VIEW OF HOUSE - AREA DRAIN IS IN FENCED IN AREA TO THE RIGHT IN THE PHOTO - NORTH SIDE OF HOUSE

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

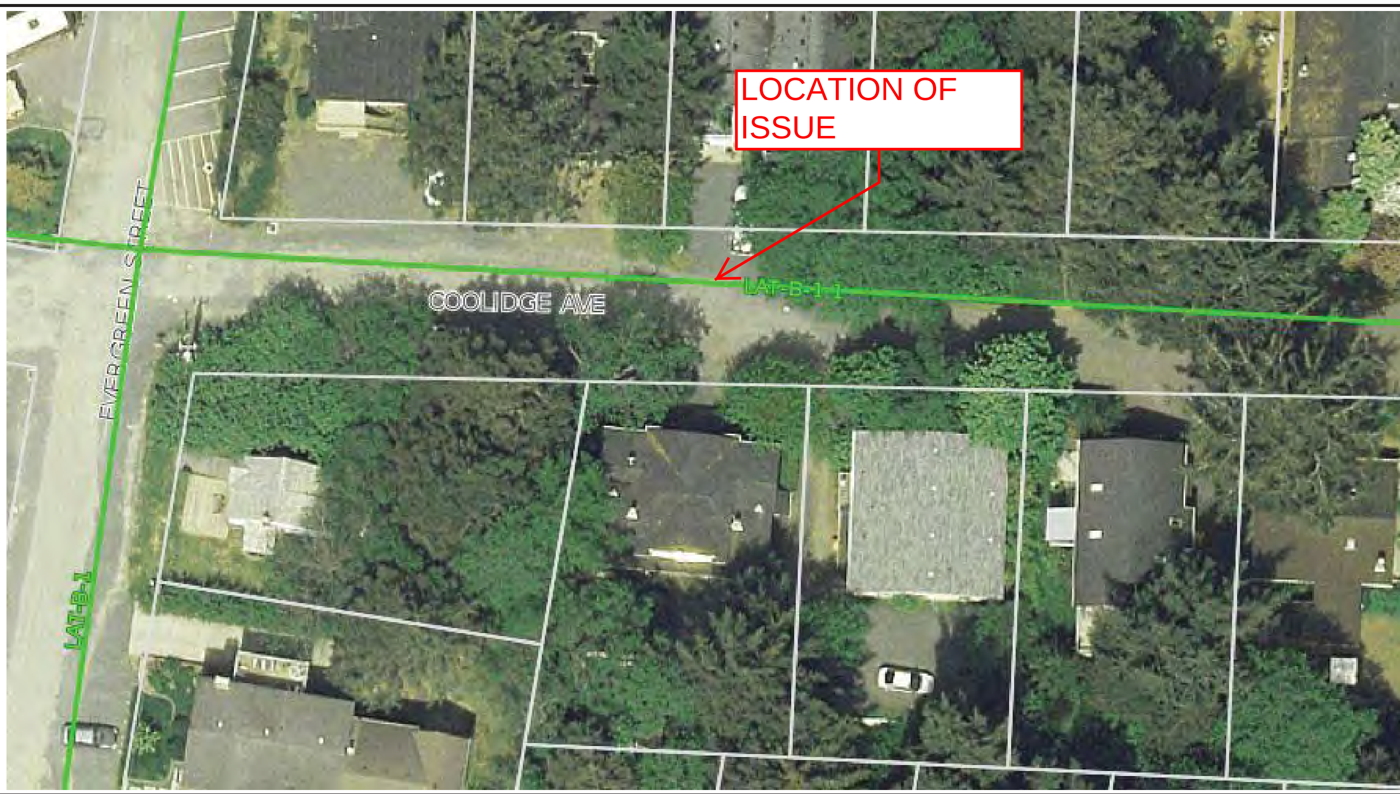
Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 05:21 ☐ a.m. ☑ p./ .

Street Address/Location: 168 COOLIDGE **Smoke from Manhole No.** UNKOWN

Observer: JBJ **Location of Manhole:** COOLIDGE

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM GROUND AROUND THE MANHOLE

Probable Cause:

THE GROUT IN THE MANHOLE HAS FAILED

Recommendations:

CHECK THE CONDITION OF THE GROUT AND REPAIR/REPLACE AS NEEDED

Inflow and Infiltration Study - Smoke Testing Report Form

UNMARKED MANHOLE ON COOLIDGE STREET

Note:

INTERSECTION OF COOLIDGE AND HEMLOCK

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 05:53 ☐ a.m. ☑ p.m.

Street Address/Location: 964 S HEMLOCK ST **Smoke from Manhole No.** R3

Observer: ANDREW MATSUMOTO **Location of Manhole:** HARRISON ST & ROCK CT

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

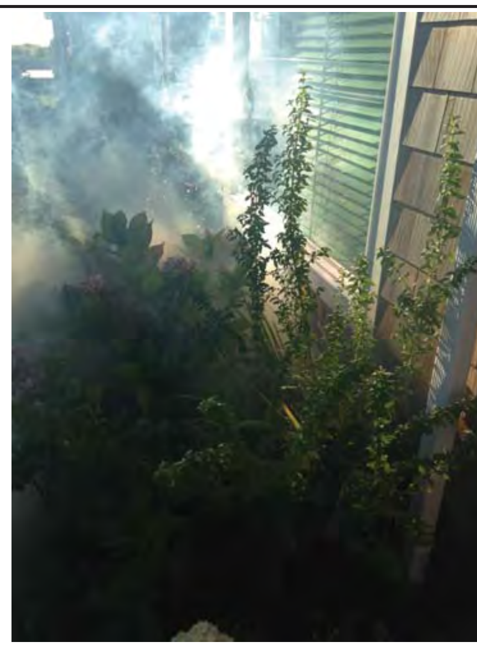
SMOKE EMERGED FROM BEHIND A BUSH NEAR THE SOUTHWEST CORNER OF THE COURTYARD HOTEL

Probable Cause:

BROKEN/MISSING CLEANOUT OR BROKEN LATERAL

Recommendations:

NOTIFY HOTEL MANAGEMENT



Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/15/16 **Time:** 06:48 ☐ a.m. ☑ p.m.

Street Address/Location: 188 JACKSON ST **Smoke from Manhole No.** M3-9

Observer: ANDREW MATSUMOTO **Location of Manhole:** JACKSON ST & HEMLOCK ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE RISING FROM THE GROUND AGAINST THE WALL OF THE BUILDING. LOCATION WAS INACCESSIBLE.

Probable Cause:

UNKNOWN

Recommendations:

NOTIFY HOTEL MANAGEMENT

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Inflow and Infiltration Study - Smoke Testing Report

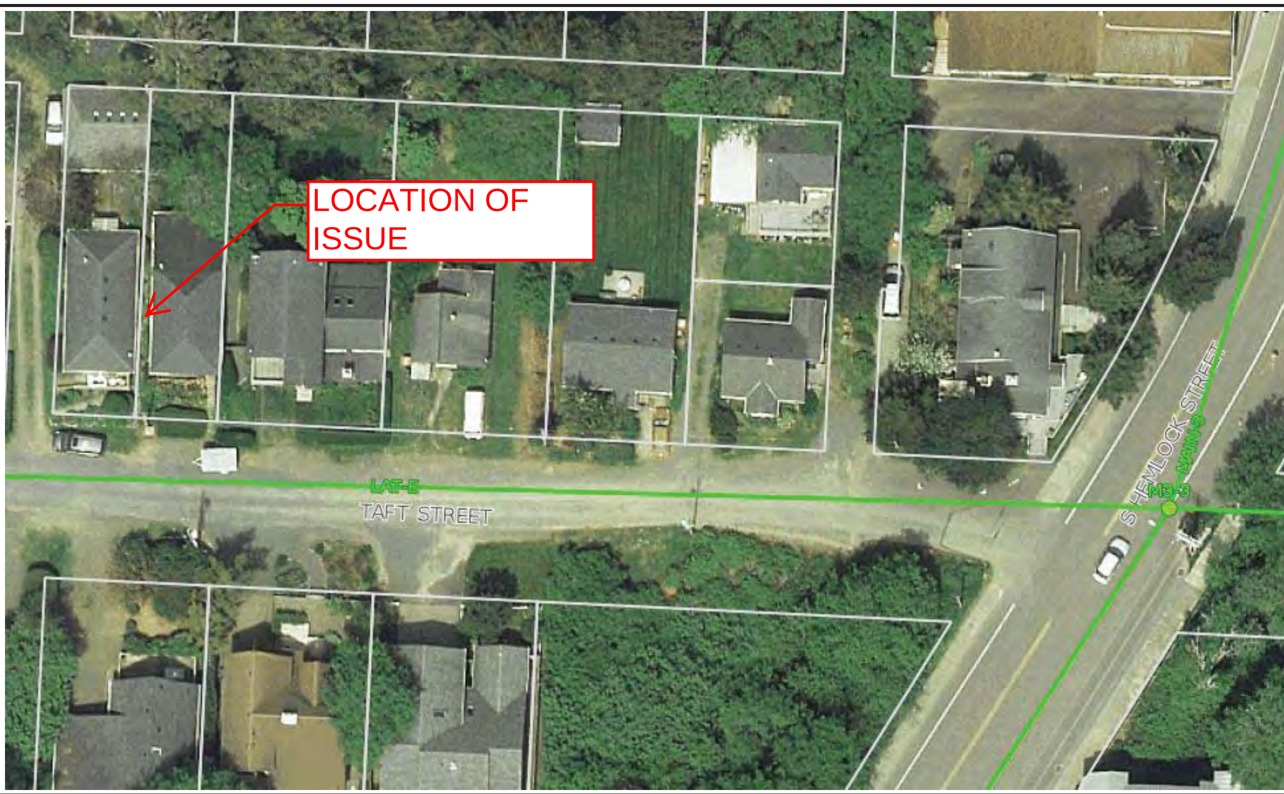
Client: CITY OF CANNON BEACH **Date:** 9/16/16 **Time:** 07:55 ☐ a.m. ☑ p./ .

Street Address/Location: 180 TAFT **Smoke from Manhole No.** M3-3

Observer: JBJ **Location of Manhole:** S HEMLOCK ST/ TAFT ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)



X

Observed Smoke Indicator:

SMOKE FROM GROUND

Probable Cause:

BROKEN LATERAL OR MISSING CLEAN OUT CAP

Recommendations:

VERIFY LOCATION OF LATERAL, CHECK FOR MISSING CLEANOUT CAP, REPAIR/REPLACE LATERAL OR CAP AS NEEDED

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/16/16 **Time:** 08:51 ☑ .m. ☐ p./ .

Street Address/Location: 3RD STREET - WESTWIND UNIT #10 **Smoke from Manhole No.** M-1-5

Observer: DCV **Location of Manhole:** E 3RD STREET

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM SEWER
CLEANOUT IN PARKING AREA
NORTH OF WESTWIND UNIT #10

Probable Cause:

POOR FITTING CLEANOUT CAP

Recommendations:

REPLACE/REPAIR

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/16/16 **Time:** 09:05 ☐ a.m. ☑ p.m.

Street Address/Location: 364 SPRUCE ST **Smoke from Manhole No.** NOT LABELLED

Observer: ANDREW MATSUMOTO **Location of Manhole:** SPRUCE ST

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE RISING FROM GROUND NEAR DOORWAY

Probable Cause:

LOOSE/BROKEN CLEANOUT CAP

Recommendations:

NOTIFY HOMEOWNER

Inflow and Infiltration Study - Smoke Testing Report Form

LOCATION OF ISSUE

Note:

Note:

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Inflow and Infiltration Study - Smoke Testing Report

Client: CITY OF CANNON BEACH **Date:** 9/16/16 **Time:** 10:12 ☑ .m. ☐ p./ .

Street Address/Location: 539 N LAUREL **Smoke from Manhole No.** A-8

Observer: DCV **Location of Manhole:** N LAUREL STREET

Sketch of Area

(Location of MH, Street, any structures, areas smoke was observed, etc.)

X

Observed Smoke Indicator:

SMOKE COMING FROM SEWER
CLEANOUT IN PARKING AREA NEAR
FRONT DOOR

Probable Cause:

MISSING CLEANOUT CAP

Recommendations:

REPLACE/REPAIR

Appendix B- Television Survey Documentation

The tables shown in this section are included as a reference to the types of deficiencies identified by the 2016 television inspections. Please refer to the original survey logs when planning repair projects.

For the tables shown in this section, the linear footage location represents the distance from the point of camera insertion to the identified landmark in the pipe. When possible, the starting manhole is identified in bold. In some instances, the television inspection log did not indicate the starting manhole, and the starting manhole had to be inferred based on comments presented in the deficiency log.

Deficiencies Identified Along 5th Street

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
5th St (A-2 TO **A-1**)	
Manhole A-2 is leaking	

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
5th St (A3 TO **A2**)	
Manhole A3 is leaking	

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Antler Ave (A3-1 TO **A-2**)	
No Observed Problems	

Deficiencies Identified Along South Hemlock Street

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
S Hemlock St (**M3-5** TO M3-4)	
Evidence of infiltration at joint	19.3
Water running at joint	36.9
Evidence of infiltration	160.9

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Hemlock St (**M3-6** TO M3-5)	
Infiltration at the joint (light)	22.5
Service (top left) with infiltration	75.3
Infiltration at the joint (light)	101.2
Infiltration at the joint (light)	104.8
Infiltration at the joint	115.4
Infiltration at the joint (light)	126
Infiltration at the joint (light)	150.9
Infiltration at the joint (medium)	168.7

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Hemlock St (**M3-7** TO M3-6)	
Infiltration at the joint (light)	2
Infiltration at the joint (medium)	41.1
Infiltration at the joint (medium)	62.8
Infiltration at the joint (light)	145.1
Infiltration at the joint (medium)	177.4

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Hemlock St (**M3-8** TO M3-7)	
Infiltration at the joint (light)	205.3
Infiltration at the joint	222.5

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Washington St (**F1** TO M3-4)	
Service (right) with light roots	279.1

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Washington St (**F1-1** TO M3-4)	
Lateral is offset to the wye with light roots	30.9
Field tap protruding with evidence of leaking	179.4
Service (right) leaking at the wye	195.2
Radial fracture and small hole at service (right)	282.4
Pin hole leaking	340.7

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Adams St (G-1 TO **M3-5**)	
Longitudinal crack with signs of leaking	288
Longitudinal crack with signs of leaking	300.4

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Adams St (G-1-1 TO **M3-5**)	
No Observed Problems	

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jefferson St (**H-1** TO M3-6)	
Hole in service with void	69.2
Infiltration at joint	120.3
Leaking at joint	151.8
Service (right) leaking at wye	237.6
Service (left) leaking at wye	269.6
Service (right) leaking in wye	309.1
Evidence of infiltration at MH M3-6 ring joints	363.2

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jefferson St (**H1-1** TO M3-6)	
Service (right) leaking	24.6
Infiltration at the joint	25.8
Infiltration	38.1
Infiltration at the joint	41
Service (left) with infiltration at the wye	65.4
Infiltration at the joint	67.2
Infiltration at the joint	82.1
Infiltration at the joint	187.5
Infiltration at the joint	200.5
Infiltration at the joint	206.2
Service (right) leaking	218.4
Infiltration at the joint	219.6
Service (left) leaking in the wye	246.2

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jefferson St (H1-2 TO **H1-1**)	
Crack	3.5
Crack with evidence of leaking	15.7
Infiltration at the joint	16.3
Pin hole that has been leaking	27
Pin hole that has been leaking	28.8
Hairline crack	33.6
Service (right) capped and leaking	37.4
Multiple hairline cracks	40.1
Pin holes with evidence of leaking	42.2
Infiltration at the joint	46.3
Crack with evidence of leaking	48.1
Multiple heairline cracks	51.8
Radial crack with evidence of leaking	53.9
Radial crack with evidence of leaking	55.3
Multiple fractures with evidence of leaking	56.8
Infiltration at the joint	58.5
Multiple cracks with evidence of leaking	59.8
Service (right) capped and leaking	64.6
Crack with evidence of leaking	66.3
Crack with evidence of leaking	69.5
Infiltration at the joint with visible light roots	70.9
Pin hole that has been leaking	73.5
Field tap (left) that has been leaking	74.6
Radial fracture at field tap that has been leaking	74.6

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Madison St (**J-1** TO M3-7)	
Joint offset	3
Infiltration at joint	197.4
Infiltration prior to MH	428.8

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Madison St (J1-2 TO **J1-1**)	
Infiltration at joint	2.5

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Monroe St (**K1** TO M3-8)	
Service (left) leaking with iron oxide buildup	38.8
Service (right) leaking with iron oxide buildup	40.5
Service (left) leaking in the wye	42
Service (left with infiltration in lateral	195.7
Service (left) leaking inside	293.2
Service (right) leaking with iron oxide accumulation in the wye	294.9

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Monroe St (K1-1 TO **M3-8**)	
Service (right) leaking with heavy iron oxide buildup	106.8
Infiltration at the joint	175.8

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Monroe St (**K1-2** to K1-1)	
Service (left) is leaking at the wye	66.1
Radial crack at service that has been leaking	155.6
Field tap (left) has been leaking at main	156.6
Service (left) leaking inside lateral	184.1
Pin hole that has been leaking	185
Service (right) almost filled with iron oxide buildup and a constant flow of water infiltration	219.4
Pin holes leaking	270.7

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Monroe St (K1-3 TO **K1-2**)	
Infiltration at the joint	8
Service (left) has been leaking	54.4
Infiltration at the joint	240.8
Radial crack leaking at the service	288.4

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Monroe St (K1-4 TO **K1-3**)	
Infiltration at the joint	69.2

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jackson St (**L7** TO M3-9)	
Service (left) blocked with debris	4
Broken pipe around service	4
Light roots at joint	174
Service (right) with buildup in the wye	253.8

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jackson St (**L1-1** TO M3-9)	
Radial crack that has been leaking	22.3
Service (right) leaking in lateral	47.4
Radial crack that has been leaking	299.6

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jackson St (**L1-2** TO L1-1)	
Service (left) with evidence of infiltration	77.5
Service (left) with infiltration in the wye	111.9
Infiltration at the joint	165.5
Service (left) with evidence of infiltration	214.7

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Jackson St (L1-3 TO **L1-2**)	
Medium to heavy infiltration at radial crack at field tap	211.5
Service (left) with light roots	386.6
Service (right) with light roots	426.1

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Van Buren St (**N1** TO M3-10)	
Service (right) shows evidence of infiltration in lateral	146.4
Service (left) leaking at the wye	270.4

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Van Buren St (**N1-1** to M3-10)	
Leaking around lateral	138.6

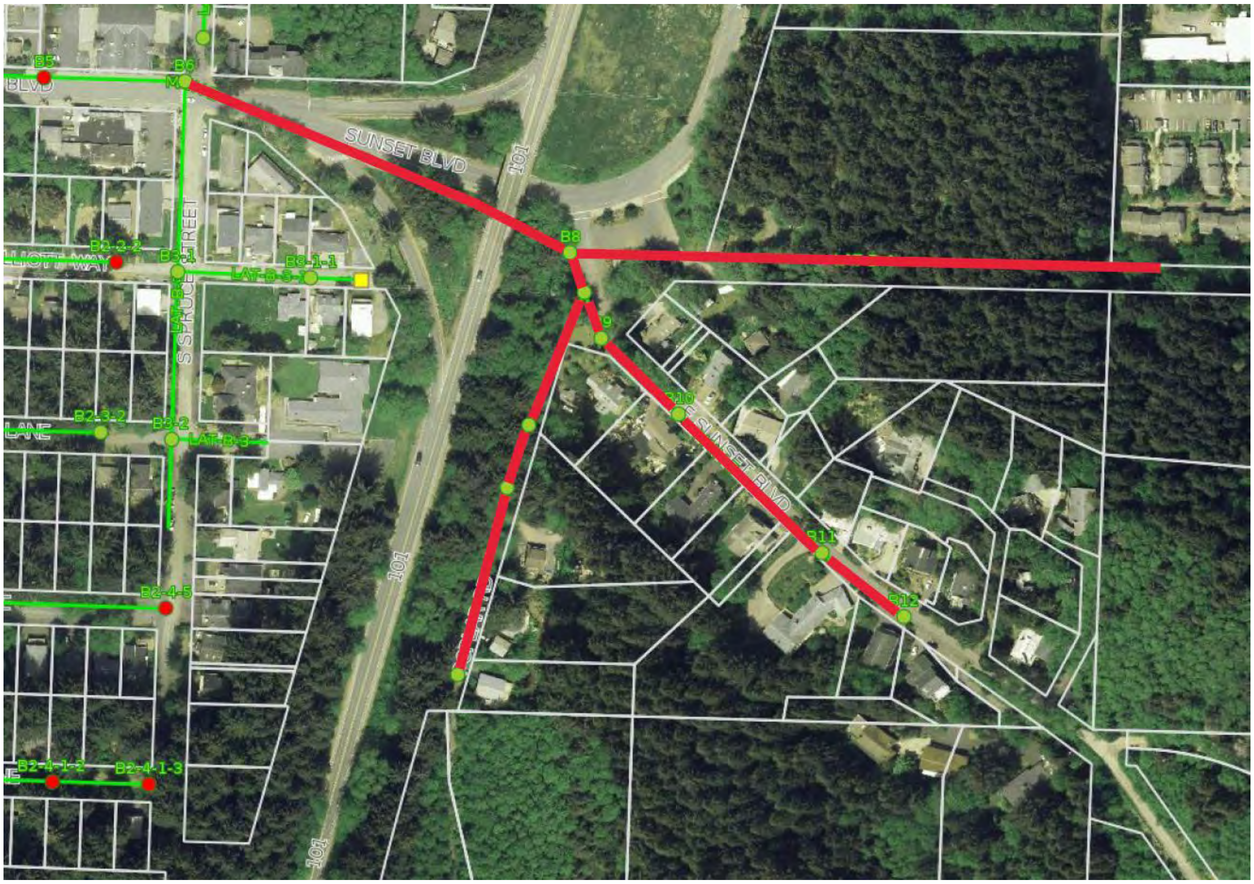
PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Van Buren St (**N1-2** TO N1-1)	
Infiltration (Gusher)	84
Cracks	84
Service (right) leaking in the wye	202.2

PIPE AND COMMENTS (UPSTREAM MH TO DOWNSTREAM MH)	LINEAR FOOTAGE LOCATION
Van Buren St (N1-3 TO **N1-2**)	
Heavy infiltration in Manhole N1-3	0

Appendix C- Recommendation Maps

Sections of sanitary sewer pipe along S Hemlock St and Harrison St recommended for television inspection.

Sections of sanitary sewer pipe along S Spruce St, Elliott Way, and Hills Lane recommended for television inspection.



Sections of sanitary sewer pipe along Sunset Blvd recommended for television inspection.

Sections of sanitary sewer pipe along S Pacific St, Nelchena St, and S Hemlock St recommended for television inspection.

Section of sanitary sewer pipe along Umpqua St recommended for television inspection.

Section of sanitary sewer pipe along Surfcrest Ave and under US Hwy 101 recommended for television inspection.

APPENDIX C

Biosolids Management Plan

Biosolids Management Plan
The City of Cannon Beach
NPDES Permit No. 1002237
File No. 13729
Daniel Grassick P.E.
503-436-8066

INTRODUCTION

The City of Cannon Beach owns and operates a municipal wastewater collection and treatment system and manages a biosolids land application program. Wastewater processed by the treatment works is primarily of domestic origin. Because there are no industrial sources of wastewater, no formal pretreatment program is required to be implemented under the NPDES permit. The City of Cannon Beach does not collect or process septage.

This biosolids management plan, as required by the NPDES permit, outlines the liquids and solids processes at the facility, how biosolids are managed to meet federal and state requirements, and how the biosolids management program is operated. The City of Cannon Beach's biosolids management plan was originally approved by the Oregon Department of Environmental Quality Northwest Region in 1999, and is being updated at this time as a requirement for application to the 2016 permit renewal.

WASTEWATER TREATMENT FACILITY

Liquids Processing

The City of Cannon Beach operates a wastewater treatment plant located at 295 East 2nd Street, Cannon Beach, in Clatsop County, Oregon. Treated effluent is discharged year-round to Ecola Creek via unnamed wetlands at river mile 1.0. The current wastewater treatment plant is an extended aeration, activated sludge type with integral clarifiers, using Biolac treatment equipment and was built in 2007. Based on average 2015 water consumption rates, the origin of the wastewater processed is 53 percent domestic, 47 percent commercial, and 0 percent industrial.

Raw sewage is conveyed to the wastewater treatment plant by the two primary lift stations of the system, Main and Pacific. The Main lift station has a firm capacity of 2,350 gpm (3.38 MGD). The Main lift station force main pumps directly to the headworks of the wastewater treatment plant. The Pacific lift station has a firm capacity of 1,430 gpm, or (2.06 MGD). The Pacific lift station force main pumps to a discharge manhole approximately 500 feet south of the headworks, the wastewater then flows via gravity the remaining 500 feet to the headworks.

Flow enters the 24" wide headworks and then passes an automated screw-type mechanical fine screen with 0.250" spacing. The bypass channel has a manual bar screen with 1.625" bar spacing. Immediately following screening, the flow is measured at a 9" Parshall flume. The headworks screens and the Parshall flume have a peak hourly flow capacity of 4.83 MGD. After the Parshall flume, the sewage enters a 9,500 gallon mixing chamber where magnesium hydroxide is used for pH/alkalinity adjustment.

Next, the sewage proceeds to a 2-way splitter box where it is directed to either one or both of the Biolac aeration basins. The Biolac system at Cannon Beach has an average dry weather design flow rate of 0.87 million gallons per day (MGD), and an average wet weather design flow rate of 1.13 MGD. The design peak day flow for the Biolac system is 3.42 MGD. Actual measured influent flows from May to October 2015 averaged 0.48 MGD and during the wet season flows averaged 0.84 MGD. The actual measured Peak day flow for 2015 was 3.37 MGD, on this day 4.65 inches of rain fell, approaching the 5.00 inch 5 year 24-hour storm event. Typically, the plant is run on one aeration basin. After the aeration basins, the flow passes into integrated clarifiers. The clarifiers separate activated sludge from the treated wastewater. Treated wastewater then flows through a 20-inch mag-flow meter, then to the UV disinfection channel. The UV channel runs 48 bulbs and can handle flows up to 3.94 MGD. After the UV disinfection channel, the effluent is sampled and then flows via gravity to the wetland area just east of Highway 101.

The clarifiers employ an airlift pump that pumps activated sludge up to a splitter box at the top of the clarifier. The majority of the activated sludge is returned, via gravity from the activated sludge box, to the pH/Alkalinity mixing box. A motorized control valve on the sludge splitter box is periodically opened to allow the wasting of activated sludge to the waste activated sludge lift station. The WAS lift station pumps at 157 gpm, and is operated for a total of 60 minutes per day during the winter and 90 minutes per day during the summer. The WAS lift station pumps wasted sludge to the sludge storage lagoons.

There are four sludge storage lagoons. Lagoon One has a total volume of 6.84 MG, Lagoon Two has a total volume of 8.13 MG, Lagoon Three has a total volume of 7.82 MG, and Lagoon Four has a total volume of 6.06 MG. Waste activated sludge is “wasted” to ports around the perimeter of the sludge storage basins. Discharge to the waste activated sludge effluent ports around the perimeter of the sludge store basins are alternated periodically to avoid sludge buildup in one area.

Since the previously approved biosolids management plan was approved in 1999, the wastewater treatment plant has been converted from a lagoon style treatment plant to a mechanical activated sludge process in 2007. With the conversion of the treatment plant, the treatment lagoons were converted to sludge storage lagoons to accommodate the waste sludge generated by the new activated sludge style wastewater treatment plant.

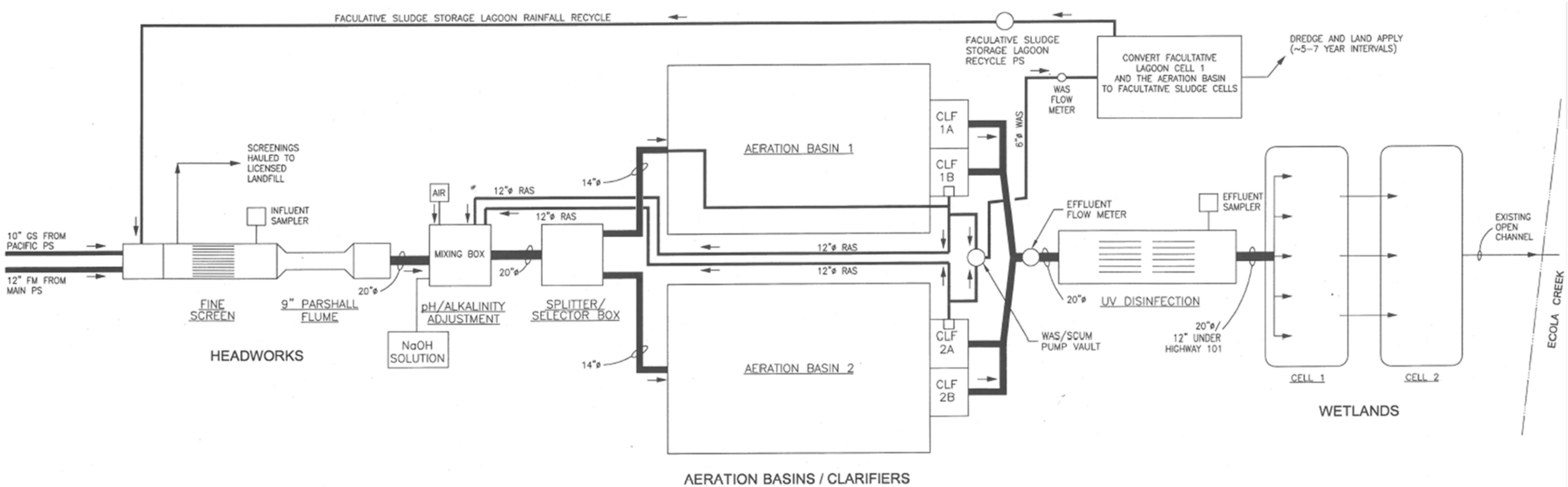
Cannon Beach is unique in that they have a large influx of population in the summer months due to tourism. This large increase in population on average effectively doubles BOD and TSS loading, and increases daily average base flows approximately 40% from 0.40 MGD to 0.56 MGD. Due to I/I and the extreme length of the collection system, Cannon Beach has experienced peak wet weather flows up to 8 times higher than their base flow of 0.40 MGD.

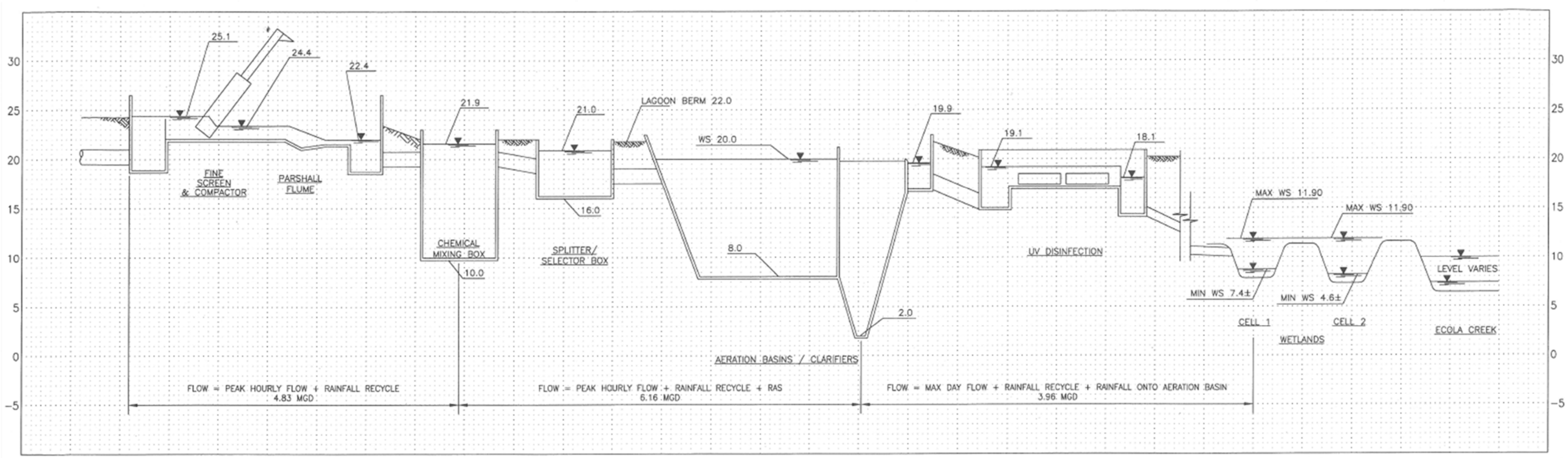
The Cannon Beach wastewater treatment plant is allowed to discharge treated effluent year-round to the unnamed wetlands that ultimately flow to river mile 1.0 of the Ecola Creek. During seasonally high flows, the plant may switch to running both aeration basins in parallel to increase hydraulic retention times.

Waste activated sludge flows from the clarifiers to the waste activated sludge lift station where it is then pumped to the sludge storage lagoons. Each sludge lagoon has from 9 to 14 wasting ports running along the south and west banks. Sludge is typically pumped from two ports of one lagoon for 30 days, and then to the next pair of ports until all ports have been used, resulting in 4-7 months of sludge discharge to each lagoon. Then the sludge flow is directed to the first two ports of the next lagoon in rotation, and so on.

The 9" Parshall Flume after the headworks measures all flow coming into the treatment plant. A magnetic flow meter after the clarifiers measures the liquid stream effluent line prior to the UV disinfection channel and discharge from the plant. A separate magnetic flow meter after the waste activated lift station measures WAS pumped to the sludge storage lagoons.

Process Schematic and Hydraulic Profile





Solids Processing

Waste activated sludge is pumped from the Biolac clarifiers to one of four sludge stabilization/storage lagoons. The waste activated sludge pump is rated at 157 gpm and runs for approximately 60 minutes per day during the winter months and 90 minutes per day during the summer months. Waste activated sludge is pumped to different areas of each lagoon, and rotated periodically between the four lagoons. Total combined volume of all four facultative sludge storage lagoons is 28.85 million gallons. At the completion of the 2015 sludge storage lagoon profile, the current volume of sludge stored to date was 6.98 million gallons, or 24.18% of the total volume of all four lagoons.

Since the conversion of the stabilization lagoons to facultative storage lagoons in 2007, no biosolids have been removed from the lagoons. Annual sludge profiling of the lagoons suggests digestion may be taking place, as the thickness of the sludge layer in the lagoons appears to be increasing at a very slow rate. On average, the sludge layer shows an increase of 0.65 inches per year over the last four years.

Over the past four years, an estimated 21.5 million gallons of sludge at an estimated 5-8% solid sludge concentration has been pumped into the four sludge storage lagoons. This amount of sludge dewatered and compressed would yield a sludge layer 3.62 inches thick. Over the past four years, the average level of the actual submerged sludge layer has risen only 2.60 inches indicating that a moderate degree of sludge digestion is taking place. If the current rates of sludge input and sludge digestion were to continue in a linear fashion, it is estimated that that the sludge storage lagoons would not have to be dredged or pumped out until approximately 2047 when the sludge layer would be half as deep as the lagoons on average. Currently the average sludge layer thickness is approaching 25 percent of the overall lagoon depth. Cannon Beach has an annual profile done of the sludge lagoons by OAWU (Oregon Association of Water Utilities). In the OAWU reports for 2011-2015 it is noted that, *"As wastewater lagoon sludge volumes reach 15 percent, operational concerns may begin. However, most of these problems are not visibly noticeable at the time. After sludge levels reach 33 percent, it becomes challenging to remain in compliance with the NPDES permit. Once sludge levels reach the 50 percent level, the lagoon cease to function properly."* This would indicate that digestion rates have the potential to start slowing down as the layer thickens. Conservatively, it would be prudent to plan for exporting sludge once the levels approach the 33 percent mark, which should occur at the latest in 2026 provided that the sludge digestion/loading rates remain consistent.

Pretreatment Program

The City of Cannon Beach is not required at this time to implement an industrial wastewater pretreatment program as the City of Cannon Beach has no industrial sources of wastewater. Pollutant monitoring requirements as stated in the permit will ensure land application of biosolids occurs within federal and state limitations.

BIOSOLIDS TREATMENT PROCESSES

Under 40 CFR Part 503 and Oregon Administrative Rules Chapter 340, Division 50, pathogen reduction and vector attraction reduction for biosolids must be met prior to land application. Vector attraction reduction requirements can also be met at the time of land application if biosolids are injected below the surface of the land or incorporated into the soil within 6 hours after application to the land. Biosolids are categorized as Class A or Class B depending on the method used to accomplish pathogen and vector attractant reduction. Biosolids may also be classified as exceptional quality (EQ) if the product meets: pollutant concentration limits in 40 CFR Part 503, one of the Class A pathogen reduction alternatives in 40 CFR §503.32(a), and one of the vector attraction reduction options in 40 CFR §503.33(b)(1) through (8). To meet regulatory requirements, pathogen reduction must be met before or at the same time that vector attraction reduction is achieved.

The City of Cannon Beach will certify in writing that Class B pathogen requirements and vector attraction reduction requirements are met. The City of Cannon Beach will also notify the Department in writing and obtain written approval prior to any process change that would use a pathogen reduction or vector attraction reduction method other than what is specified in this biosolids management plan.

In the event that testing indicates that Class B pathogen requirements and vector reduction cannot be met, The City of Cannon Beach will have the biosolids removed and hauled locally to the Class A treatment facility located at the wastewater treatment plant in the City of Seaside.

Pathogen Reduction

Pathogen reduction requirements of 40 CFR Part 503 and OAR 340-050 are verified through Alternative 1 of the Class B Pathogen Requirements.

Class B Pathogen Requirements

☒ Alternative 1: The geometric mean of the density of fecal coliform of seven representative samples shall be less than either 2 million Most Probable Number (MPN) or 2 million Colony Forming Units (CFU) per gram of total solids (dry weight basis).

Vector Attraction Reduction

Vector attraction reduction requirements of 40 CFR Part 503 are met through Option 1 of the Vector Attraction Reduction Options.

Vector Attraction Reduction Options
**Note: Must meet one of the following options. Check applicable option(s).*

40 CFR Part 503 Requirement		What is Required?	Most Appropriate For:
☒	Option 1 503.33(b)(1)	At least 38% reduction in volatile solids during sewage sludge treatment	Sewage sludge processed by: Anaerobic biological treatment Aerobic biological treatment

BIOSOLIDS STORAGE

Treatment Facility

From the waste activated sludge lift station liquid sludge is pumped to one of four storage lagoons. Storage Lagoon One is 4.20 acres in surface area and 5 feet deep on average. Storage Lagoon Two is 4.16 acres in surface area and 6 feet deep on average. Storage Lagoon Three is 4.00 acres in surface area and 6 feet deep on average. Storage Lagoon Four is 1.86 acres in surface area and 10 feet deep on average. The sludge storage lagoons have a combined area of 14.22 acres. The combined volume of the sludge storage lagoons is 28.85 million gallons. Capacity-wise, the four lagoons are approximately 10 years into a 20-year cycle. The four lagoons will be dredged sequentially on a four-year plan, with each lagoon being taken out of service and dredged for that year. Further pathogen reduction is achieved through facultative processes due to the extended residence time in the sludge storage lagoons prior to the biosolids being land applied.

Staging

The unloading and placement of biosolids in one area at a land application site may occur on a limited time basis. If staging of biosolids occurs, the requirements outlined in the site authorization letters for each site will be followed.

Field Storage

Field storage is not authorized by the Department at this time.

TRANSPORTATION

The City of Cannon Beach will contract out the dredging and pumping to Baker tanks and centrifuging. The City will notify DEQ in advance as to who will be the biosolids transport contractor. The trucks will be loaded at the lagoons to transport dewatered biosolids from the wastewater treatment facility to DEQ authorized land application sites. The City of Cannon Beach will be able to handle the volume of biosolids produced through these dredging and transportation practices.

REMEDIAL PROCEDURES

All spills into waters of the state or spills on the ground surface that are likely to enter waters of the state will be reported immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and the Department's Regional Biosolids Coordinator at (503) 229-5347. All spills of 50 gallons or more (or larger than the volume of a 55-gallon drum) on the ground surface will be reported to OERS and to the Department's Regional Biosolids Coordinator within 24 hour(s) of the spill incident.

The City of Cannon Beach or its contracted hauling/transportation agent is responsible for cleanup of any biosolids spills that occur while transporting to land application sites. If a spill occurs during the transport of biosolids between the wastewater treatment facility and the land application site, the City of Cannon Beach or its contracted agent will:

- Contain the spill.
- Post the area and set up temporary fencing if there is a potential for public exposure.
- Remove spilled biosolids with a front end loader or shovel.
- Cover the area with dry lime if needed.
- Apply absorbent (e.g., sand) if needed.
- Transport spilled product to a Department authorized biosolids land application or disposal site.

Solids Treatment Process Failure or Modification

If a mechanical problem occurs with the dredging or dewatering equipment and replacement parts are not in stock at the treatment facility, an emergency parts order will be placed. During this period, work would cease. If work is to be stopped for more than 24 hours, the Department will be notified. Two centrifuge units will be on-site for redundancy.

If maintenance is needed on a treatment process component that will affect compliance with pathogen reduction or vector attraction reduction requirements, the City of Cannon Beach will notify the Department and get approval prior to the maintenance activity.

MONITORING AND REPORTING

Monitoring and Sampling Program

The City of Cannon Beach has developed and implemented a biosolids monitoring and sampling plan in August 2016 to determine if the solids dredged from the lagoons meet the requirements for land application of Class B biosolids. Samples collected and analyzed will be representative of the biosolids to be land applied. Quality control measures and procedures will be implemented for microbiological tests to verify precision and accuracy. Sampling location(s) stated will demonstrate how Pathogen Reduction Alternative 1, and Vector Attraction Reduction Option 1 are met. The plan includes:

- The sampling locations, 7 locations per lagoon cell
- How samples will be collected, preserved and transported
- The analytical method for each analysis.

All monitoring and reporting will be conducted in accordance with the City of Cannon Beach's NPDES permit. The City of Cannon Beach is required to sample biosolids only when removal of solids for land application is planned.

Recordkeeping and Reporting Procedures

The City of Cannon Beach as the preparer and land applier of biosolids is required to maintain records to demonstrate that federal and state biosolids requirements are met. Records will be kept on file by the City of Cannon Beach and will be available upon request by the Department. Monitoring and sampling records will be retained for a period no less than 5 years, unless otherwise required by the NPDES permit or a site authorization letter. The minimum required records include the following information:

- Pollutant concentrations of each parameter stated in the permit.
- Pathogen requirements as stated in the permit for Class B.
- Description of how one of the vector attraction reduction requirements in 40 CFR §503.33(b)(1) through (8) are met.
- Description of how the management practices in 40 CFR §503.14 and site restrictions in 40 CFR §503.32(b)(5) are met for each biosolids land application site.
- Certification that the information submitted is accurate to determine compliance with pathogen and vector attraction reduction requirements, and site restriction/management requirements.

Annual Reporting

A biosolids annual report is required to be submitted to the Department each year by February 19th or as required by the permit if bulk biosolids have been land applied, or biosolids derived products were sold or given away the previous year. The report will include information on biosolids handling activities and data (i.e., monitoring results, nutrient loading rates) from the previous calendar year. Some of the information required with the annual report includes:

- Daily site logs or records, including date, time, and quantity (gallon, pounds) of nitrogen/acre land applied.
- Map, including scale, showing the site and the land application location that coincides with the daily site application method (e.g., truck spreader bar, irrigation cannon).
- Signed copy of the certification statement (see next section on Certification Statement).

Certification Statement – Generator, The City of Cannon Beach

The City of Cannon Beach is capable of meeting Class B pathogen reduction and vector attraction reduction requirements. As required under 40 CFR §503.17, the City of Cannon Beach must retain a certification statement indicating whether compliance with pathogen reduction, vector attraction reduction, and certain site restrictions have been met. The certification statement must be retained for a period of five years, and must be submitted with the annual report that is due February 19th or as required by the permit.

The City of Cannon Beach will retain the following certification statement and it will be signed by a principal executive officer or ranking elected official or their duly authorized representative (e.g., individual or position having responsibility for the overall operation of the system, such as the position of plant manager, supervisor, superintendent or equivalent responsibility).

> "I certify, under penalty of law, that the information that will be used to determine compliance with the Class B pathogen requirements in 40 CFR §503.32(b)1, the vector attraction reduction requirement in 40 CFR §503.33(b)1, and the site restrictions in 40 CFR §503.32(b)(5) for each site on which Class B sewage sludge was applied, was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment."

Signature____Date______________________

The City of Cannon Beach is also required as the land applier to certify that the management practices in 40 CFR §503.14 are being met. This certification includes that biosolids are being land applied at approved agronomic loading rates as specified in department issued site authorization letters.

> "I certify, under penalty of law that the management practices in 40 CFR §503.14 have been met for each site on which bulk biosolids is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices have been met. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment."

Signature____Date______________________

BIOSOLIDS CHARACTERISTICS

Pollutant Characteristics

The following tables are representative biosolids analysis for pollutant characteristics. This data and all previous data indicate that pollutant concentrations for all regulated pollutants have been met.

Lagoon 1 Parameters	Biosolids Analytical Result (mg/kg)	Sample Date	40 CFR §503.13(b)(3) Pollutant Concentration Limits (mg/kg)
Arsenic (As)			41
Cadmium (Cd)			39
Chromium (Cr)			-
Copper (Cu)			1500
Lead (Pb)			300
Mercury (Hg)			17
Molybdenum (Mo)			-
Nickel (Ni)			420
Selenium (Se)			100
Zinc (Zn)			2800

Lagoon 2 Parameters	Biosolids Analytical Result (mg/kg)	Sample Date	40 CFR §503.13(b)(3) Pollutant Concentration Limits (mg/kg)
Arsenic (As)			41
Cadmium (Cd)			39
Chromium (Cr)			-
Copper (Cu)			1500
Lead (Pb)			300
Mercury (Hg)			17
Molybdenum (Mo)			-
Nickel (Ni)			420
Selenium (Se)			100
Zinc (Zn)			2800

Lagoon 3 Parameters	Biosolids Analytical Result (mg/kg)	Sample Date	40 CFR §503.13(b)(3) Pollutant Concentration Limits (mg/kg)
Arsenic (As)			41
Cadmium (Cd)			39
Chromium (Cr)			-
Copper (Cu)			1500
Lead (Pb)			300
Mercury (Hg)			17
Molybdenum (Mo)			-
Nickel (Ni)			420
Selenium (Se)			100
Zinc (Zn)			2800

Lagoon 4 Parameters	Biosolids Analytical Result (mg/kg)	Sample Date	40 CFR §503.13(b)(3) Pollutant Concentration Limits (mg/kg)
Arsenic (As)			41
Cadmium (Cd)			39
Chromium (Cr)			-
Copper (Cu)			1500
Lead (Pb)			300
Mercury (Hg)			17
Molybdenum (Mo)			-
Nickel (Ni)			420
Selenium (Se)			100
Zinc (Zn)			2800

Nutrient Characteristics and Other Parameters

The following table is a representative biosolids analysis for nutrient characteristics and other parameters.

Lagoon 1 Parameters/measurement units	Biosolids Analytical Result	Sample Date
Total solids, percent		
Volatile solids, percent		
TKN, percent		
NO_3-N, percent		
NH_4-N, percent		
Phosphorus (P), percent		
Potassium (K), percent		
pH, standard unit		

Lagoon 2 Parameters/measurement units	Biosolids Analytical Result	Sample Date
Total solids, percent		
Volatile solids, percent		
TKN, percent		
NO_3-N, percent		
NH_4-N, percent		
Phosphorus (P), percent		
Potassium (K), percent		
pH, standard unit		

Lagoon 3 Parameters/measurement units	Biosolids Analytical Result	Sample Date
Total solids, percent		
Volatile solids, percent		
TKN, percent		
NO_3-N, percent		
NH_4-N, percent		
Phosphorus (P), percent		
Potassium (K), percent		
pH, standard unit		

Lagoon 4 Parameters/measurement units	Biosolids Analytical Result	Sample Date
Total solids, percent		
Volatile solids, percent		
TKN, percent		
NO_3-N, percent		
NH_4-N, percent		
Phosphorus (P), percent		
Potassium (K), percent		
pH, standard unit		

BIOSOLIDS UTILIZATION PROGRAM

A percentage of biosolids generated by the City of Cannon Beach will be beneficially used through land application. The following biosolids land application plan outlines agronomic application rate and site crops, where biosolids are land applied, site selection criteria for a new site, and site and crop management practices.

BIOSOLIDS LAND APPLICATION PLAN

Given the significant time before any land application is likely to take place, it is anticipated that potential application sites, haulers, and applicators may change. The City anticipates land application activities will take place no sooner than 2026, and will provide all details pertinent to biosolids land application to DEQ 2 years prior to said activities.

Agronomic Application Rate and Site Crops

Class B biosolids are required to be land applied to a site at a rate that is equal to or less than the agronomic rate for the site. An agronomic rate is the whole biosolids application rate (dry weight basis) designed to provide the annual total amount of nitrogen needed by a crop and to minimize the amount of nitrogen passing below the root zone of the crop or vegetation to groundwater.

Biosolids application rates for the City of Cannon Beach sites were developed based on Oregon State University (OSU) Extension Service Fertilizer Guide: *Fertilizing with Biosolids, PNW 508-E, revised February 2015*, and *Worksheet for Calculating Biosolids Application Rate in Agriculture*, *PNW 0511-E,* available nitrogen (N) per acre, unless the application site demonstrates additional nitrogen is required to match crop uptake rates. The land application sites authorized for use can assimilate the total plant available nitrogen that the biosolids provide on an annual basis. Specific site agronomic loading rates are stated in the Department issued site authorization letters.

Site Inventory of Existing and Potential Sites

The City of Cannon Beach plans to land apply Class B biosolids to the Department authorized sites listed in the table below. Details of surface application of biosolids will be provided 2 years prior to any application activities. Site maps with the general location and size of existing authorized sites will be included as an Appendix of this biosolids management plan.

Biosolids Land Application Site Inventory

Site Name/Identifier	Type of Crop/Acreage	lb. N/acre	lb. N/site	Time of year applied (month)	Harvest Cycle	Department Authorized?

Site Selection Criteria for a New Site

If necessary, the City of Cannon Beach will locate additional sites for land applying biosolids. Prior to using any site for land application, the City of Cannon Beach is required to receive a written site authorization letter from the Department. The following site conditions will be considered when determining the suitability of a site for land application:

- All sites will be located on land in Clatsop County.
- A site should be on a stable geologic formation not subject to flooding or excessive run-off from adjacent land.
- Minimum depth to permanent groundwater should be four feet.
- Topography should be suitable for normal agricultural operations. Dewatered or dried biosolids may be land applied on well vegetated slopes up to 30 percent.
- Soil should have a minimum rooting depth of 24 inches.

Public Notification

The City of Cannon Beach is required to notify the public of the proposed land application activity. Each year prior to land application of biosolids, the City of Cannon Beach should verify for those sites to be used for the year that the property owners who received prior notification have not changed. If a property owner has changed, notification of the land application activity should be made to the new property owner and documented.

Site Management Practices

Site access restrictions and setbacks will be followed as outlined in the Department's site authorization letters. The City of Cannon Beach will ensure that access is restricted by appropriate means as necessary, such as fencing or posting of signs at the land application site. Biosolids land application will not occur in those areas designated as buffer strips and will be achieved through accurate measurement of the buffer area prior to commencing land application.

Crop Management Practices

The type of crops will be listed in the Biosolids Land Application Site Inventory table on page 16. Timing of application and the harvest cycle of the crop will also be listed. Soil conditions must be favorable for application such that runoff, leaching, or soil compaction does not occur. The timing of land application will take into consideration tilling and irrigation practices that may occur on an authorized site.

The overall management of nutrients at the land application sites takes into account the amount of biosolids land applied, the amount of commercial fertilizers used and the amount of residual nutrients in the soil. When additional sources of nitrogen (e.g., commercial fertilizer) are applied to a site, then the application of biosolids should be reduced to compensate for the additional nitrogen loading.

Prior to the initiation of biosolids application to a site, a representative soil sample is collected across the entire site, and analyzed by an independent commercial laboratory. Existing nitrogen levels in the soil profile are subtracted from the OSU Extension Service recommended nitrogen application rates for the crop and the biosolids application rate is adjusted. Frequency and location of testing sites will be provided prior to biosoilds land application. In the event of annual biosolids application to the same field for 3 consecutive years, annual sampling and testing of application site soils for nitrate and ammonia nitrogen will be conducted prior to biosolids application. Application rates must be adjusted to account for available nitrogen carried over from previous applications. If crop removal of nitrogen exceeds the calculated agronomic rate, additional nitrogen may be required to sustain crop production.

APPENDIX D

WWTP and Lift Station Data

DESIGN DATA

PLANT RELIABILITY: CLASS 1
SEPTAGE RECEIVING: NOT ALLOWED

YEAR	2002	DESIGN 2025
POPULATION (EQUIVALENT)	7,250	11,435
FLOW, mgd		
AVERAGE ANNUAL (AAF)	0.65	1.03
MAXIMUM MONTH (MMF)	0.80	1.33
MAXIMUM DAY (MDF)	2.85	3.42
PEAK HOUR (PHF)	–	4.50
BOD, ppd		
AVERAGE ANNUAL	1250	1972
MAXIMUM MONTH	1950	3075
PEAK WEEK	2450	3863
TSS, ppd		
PEAK WEEK	1404	2704
TKN, ppd		
PEAK WEEK	203	321
ANTICIPATED EFFLUENT QUALITY		
BOD, mg/L	–	10
TSS, mg/L	–	10
NH3–N, mg/L	–	1

HEADWORKS

FINE SCREEN	
CHANNEL WIDTH	24 INCHES
NUMBER	1 W/ BYPASS CHANNEL
SCREEN OPENING SIZE	1/4 INCH
FLOW MEASUREMENT:	
INFLUENT	PARSHALL FLUME
THROAT WIDTH, inches	9
WATER DEPTH AT PEAK FLOW, inches	21.5

ALKALINITY ADJUSTMENT

CHEMICAL	SODIUM HYDROXIDE (50% SOLUTION)
FEED CONTROL	FLOW PACED
ALKALINITY REQUIRED	355 PPM
MAXIMUM FEED RATE	419 GALS/DAY
FEED STORAGE CAPACITY	4,050 GALLONS
FEED STORAGE DURATION	9–22 DAYS/MONTH

AERATION BASINS

TYPE	BIOLAC SELECTOR
NUMBER OF PRIMARY AERATION BASINS	2
WATER DEPTH, feet	12.0
WATER SURFACE ELEVATION, feet	20.0
BASIN SIDE SLOPES	1.5:1
BASIN BOTTOM DIMENSIONS, feet	70 X 138
BASIN DIMENSIONS AT WATER SURFACE, feet	106 X 156
BASIN VOLUME, mgal (each)	1.15
TOTAL BASIN VOLUME, mgal	2.30
F/M RATIO	0.066
MLSS, mg/L:	3000
AVERAGE HRT, days	2.06
AVERAGE SRT, days	22
MAXIMUM MONTH SLUDGE PRODUCTION, Based on 80% Yield for Maximum Month BOD, ppd	2460
OXYGEN REQUIREMENT, lbs/hr (per basin)	121
AIR REQUIREMENT, SCFM (per basin)	1233
NUMBER OF DIFFUSERS, (per basin)	56
NUMBER OF HEADERS, (per basin)	7
MINIMUM BREAK HORSE POWER, per basin	49
NUMBER OF BLOWERS INSTALLED	3
BLOWER HORSE POWER, each	60
BLOWER CAPACITY	1383 SCFM AT 6.3 PSIG
BLOWER TYPE	POSITIVE DISPLACEMENT

YEAR	STARTUP 2006	DESIGN 2025
CLARIFIERS		
TYPE		BIOLAC RECTANGULAR HOPPER
NUMBER OF CLARIFIERS		4
SIZE OF CLARIFIERS, feet, each		26.5 X 35
OVERFLOW RATE, gpd/sf		
AVERAGE ANUUAL		319
MAXIMUM MONTH		638
PEAK HOUR		1595
WEIR OVERFLOW RATE, gpd/lf		
AVERAGE ANUUAL		10,960
MAXIMUM MONTH		14,150
PEAK HOUR		47,870
RETURN ACTIVATED SLUDGE, (gpm, each) (100% of maximum month flow total)	278	462
WASTE ACTIVATED SLUDGE, (gpd, each) (assume WAS concentration of 0.75% at average annual load)	3,733	5,890
ULTRAVIOLET DISINFECTION		
TYPE		
CHANNEL DESIGN		HORIZONTAL, LOW PRESSURE SELF CLEANING
LENGTH, feet (minimum)		26
WIDTH AT UV LAMP BANK, inches		12
DEPTH, inches		62
WIDTH AT FINGER WEIR, inches		42
MIN WATER DEPTH AT UV LAMP BANK, inches		18.5
LENGTH OF FINER WEIR, inches		633
DESIGN FLOW, mgd		3.94
# OF CHANNELS		1
# OF BANKS PER CHANNEL		2
# OF LAMPS PER BANK		24
TOTAL # OF LAMPS		48
NOMINAL AVERAGE INTENSITY, microWatts/sq cm		>40,000
UNIFORM LAMP ARRAY		PARALLEL TO FLOW
DESIGN E. COLI, 30 day log mean		126 EC/100 ml
EFFLUENT FLOW METER		
FLOW ELEMENT TYPE		20" MAG METER
WAS PUMP STATION		
TYPE		60" WET WELL
PUMP TYPE		SUBMERSIBLE
NUMBER OF PUMPS		2
DRIVE TYPE		CONSTANT SPEED
OPERATING CONDITIONS		290 GPM @ 15 FEET TDH
HORSEPOWER		3
POWER REQUIREMENT		480 VOLT, 3 PHASE
PUMP CONTROL TYPE		LEVEL
FLOW METER		6" MAG FLOW METER
RAINFALL RECYCLE PUMPS		
TYPE		60" WET WELL
PUMP TYPE		SUBMERSIBLE
NUMBER OF PUMPS		2
DRIVE TYPE		CONSTANT SPEED
OPERATING CONDITIONS		230 GPM @ 17.2 FEET TDH
HORSEPOWER		3
POWER REQUIREMENT		480 VOLT, 3 PHASE
PUMP CONTROL TYPE		LEVEL
STANDBY POWER		
TYPE		DIESEL GENERATOR
SIZE		150 KW
OUTFALL TO WETLANDS		
SIZE AND MATERIAL		20" DI/12" PVC UNDER HWY 101
LENGTH		1336 FEET
DISTRIBUTOR		8" PORT
WETLAND AREA		2 CELLS, APPROX. 8 ACRES EACH
WETLAND DEPTH		1–2 FEET DEEP

YEAR	DESIGN 2025
SOLIDS HANDLING	
WASTE SLUDGE PRODUCTION,(from clarifiers, 80% yield) ppd	
MAXIMUM MONTH	2460
INERT (20%)	492
VOLATILE	1968
AVERAGE ANNUAL	1578
INERT (20%)	316
VOLATILE	1262
SLUDGE STORAGE BASIN TYPE	FACULTATIVE
LAGOON SURFACE AREA CRITERIA	20 LB VSS/1000 SQ FT/DAY
TOTAL SURFACE AREA REQUIRED	
MAXIMUM MONTH (SQ FT)	98,400
FACULTATIVE SLUDGE STORAGE LAGOON	
NUMBER OF BASINS	2
SLUDGE CELL 2	
WATER DEPTH (feet)	9
MAXIMUM SLUDGE DEPTH (feet)	5
MINIMUM FREEBOARD (feet)	3
SIDEWALL SLOPES	3:1
BASIN SURFACE AREA (acres)	2.0
VOLUME AVAILABLE FOR STORAGE OF SOLIDS (gallons)	2,290,000
SOLIDS STORAGE CAPACITY AT 5% SOLIDS (pounds)	1,020,000
SOLIDS STORAGE CAPACITY AT 5% SOLIDS (days)	
MAXIMUM MONTH	415
AVERAGE ANNUAL	646
SLUDGE CELL 1	
WATER DEPTH (feet)	5.5
MAXIMUM SLUDGE DEPTH (feet)	2.5
MINIMUM FREEBOARD (feet)	3
SIDEWALL SLOPES	3:1
BASIN SURFACE AREA (acres)	4.3
VOLUME AVAILABLE FOR STORAGE OF SOLIDS (gallons)	3,600,000
SOLIDS STORAGE CAPACITY AT 5% SOLIDS (pounds)	1,610,000
SOLIDS STORAGE CAPACITY AT 5% SOLIDS (days)	
MAXIMUM MONTH	655
AVERAGE ANNUAL	1,020
MAIN PUMP STATION	
TYPE	DRY WELL/WET WELL
PUMP TYPE	VERTICAL DRY PIT CENTRIFUGAL
NUMBER OF PUMPS	2
DRIVE TYPE	VARIABLE SPEED
OPERATING CONDITIONS	1400 GPM @ 45.5 FEET TDH
HORSEPOWER	20
POWER REQUIREMENT	240 VOLT, 3 PHASE
PUMP CONTROL TYPE	BUBBLER WITH LEVEL SWITCHES
FORCEMAIN	
DIAMETER AND MATERIAL	12 INCH PVC
LENGTH	1600 FEET
STANDBY POWER	75KW, DIESEL GENSET AT WWTP
OVERFLOW	MH LID AT 2ND ST & SPRUCE ST ELEV. 8.7
PACIFIC PUMP STATION	
TYPE	DRY WELL/WET WELL
PUMP TYPE	NON–CLOG CENTRIFUGAL
NUMBER OF PUMPS	2
DRIVE TYPE	VARIABLE SPEED
OPERATING CONDITIONS	1285 GPM @ 67 FEET TDH
HORSEPOWER	25
POWER REQUIREMENT	240 VOLT, 3 PHASE
PUMP CONTROL TYPE	BUBBLER WITH LEVEL SWITCHES
FORCEMAIN	
DIAMETER AND MATERIAL	10 INCH PVC
LENGTH	1900 FEET
STANDBY POWER	80 KW, PORTABLE DIESEL GENSET
OVERFLOW	STORM DRAIN OCEAN OUTFALL, ELEV 15.5
MATANUSKA PUMP STATION	
TYPE	WET WELL
PUMP TYPE	SUBMERSIBLE NON–CLOG
NUMBER OF PUMPS	3
DRIVE TYPE	CONSTANT SPEED
OPERATING CONDITIONS	
1 PUMP OPERATING	533 GPM @ 115 FEET TDH
2 PUMPS OPERATING	936 GPM @ 135 FEET TDH
HORSEPOWER	35
POWER REQUIREMENT	460 VOLT, 3 PHASE
PUMP CONTROL TYPE	BUBBLER WITH LEVEL SWITCHES
STANDBY POWER	85 KW, NATURAL GAS GENERATOR
OVERFLOW	MH PACIFIC ST & NELCHENA ST, ELEV 13.0
FORCEMAIN	
DIAMETER AND MATERIAL	10 INCH HDPE
LENGTH	2350 FEET
HYDRAULIC DET. TIME	90 MIN
H2S CONTROL	MANHOLES 10–13 ARMORED

REV	DATE	DES	CHECK	APPROVALS	REVISION DESCRIPTION

DATE MARCH 2007	CIVIL REVIEW:	
DESIGNED: SLK	ARCH REVIEW:	
DRAWN: RSK	STRUC REVIEW:	
CHECKED: SLK	MECH REVIEW:	
APPROVED: JDM		

TETRA TECH/KCM
7080 SW Fir Loop
Portland, Oregon 97223
503-684-9097 Fax: 503-598-0583

CITY OF CANNON BEACH
WASTEWATER FACILITIES O&M MANUAL

DESIGN DATA

FILE NO: FIG 1–3.DWG
PROJECT NO: 3530018
DWG NO: FIG. 1-3
SHEET: OF

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

ECOLA

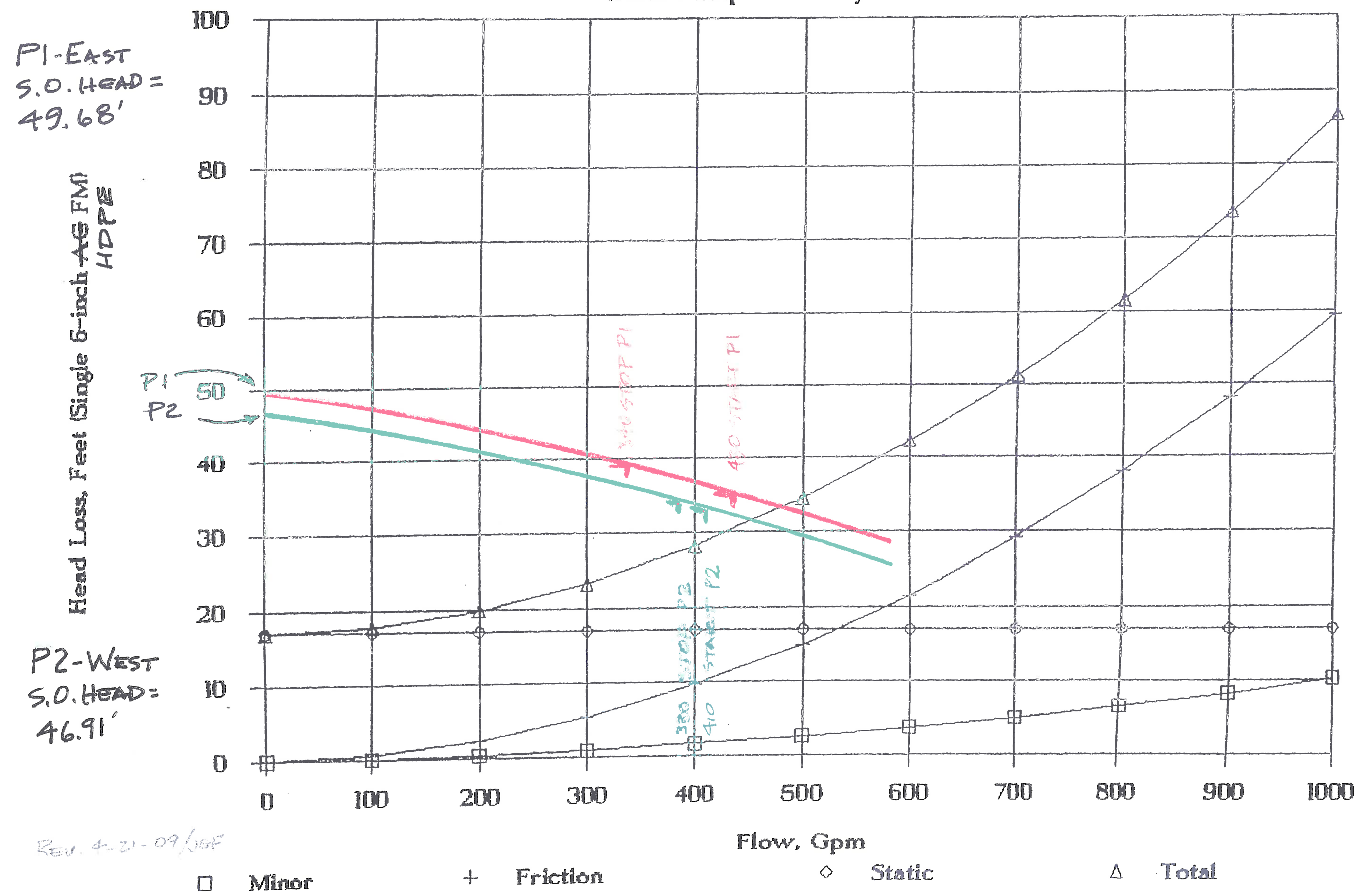
Lift Station Data

APPENDIX C

PUMP CURVE AND DEQ FLOW RATE CHECK FORM

City of Cannon Beach

Ecola Pump Station System Curve



May 1991, Master Plan

FLOW RATE CHECK FORM for DUPLEX, SUBMERSIBLE SEWAGE PUMPS

INSTALLATION DATA		CALCS	P1 - East	P2 - West
1. Pump Eye Elevation *(Calc'd from survey data)*	USER INPUT =>	A	86.08	86.08
2. Discharge guage offset from pump eye *(in feet)*	USER INPUT =>	B	1.17	0.71
3. Top slab (datum) elevation, from survey or plans *(in feet)* **ASSUMED**	USER INPUT =>	C	100	100
PRESSURE DATA				
1. SHUT-OFF HEAD, *(guage reading, psig)*	USER INPUT =>	psig	21.00	20.00
Discharge guage reading, psig x 2.31* *(converts to feet)*		D	48.51	46.20
Total shut-off head @ pump eye *(in feet)* TRACE INTO PUMP CURVE		D+B	49.68	46.91
2A. Suction head @ pump START				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	E	11.30	11.30
Water surface elevation *(in feet)*		F = C-E	88.70	88.70
Suction head @ pump START *(in feet)*		G = F-A	2.62	2.62
2B. Suction head @ pump STOP				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	H	12.90	12.90
Water surface elevation *(in feet)*		I = C-H	87.10	87.10
Suction head @ pump STOP *(in feet)*		J = I-A	1.02	1.02
3A. Discharge head *(guage reading in psi)*	USER INPUT =>	psig	16.00	15.00
Guage reading @ pump START, psig x 2.31* *(converts to feet)*		K	36.96	34.65
Reading adjusted to pump eye *(converts to feet)*		L = K+B	38.13	35.36
3B. Discharge head *(guage reading in psi)*	USER INPUT =>	psig	17.00	15.00
Guage reading @ pump STOP, psig x 2.31* *(converts to feet)*		M	39.27	34.65
Reading adjusted to pump eye *(converts to feet)*		N = M+B	40.44	35.36
4. Total Dynamic Head, *(in feet)*				
TDH @ pump START		L - G	35.51	32.74
TDH @ pump STOP		N - J	39.42	34.34
FLOWRATE DATA @ Pump RPM of 1775				
1. Flow rate @ pump START, gpm *(curve interpolation)*	USER INPUT =>		430	410
2. Flow rate @ pump STOP, gpm *(curve interpolation)*	USER INPUT =>		340	380
3. Average **Flow**, gpm			**385**	**395**

NOTES

1. This spreadsheet, sketch and the notes are based on the DEQ Guidelines, "O&M NOTES FOR GUAGES ON SEWAGE PUMPS".
2. Actual measurements used - no suction guage readings were used for calculations. Suction side measurements taken from level control.
3. If 1/2" or less, difference exists in similar or dual measurements, add, take average, use the average for both pumps, guages, etc.
4. The above testing results are an estimate of pump performance, specific to the time of testing, recommend annual testing.
5. "Use depth of wtr surface to pump centerline for suction readings. On submersible pumps this submergence must be subtracted from the discharge pressure." DSM-DEQ. Since dry pit pumps are below liquid level, they are considered as submersible pumps
6. Does pump have any special conditions? Comminutator, Mix-Flush, Start delay? **NONE**
7. Pumping rate greatest on Start,when ww deepest, pumping rate declines as ww empties, w/pump operating at higher head requirements

ATTACHMENTS TO THIS FORM

1. No factory pump curve available, just testing
2. A system curve taken from 1991 Master Plan is included for reference

CONVERSION FACTORS

1" Hg = 1.13 ft of water column
1 psig = 2.31 ft of water column*

STATION: ECOLA, CANNON BEACH, OREGON
CURVE NUMBER: FROM 1991 Master Plan
DATE OF FIELD TESTING: August 29, 2008
TESTING BY: SIGNATURE ________

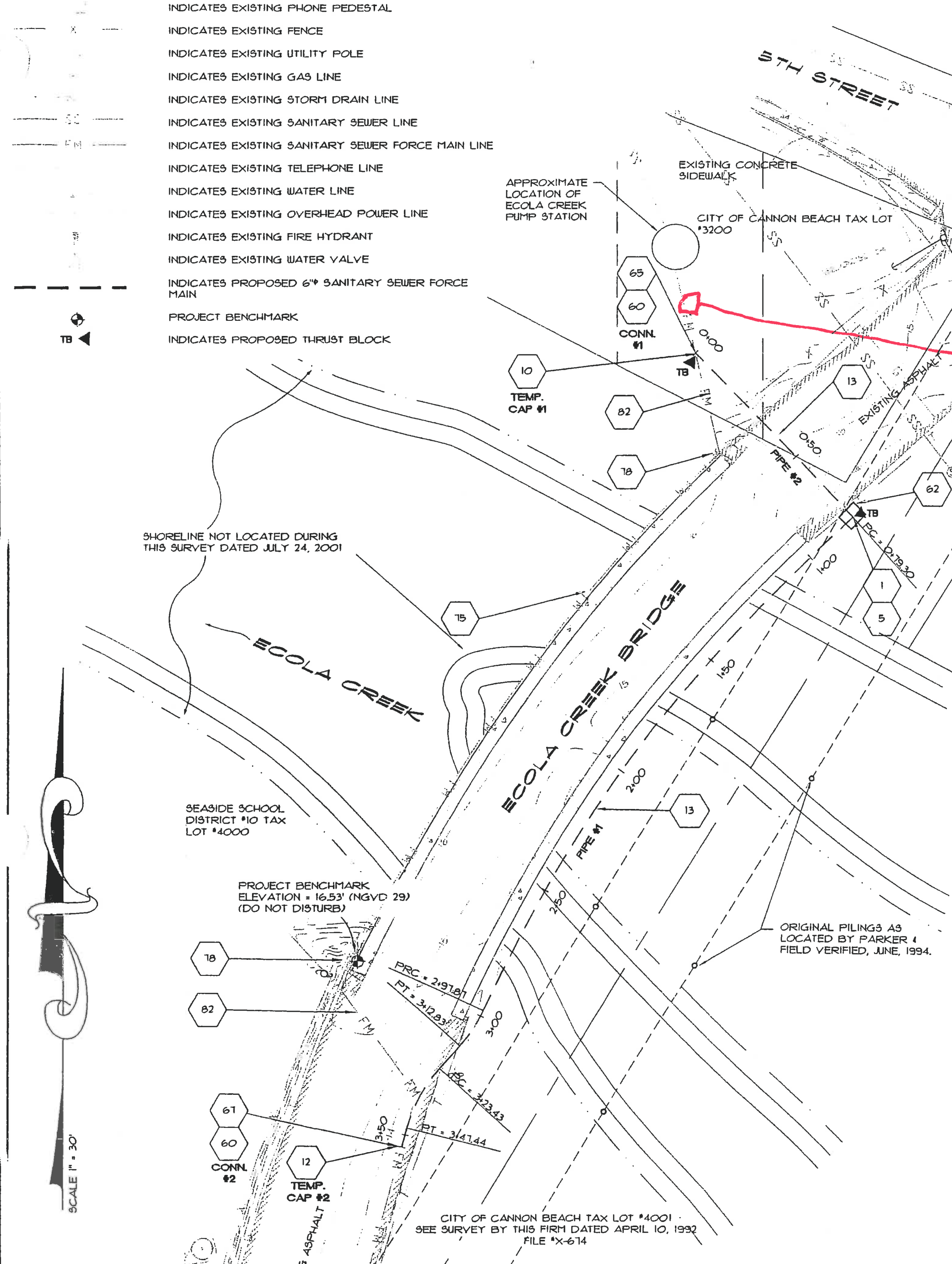
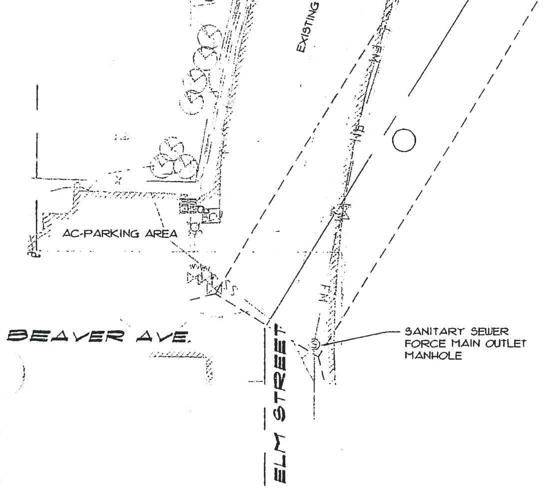
Pumps: Cornell **(EXIST. P/S)**
HP: 7.5
Trim: Unknown

APPENDIX D

EXISTING FORCE MAIN PLAN AND PROFILE

LEGEND

- INDICATES EXISTING EDGE OF PAVEMENT
- INDICATES EXISTING SANITARY SEWER MH
- INDICATES EXISTING PHONE PEDESTAL
- INDICATES EXISTING FENCE
- INDICATES EXISTING UTILITY POLE
- INDICATES EXISTING GAS LINE
- INDICATES EXISTING STORM DRAIN LINE
- INDICATES EXISTING SANITARY SEWER LINE
- INDICATES EXISTING SANITARY SEWER FORCE MAIN LINE
- INDICATES EXISTING TELEPHONE LINE
- INDICATES EXISTING WATER LINE
- INDICATES EXISTING OVERHEAD POWER LINE
- INDICATES EXISTING FIRE HYDRANT
- INDICATES EXISTING WATER VALVE
- INDICATES PROPOSED 6"Φ SANITARY SEWER FORCE MAIN
- INDICATES PROJECT BENCHMARK
- TB INDICATES PROPOSED THRUST BLOCK

CONSTRUCTION NOTES

PHASE 1 - FORCE MAIN BORING

1. CONSTRUCT 90° HDPE BEND WITH THRUST BLOCK, ROTATE TO ACCOMMODATE VERTICAL ANGLE.

5. CONSTRUCT 6"X6"X3" BUTT FUSED REDUCING TEE FOR AIR VACUUM VALVE AT HIGH POINT (SEE DETAIL 3, SHEET 2)

10. POTHOLE EXISTING 6"Φ A.C. #100 PIPE TO DETERMINE EXACT LOCATION, SIZE AND ELEVATION BEFORE BORING BENEATH ELM STREET. CONSTRUCT HDPE BEND, 3' HDPE STUB AND 6" D.I. CAP. SEE TEMPORARY CAP DETAIL #1, THIS SHEET.

12. POTHOLE EXISTING 6"Φ A.C. PIPE TO DETERMINE EXACT LOCATION, SIZE AND ELEVATION BEFORE BORING BENEATH ELM STREET AND ECOLA CREEK. CONSTRUCT HDPE PIPE TO ALIGN WITH EXISTING 6"Φ SANITARY SEWER FORCE MAIN AND CONSTRUCT 6" D.I. CAP. SEE TEMPORARY CAP DETAIL #2, THIS SHEET.

13. CONSTRUCT 6"Φ HDPE SANITARY SEWER FORCE MAIN. SEE DETAIL 1, SHEET 2 FOR TRENCH DETAIL AND MINIMUM DEPTH OF COVER. CONTRACTOR TO PREPARE A BORING PLAN AND PROFILE. AN ACCEPTED PLAN SHALL BE SUBMITTED BY CONTRACTOR BEFORE CONSTRUCTION OF PIPELINE. THE PLAN SHALL BE REVIEWED AND ACCEPTED BY BOTH THE CITY AND ENGINEER.

PHASE 2 - FORCE MAIN CONNECTION

60. POTHOLE EXISTING CONNECTION TO DETERMINE EXACT LOCATION, SIZE, AND ELEVATION OF EXISTING SANITARY SEWER FORCE MAIN.

62. CONSTRUCT AIR VACUUM AND UTILITY VAULT (SEE DETAIL 3, SHEET 2). VERIFY THAT AIR VACUUM IS POSITIONED AT HIGH POINT IN LINE. CONTRACTOR TO POTHOLE NEW HDPE BEND TO DETERMINE EXACT LOCATION AND ELEVATION.

65. REMOVE CAP FROM CONNECTION #1. CONSTRUCT CONNECTION TO EXISTING 6"Φ A.C. SANITARY SEWER FORCE MAIN WITH APPROVED COUPLING DEVISE AND THRUST BLOCK. BACKFILL CONNECTION WITH 3/4"-MINUS AFTER CITY APPROVAL AND RESTORE EXISTING SURFACE MATERIAL.

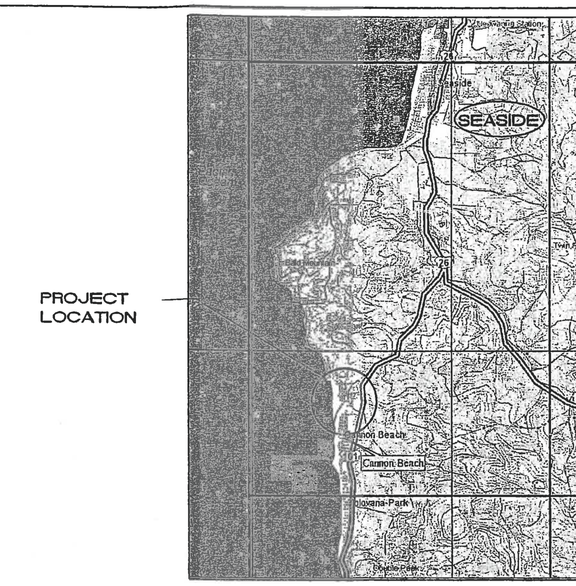
67. REMOVE CAP FROM CONNECTION #2. CONSTRUCT CONNECTION TO EXISTING 6"Φ A.C. SANITARY SEWER FORCE MAIN WITH APPROVED COUPLING DEVISE AND THRUST BLOCK. BACKFILL CONNECTION WITH 3/4"-MINUS AFTER CITY HAS APPROVED CONNECTION CONSTRUCTION AND RESTORE EXISTING SURFACE MATERIAL.

75. REMOVE EXISTING 6"Φ SANITARY SEWER FORCE MAIN AND STAINLESS STEEL BRACKETS FROM ECOLA CREEK BRIDGE.

78. SAW CUT EXISTING 6"Φ SANITARY SEWER FORCE MAIN AND CONSTRUCT 6" D.I. CAP.

82. ABANDON EXISTING SANITARY FORCE MAIN IN-PLACE.

PROJECT LOCATION



VICINITY MAP

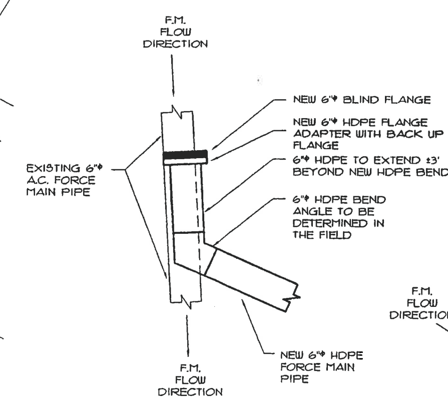
CONSTRUCTION SEQUENCING

PHASE 1 - FORCE MAIN BORING

1. POTHOLE EXISTING SANITARY SEWER FORCE MAIN AT TEMPORARY CAP LOCATIONS 1 & 2, TO DETERMINE EXACT SIZE, LOCATION AND ELEVATIONS.
2. CONSTRUCT SANITARY SEWER FORCE MAIN BENEATH ECOLA CREEK AND ELM STREET (PIPE #1).
3. CONSTRUCT SANITARY SEWER FORCE MAIN BENEATH ELM STREET (PIPE #2).
4. CONSTRUCT 90° BEND AND 2"Φ VERTICAL SADDLE, SEE DETAIL 3, SHEET 2.
5. CONSTRUCT TEMPORARY CAP #1, SEE TEMPORARY CAP DETAIL, THIS SHEET.
6. CONSTRUCT TEMPORARY CAP #2, SEE TEMPORARY CAP DETAIL, THIS SHEET.
7. PRESSURE TEST NEW SANITARY SEWER FORCE MAIN (USE REDUCING TEE).
8. BACKFILL CONNECTION #1, #2 AND 90° BEND WITH COMPACTED 3/4"- MINUS CRUSHED ROCK.

PHASE 2 - FORCE MAIN CONNECTION

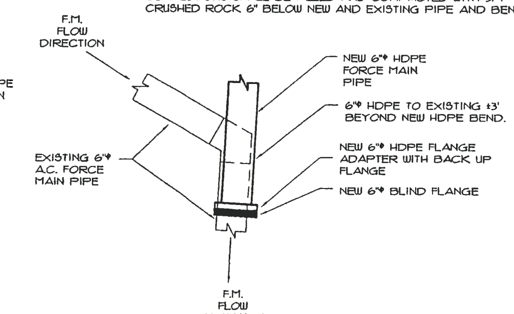
1. UNCOVER 90° BEND AND CONSTRUCT 2" AIR VACUUM RELEASE VALVE AND UTILITY VAULT. SEE DETAIL 3, SHEET 2.
2. UNCOVER TEMPORARY CAP #1 AND #2.
3. DRY FIT CONNECTIONS #1 AND #2.
4. COORDINATE SHUT OFF OF THE ECOLA CREEK PUMP STATION WITH THE CITY OF CANNON BEACH. CONTACT THE CITY OF CANNON BEACH PUBLIC WORKS DIRECTOR, JOY GANNON AT 436-1581.
5. BEGIN DRAINING THE ECOLA CREEK PUMP STATION WET WELL WITH APPROVED SANITARY SEWER DISPOSAL TRUCK. SEWAGE MAY BE RELEASED INTO THE CITY'S SANITARY SEWER LAGOONS. COORDINATE RELEASE LOCATION AND SCHEDULE WITH CITY OF CANNON BEACH.
6. CONSTRUCT CONNECTION #1.
7. CONSTRUCT CONNECTION #2.
8. RECEIVE APPROVAL OF CONNECTIONS #1 AND #2 FROM CITY AND ENGINEER.
9. BEGIN AUTOMATIC OPERATION OF THE ECOLA CREEK PUMP STATION.
10. NOTIFY CITY AND ENGINEER TO VISUALLY INSPECT CONNECTIONS PRIOR TO BACKFILL.
11. BACKFILL CONNECTION #1 AND #2.
12. REMOVE EXISTING 6"Φ SANITARY SEWER FORCE MAIN AND STAINLESS STEEL BRACKETS FROM ECOLA CREEK BRIDGE.
13. ABANDON EXISTING SANITARY FORCE MAIN (IN GROUND) AND CONSTRUCT 6" D.I. CAPS.



TEMPORARY CAP #1

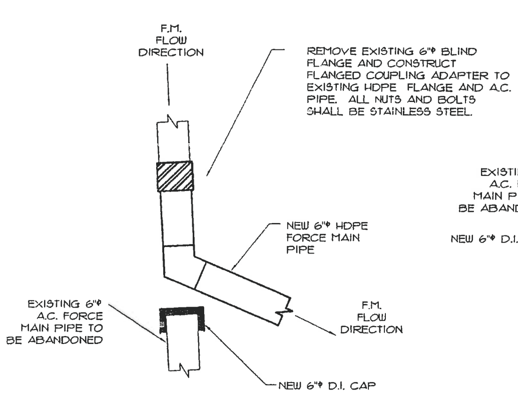
NOTES:

1. HDPE BENDS AND 3' PIPE SECTION SHALL BE CONSTRUCTED TO ALLOW CONNECTION TO EXISTING 6"Φ A.C. FORCE MAIN WITHOUT ADDITIONAL BENDS.
2. NEW 6"Φ HDPE FORCE MAIN SHALL BE LAID DIRECTLY ABOVE EXISTING 6"Φ A.C. FORCE MAIN.
3. CONNECTIONS SHALL BE FILLED AND COMPACTED WITH 3/4" - MINUS CRUSHED ROCK 6" BELOW NEW AND EXISTING PIPE AND BENDS.

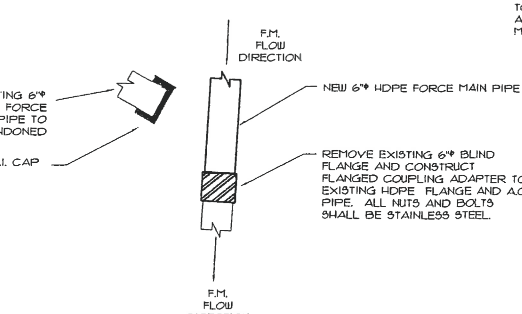


TEMPORARY CAP #2

PHASE 1 - TEMPORARY CAPS #1 AND #2

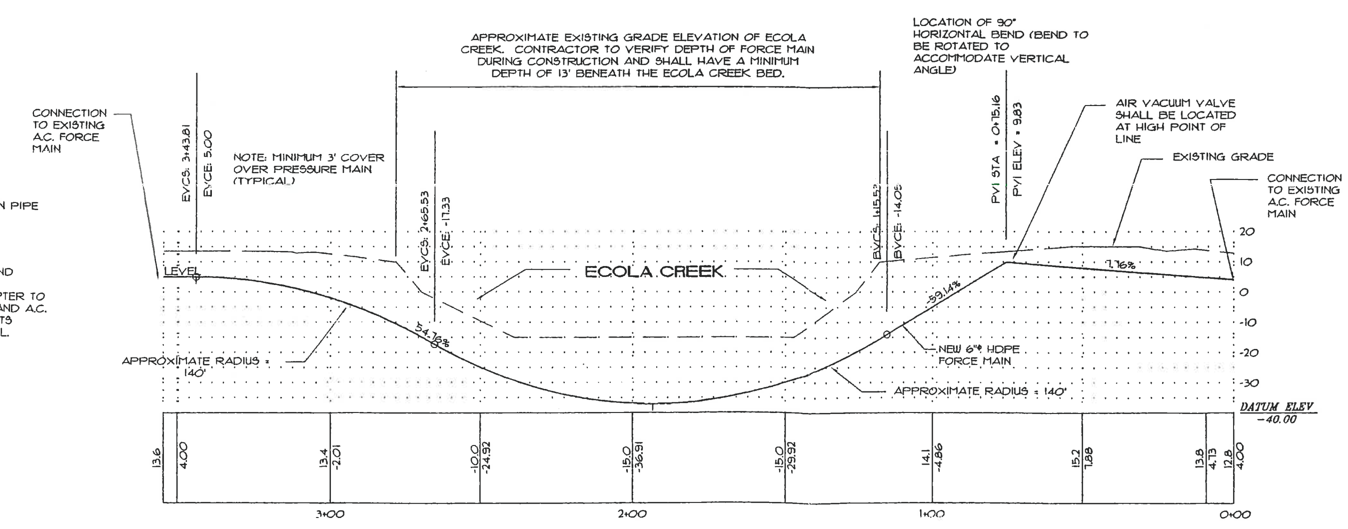


CONNECTION #1



CONNECTION #2

PHASE 2 - FORCE MAIN CONNECTION #1 AND #2



SANITARY SEWER FORCE MAIN PROFILE

SCALE: HORIZONTAL 1" = 30' VERTICAL 1" = 30'

HLB & Associates INCORPORATED
Surveying · Engineering · Planning
TILLAMOOK COUNTY
160 LANEDA AVE.
MANZANITA, OR 97130
(503) 368-5394
FAX: (503) 368-5847
CLATSOP COUNTY
4253A HWY 101 N.
GEARHART, OR 97138
(503) 738-3425
FAX: (503) 738-7455

REGISTERED PROFESSIONAL ENGINEER 18834 OREGON NOVEMBER 12, 1986 JEFF A. HARRINGTON
RENEWAL DATE: JUNE 30, 2003
"ECOLI" #30

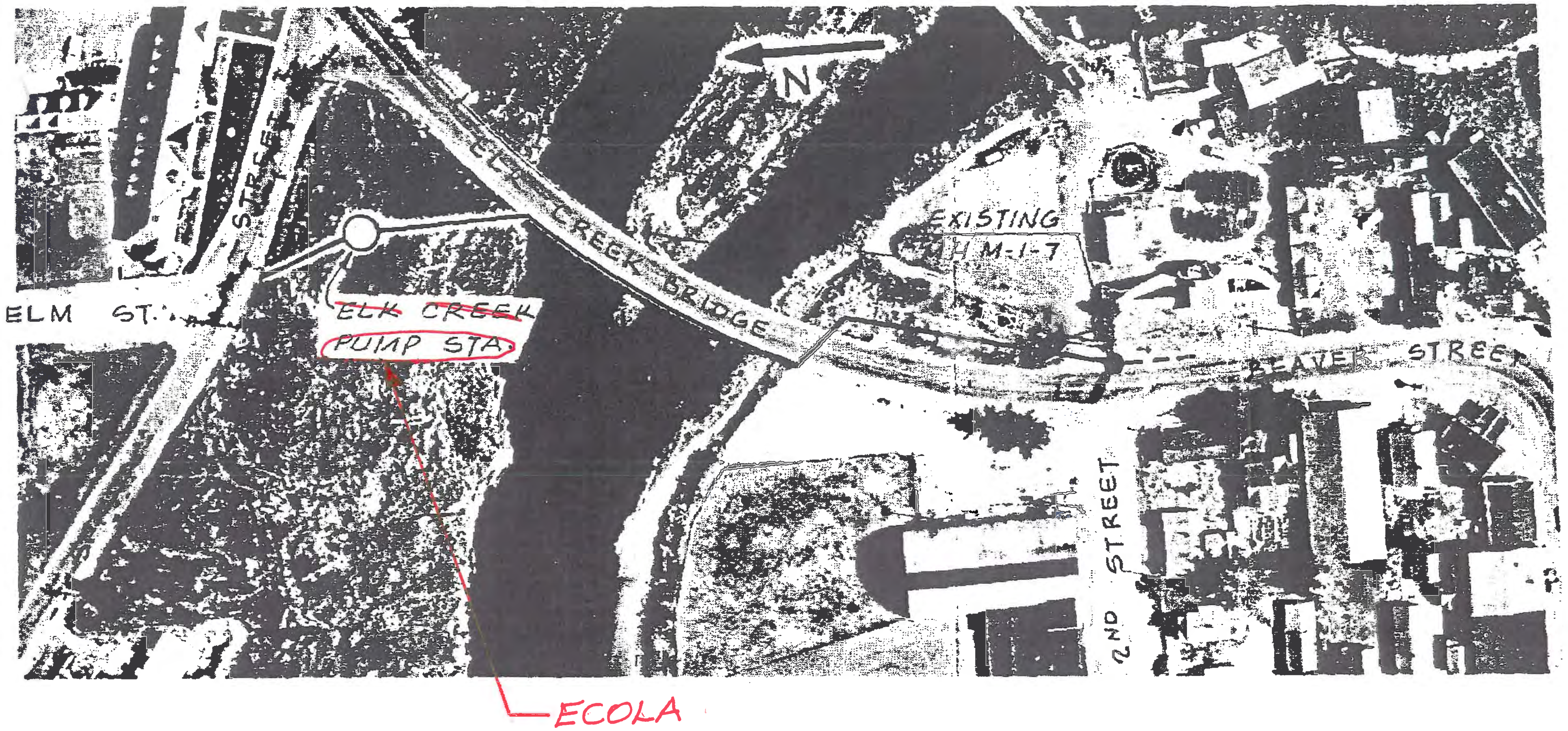
JOB NO. 0265-1816
DATE SEPT. 19, 2001
DESIGNED RCS
DRAWN RCS
CHECKED JAH
0265-1816-02-02.DWG

CITY OF CANNON BEACH

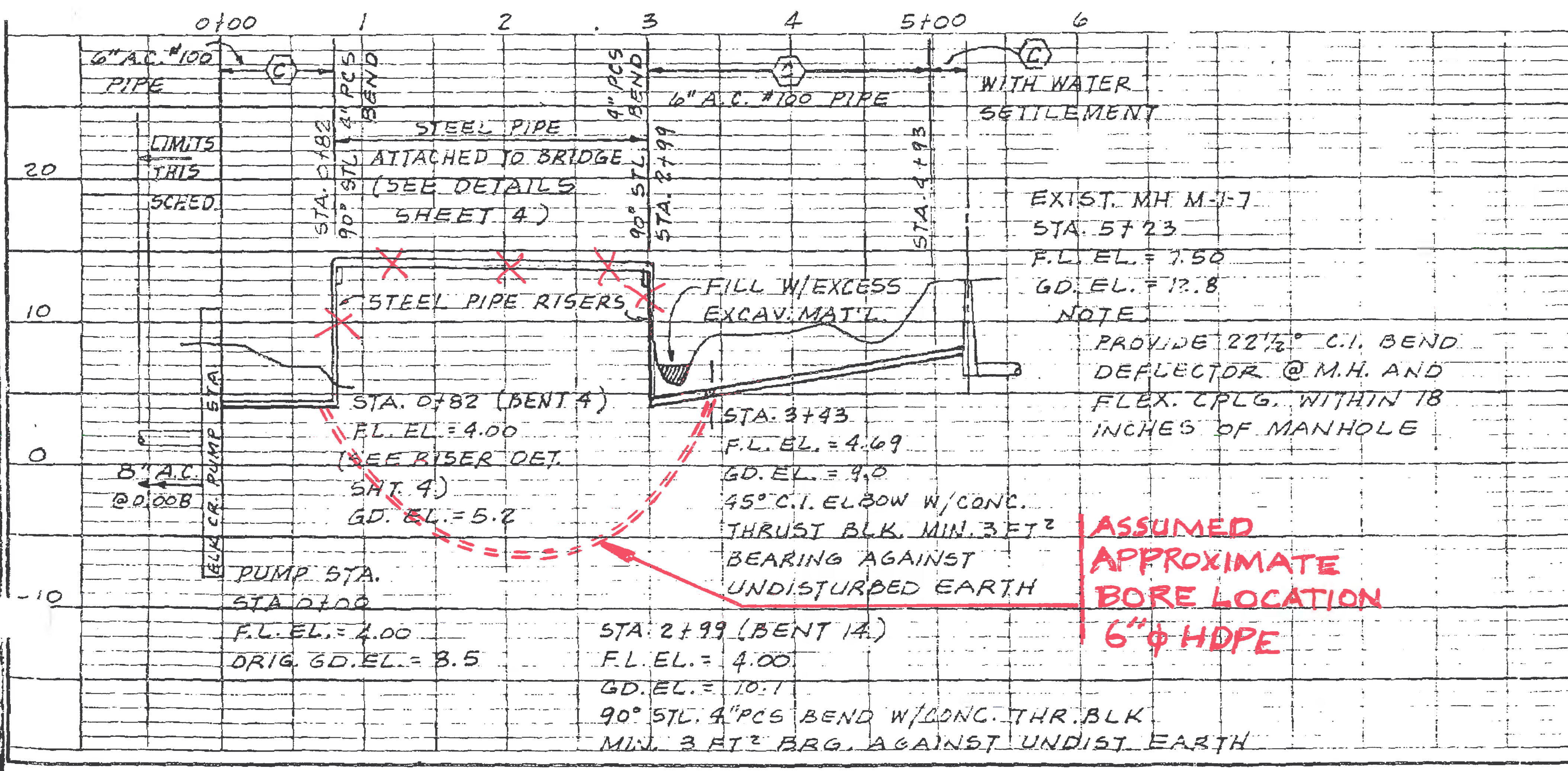
ECOLA CREEK BRIDGE REPAIR AND ACCESS PROJECT
SANITARY SEWER FORCE MAIN REPLACEMENT PLAN / PROFILE

CANNON BEACH, OREGON

SHEET 1 OF 2



COURTESY OF CITY OF CANNON BEACH, USED DURING P/S EVALUATION, 2008-2009 BY HLB-OTAK



REGISTERED PROFESSIONAL ENGINEER 2714 OREGON MAY 9, 1957 RALPH E. RODERICK

CITY OF CANNON BEACH

ELK CREEK PUMP STATION - SCHEDULE "P"

PRESSURE MAIN

SCALE: VERT. 1" = 10' HORIZ. 1" = 100'	APRIL 1961	SHEET 5 OF 5
DES. MDP / DR. JRL RVM / CK. CLW	CORNELL, HOWLAND, HAYES & MERRYFIELD — SEATTLE, CORVALLIS, BOISE	E2057-2

MAIN

Lift Station Data

Design pipe system

Project: <unnamed> - Case1 Main **6/13/2014**

Customer: <unnamed>

Adam Sheehan

Station Piping 1

					No of
Length	**0.0**	ft	Discharge conn.	0.50	**0**
Material	**Ductile Iron**		90° elbow	0.30	**1**
Pressure class	**CL53**		Valve	1.00	**0**
Dimension	**6**	inch	Tee	0.60	**0**
C-factor	**100.000**		Check valve	1.50	**0**
Inner diam.	**6.2**	inch	Outlet	1.00	**0**
			Own	0.00	**0**
			Total:	**0.30**	
Water velocity:	**15.8**	ft /s	Loss in pipe section:	**1.2** ft	

Station Piping 2

					No of
Length	**15.0**	ft	Discharge conn.	0.50	**0**
Material	**Ductile Iron**		90° elbow	0.30	**1**
Pressure class	**CL53**		Valve	1.00	**1**
Dimension	**10**	inch	Tee	0.60	**1**
C-factor	**100.000**		Check valve	1.50	**1**
Inner diam.	**10.3**	inch	Outlet	1.00	**0**
			Own	0.00	**0**
			Total:	**3.40**	
Water velocity:	**5.7**	ft /s	Loss in pipe section:	**2.0** ft	

Design pipe system

Project:	**<unnamed> - Case1**	**6/13/2014**
Customer:	**<unnamed>**	
		Adam Sheehan

Force Main 1

					No of
Length	**2400.0**	ft	Discharge conn.	0.50	**0**
Material	**MDPE/HDPE**		90° elbow	0.30	**0**
Pressure class	**DR11**		Valve	1.00	**0**
Dimension	**12**	inch	Tee	0.60	**0**
C-factor	**135.000**		Check valve	1.50	**0**
Inner diam.	**10.7**	inch	Outlet	1.00	**1**
			Own	0.00	**0**
			Total:	**1.00**	

Water velocity: **5.4** ft /s

Loss in pipe section: **21.5** ft

Station Piping 1 ***Station Piping 2*** ***Force Main 1***

			No of	Head losses:	Total head:
Total flow:	**1500.0**	USgpm			
Static Head:	**31.0**	ft	**1**	**24.7** ft	**55.7** ft

Hazen-Williams

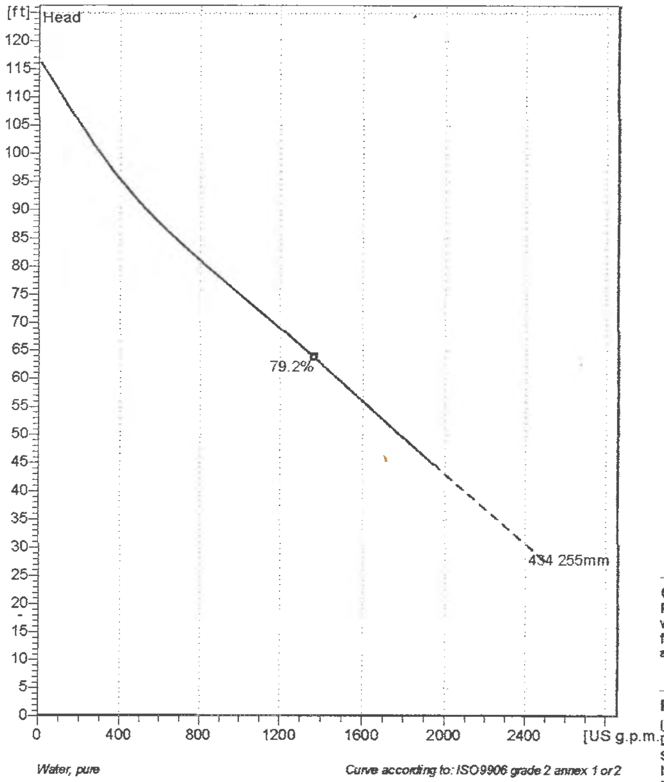
Flygt

xylem
Let's Solve Water

NP 3171 MT 3~ 434

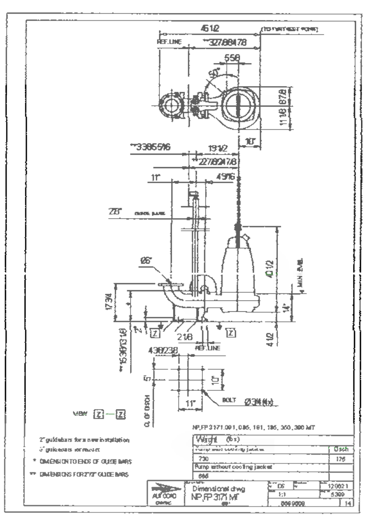
Technical specification

FLYGT



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Pump

Impeller material	Grey cast iron
Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	150 mm
Impeller diameter	255 mm
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	30 hp
Rated current	36 A
Starting current	231 A
Rated speed	1755 rpm
Power factor	
1/1 Load	0.87
3/4 Load	0.83
1/2 Load	0.73
Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2014-06-16	

xylem
Let's Solve Water

NP 3171 MT 3~ 434

Performance curve

FLYGT

Pump

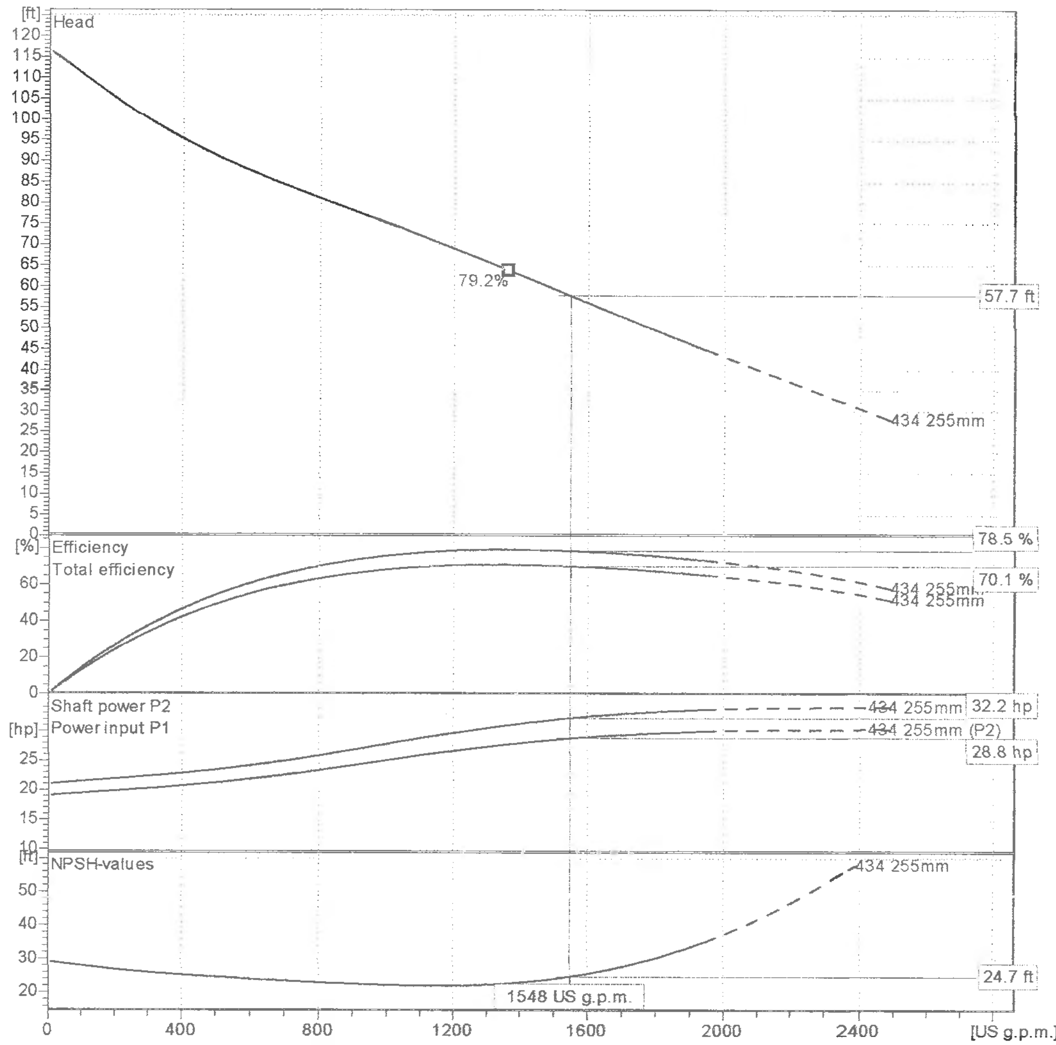
Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	150 mm
Impeller diameter	10 1/16"
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	30 hp
Rated current	36 A
Starting current	231 A
Rated speed	1755 rpm

Power factor	
1/1 Load	0.87
3/4 Load	0.83
1/2 Load	0.73

Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.5 %



Water, pure

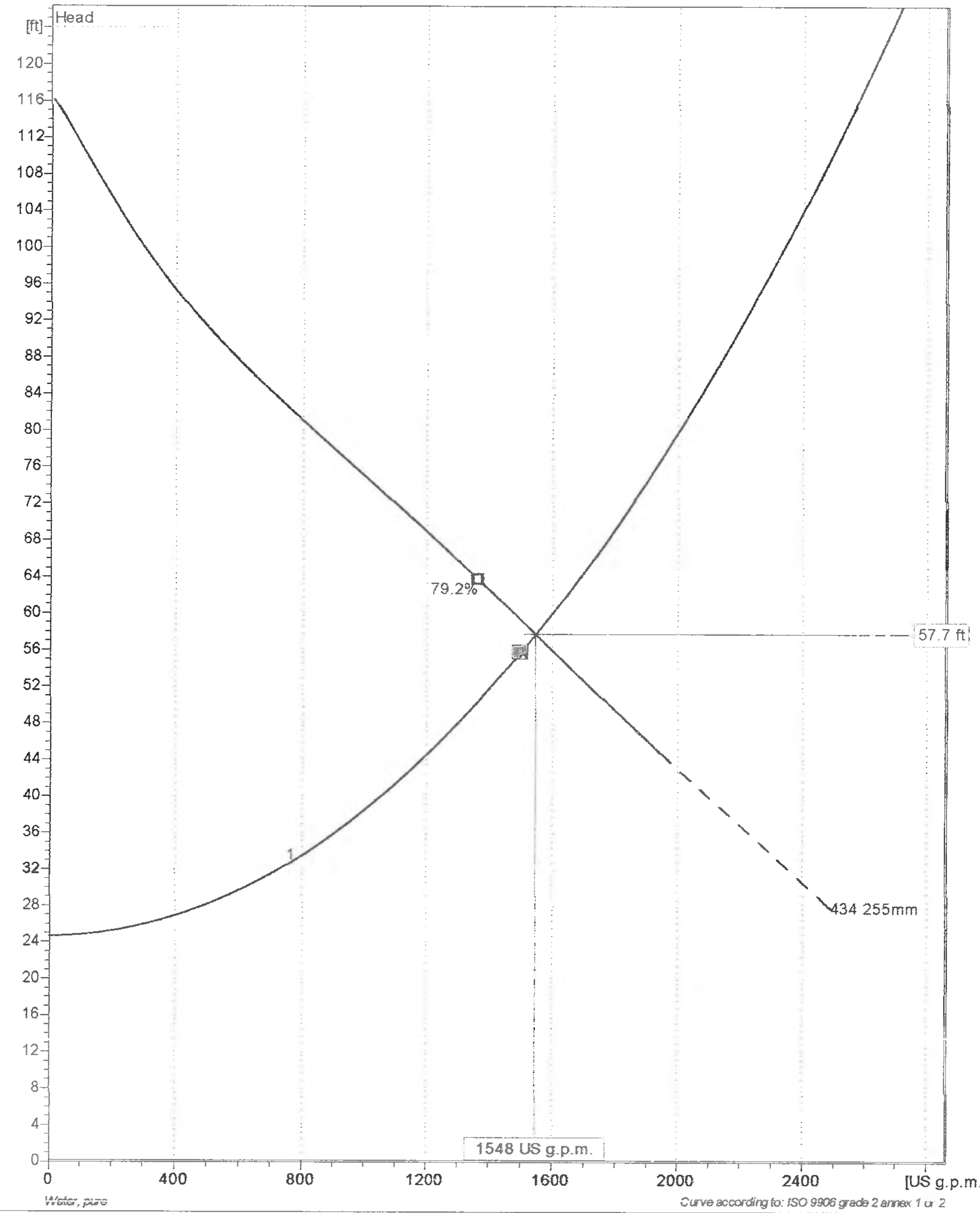
Curve according to: ISO 9906 grade 2 annex 1 or 2

Project	Project ID	Created by	Created on	Last update
			2014-06-16	

xylem
Let's Solve Water

NP 3171 MT 3~ 434
Duty Analysis

FLYGT



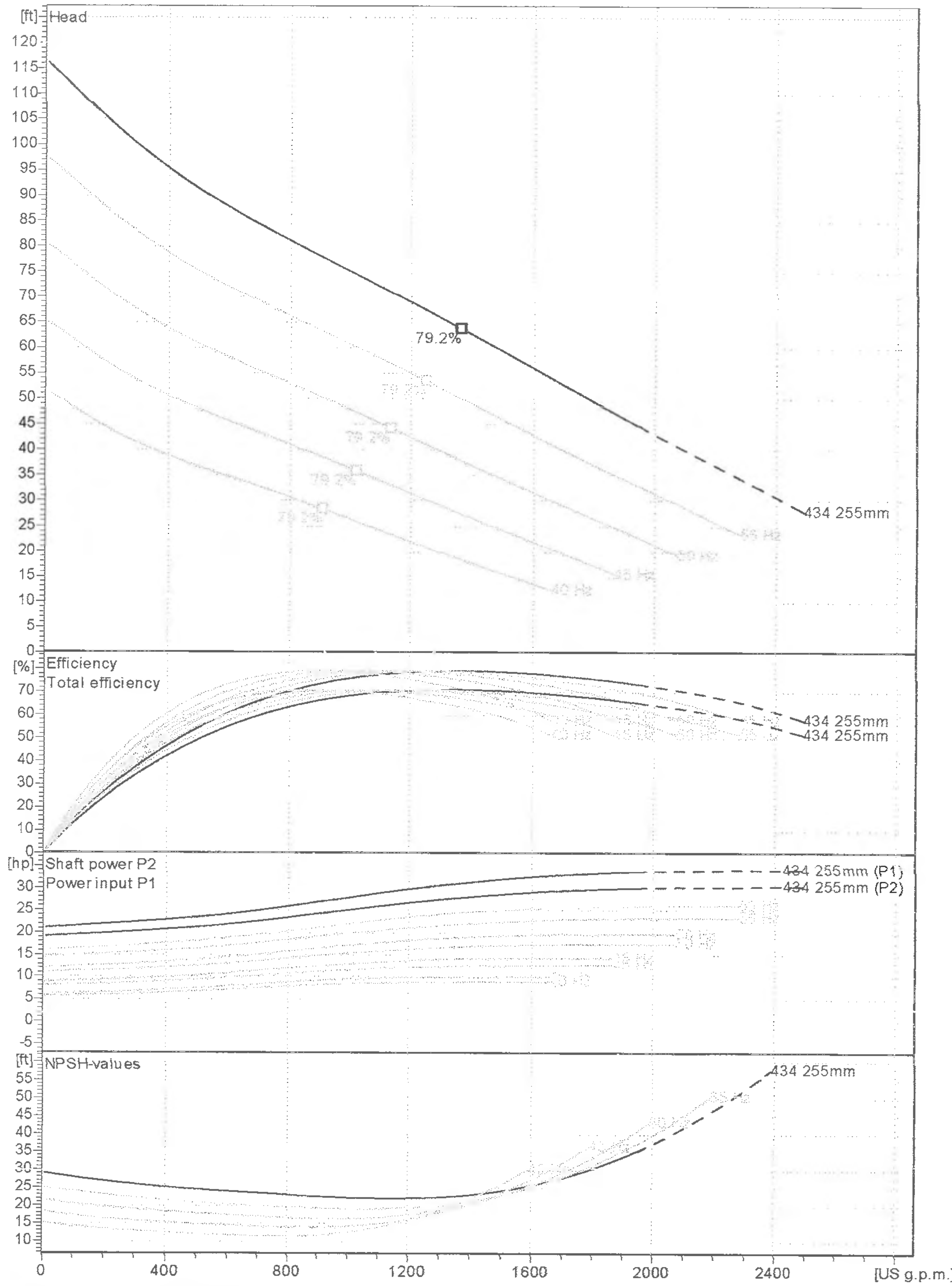
Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	1550 US g.p.m.	57.7 ft	28.8 hp	1550 US g.p.m.	57.7 ft	28.8 hp	78.5 %	259 kWh/US MG	24.7 ft

Project	Project ID	Created by	Created on	Last update
			2014-06-16	

xylem
Let's Solve Water

NP 3171 MT 3~ 434
VFD Curve

FLYGT



Water, pure

Curve according to: ISO 9906 grade 2 annex 1 or 2

Project	Project ID	Created by	Created on	Last update
			2014-06-16	

GRAPHIC SCALE

200 0 100 200 400

1" = 200'

M:\Govt\Cannon Beach\Pump Station Evaluation - 66088\Drawings\C088P012.dwg Plotted: May 14, 2009 - 3:32pm By: add

PACIFIC

Lift Station Data

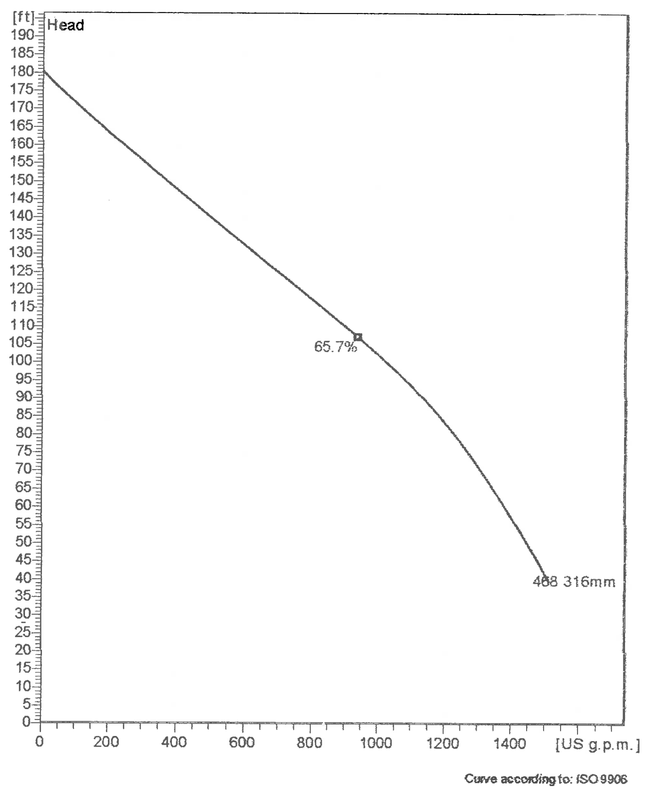
Pacific

xylem
Let's Solve Water

NT 3202 HT 3~ 468

Technical specification

FLYGT



Curve according to: ISO 9906

Note: Picture might not correspond to the current configuration.

General
Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

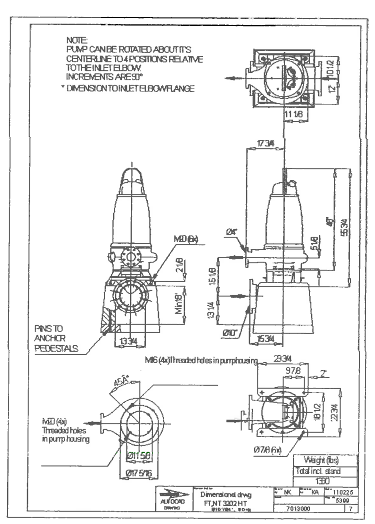
Impeller material	Grey cast iron
Outlet width	3 15/16 inch
Inlet diameter	200 mm
Impeller diameter	316 mm
Number of blades	2

Motor

Motor #	N3202.090 30-19-4AA-D 45hp
Stator variant	
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	45 hp
Rated current	51 A
Starting current	315 A
Rated speed	1770 rpm
Power factor	
1/1 Load	0.91
3/4 Load	0.89
1/2 Load	0.82
Efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.5 %

Configuration

Installation: T - Vertical Permanent, Dry



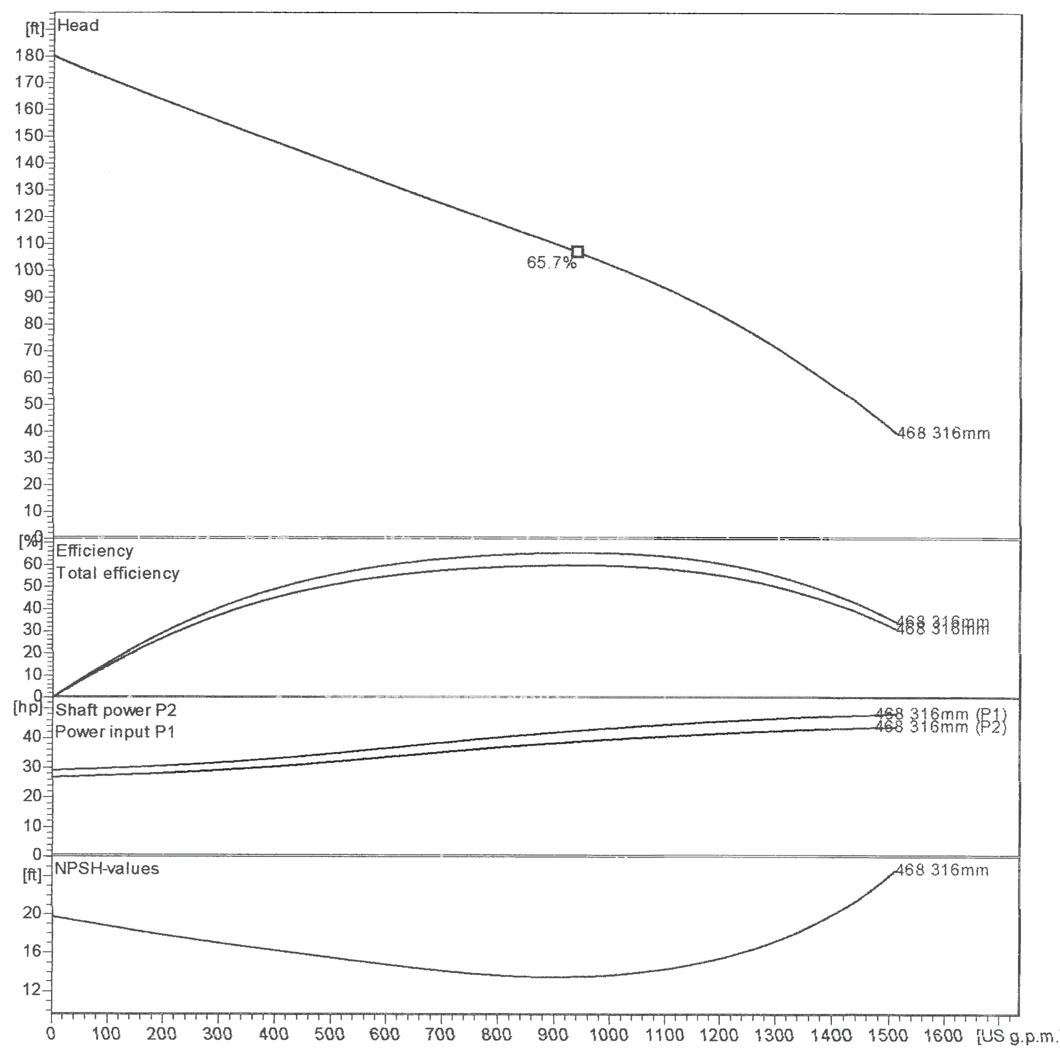
Project	Project ID	Created by	Created on	Last update
			2012-03-22	

xylem
Let's Solve Water

NT 3202 HT 3~ 468

Performance curve

Pump		Motor			
Outlet width	3 15/16 inch	Motor #	N3202.090 30-19-4AA-D 45hp	Power factor	
Inlet diameter	200 mm	Stator variant		1/1 Load	0.91
Impeller diameter	12 7/16"	Frequency	60 Hz	3/4 Load	0.89
Number of blades	2	Rated voltage	460 V	1/2 Load	0.82
		Number of poles	4	Efficiency	
		Phases	3~	1/1 Load	90.5 %
		Rated power	45 hp	3/4 Load	91.5 %
		Rated current	51 A	1/2 Load	91.5 %
		Starting current	315 A		
		Rated speed	1770 rpm		

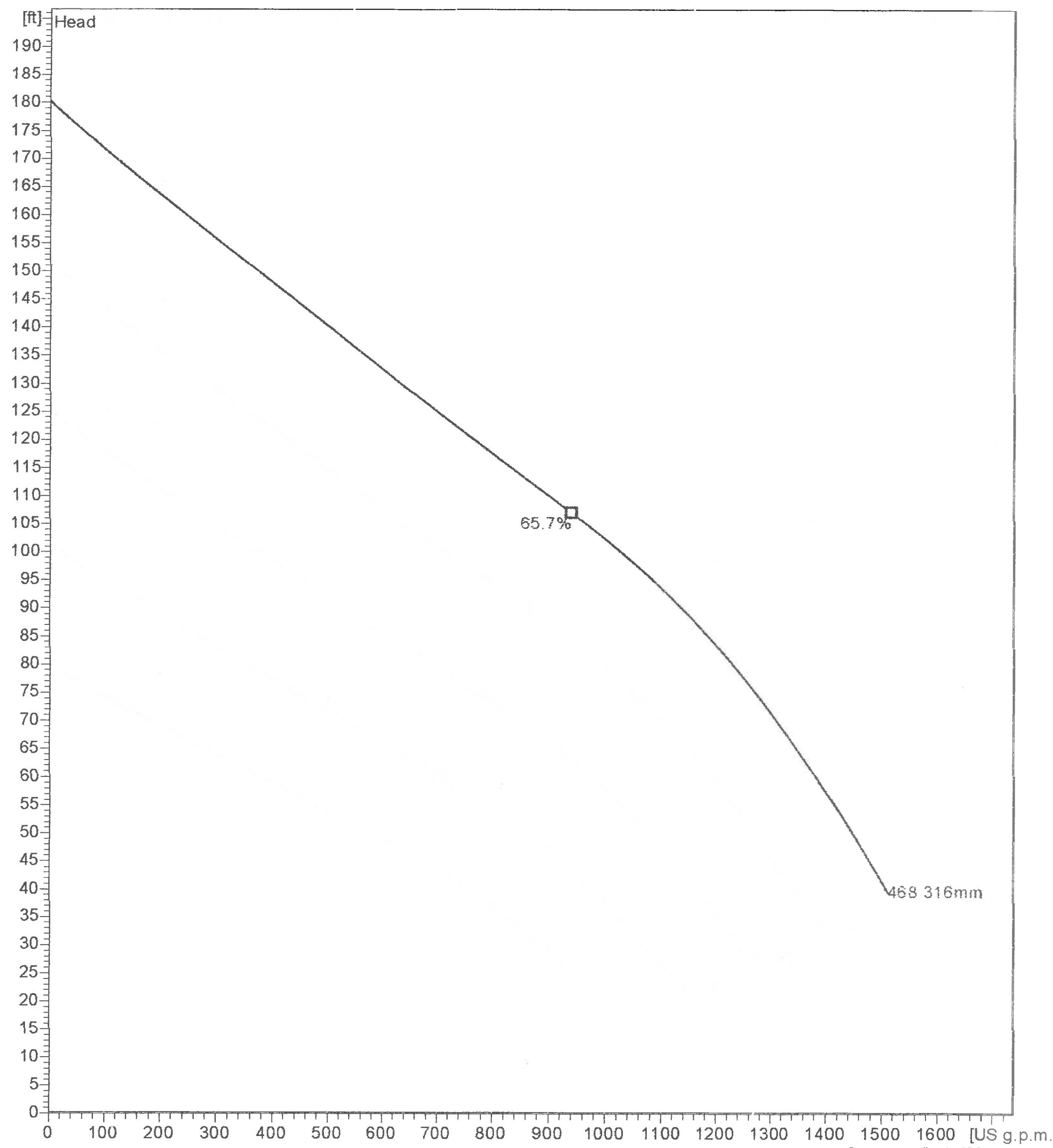


Project	Project ID	Created by	Created on	Last update
			2012-03-22	

xylem
Let's Solve Water

FLYGT

NT 3202 HT 3~ 468
VFD Analysis

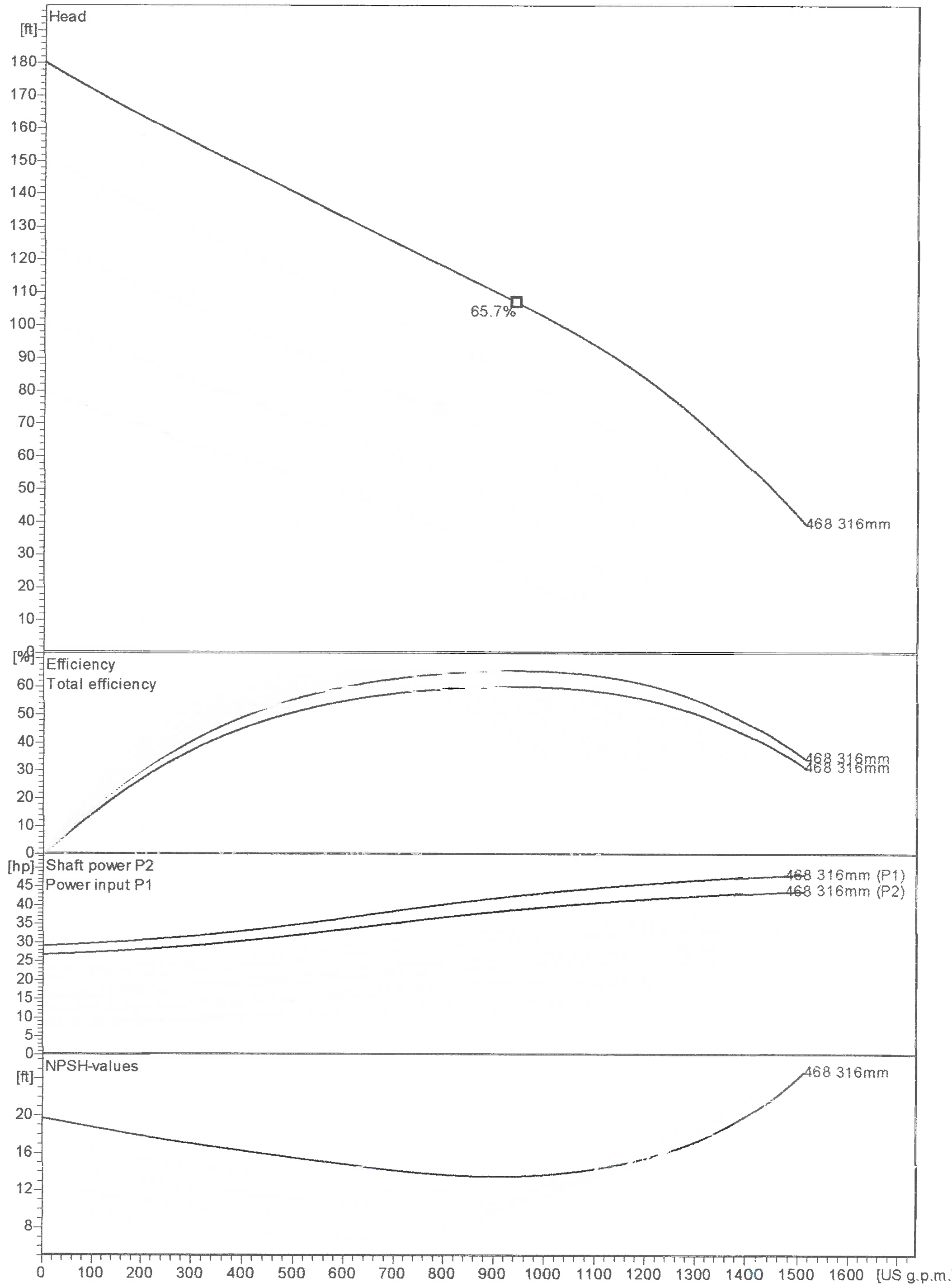


60 Hz 55 Hz 50 Hz 45 Hz 40 Hz

Project	Project ID	Created by	Created on	Last update
			2012-03-22	

xylem
Let's Solve Water

NT 3202 HT 3~ 468
VFD Curve



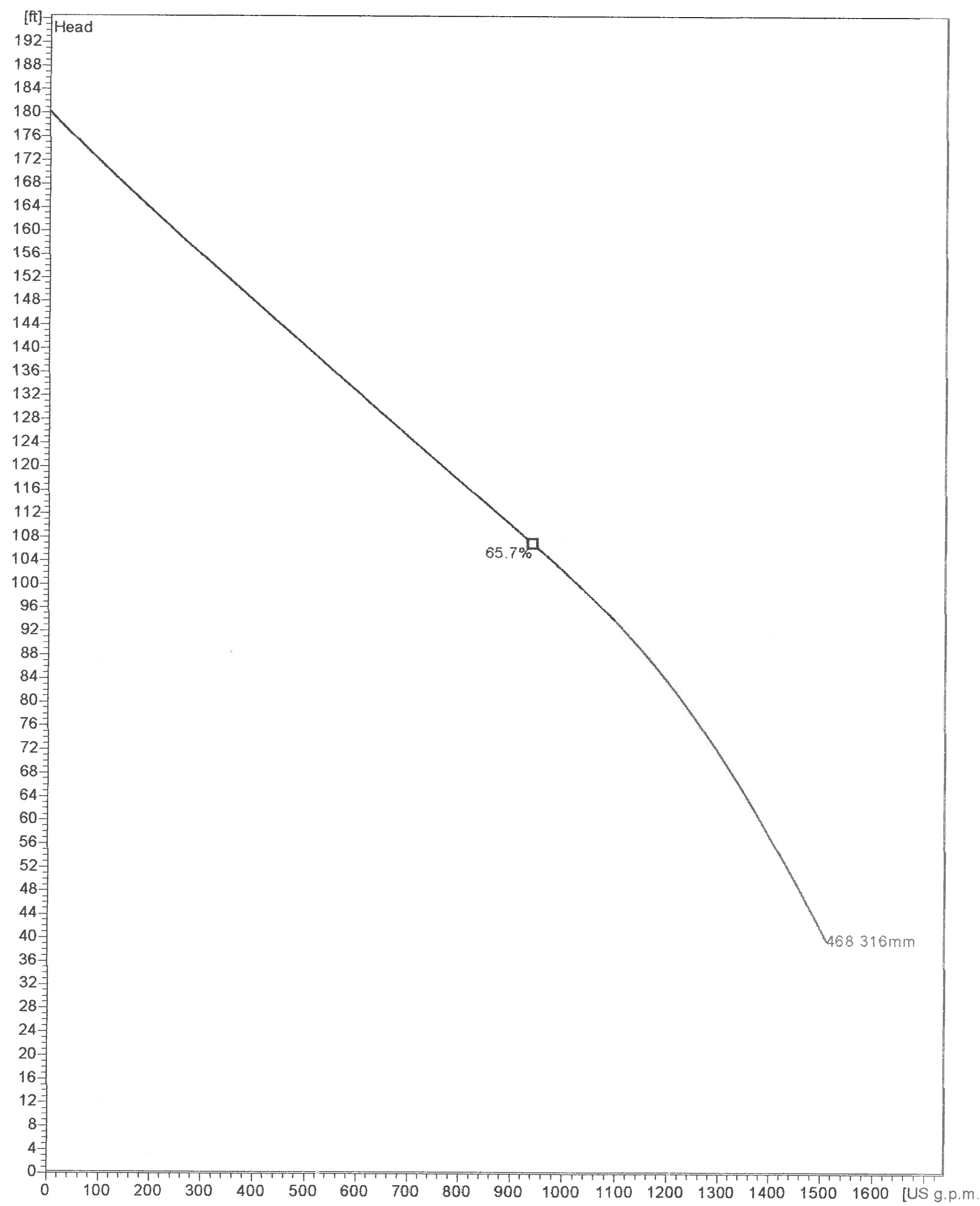
Curve according to: ISO 9906

Project	Project ID	Created by	Created on	Last update
			2012-03-22	

xylem
Let's Solve Water

NT 3202 HT 3~ 468
Duty Analysis

FLYGT



Curve according to: ISO 9906

Project	Project ID	Created by	Created on	Last update
			2012-03-22	

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

PACIFIC FORCE MAIN

NO.	DATE	BY	REVISION COMMENTS

Design	Drawn	Checked	Date	Initial Issue Date:
	ADD	JAH		

CITY OF CANNON BEACH

PUMP STATION EVALUATION
PACIFIC FORCE MAIN
SITE OVERVIEW
CANNON BEACH, OREON

HLB
otak
Incorporated

4253-A HWY 101 N.
GEARHART, OREGON 97138
Phone: (503) 738-3425
FAX: (503) 738-7455
Internet: WWW.HLB-OTAK.COM

66088 C088P006.DWG
Project No. Drawing No.

1
Sheet No.

N:\Engr\Govt\Cannon Beach\Pump Station Evaluation - 66088\Drawings\C088P006.dwg Plotted: May 04, 2009 - 11:37am By: add

ELKLAND

Lift Station Data

ITT Water & Wastewater	PERFORMANCE CURVE	PRODUCT NP3127.090	TYPE HT
DATE 2010-03-10	PROJECT <unnamed>	CURVE NO 61-489-00-3002	ISSUE 4

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.96	0.99	1.00
EFFICIENCY	83.0 %	84.5 %	83.0 %
MOTOR DATA	—	—	—

RATED POWER	7.5	hp
STARTING CURRENT ...	66	A
RATED CURRENT ...	30	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.049	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER 195 mm

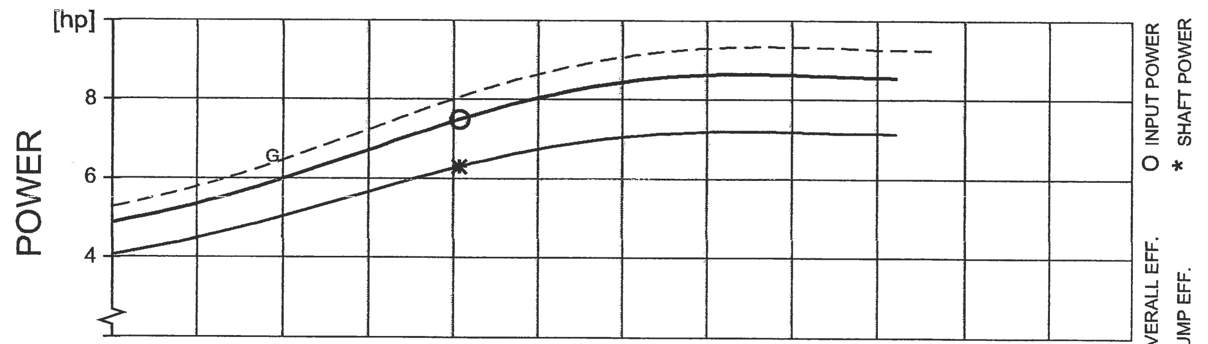
MOTOR #	STATOR	REV
21-12-4AL	12-	13

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	1	230 V	4

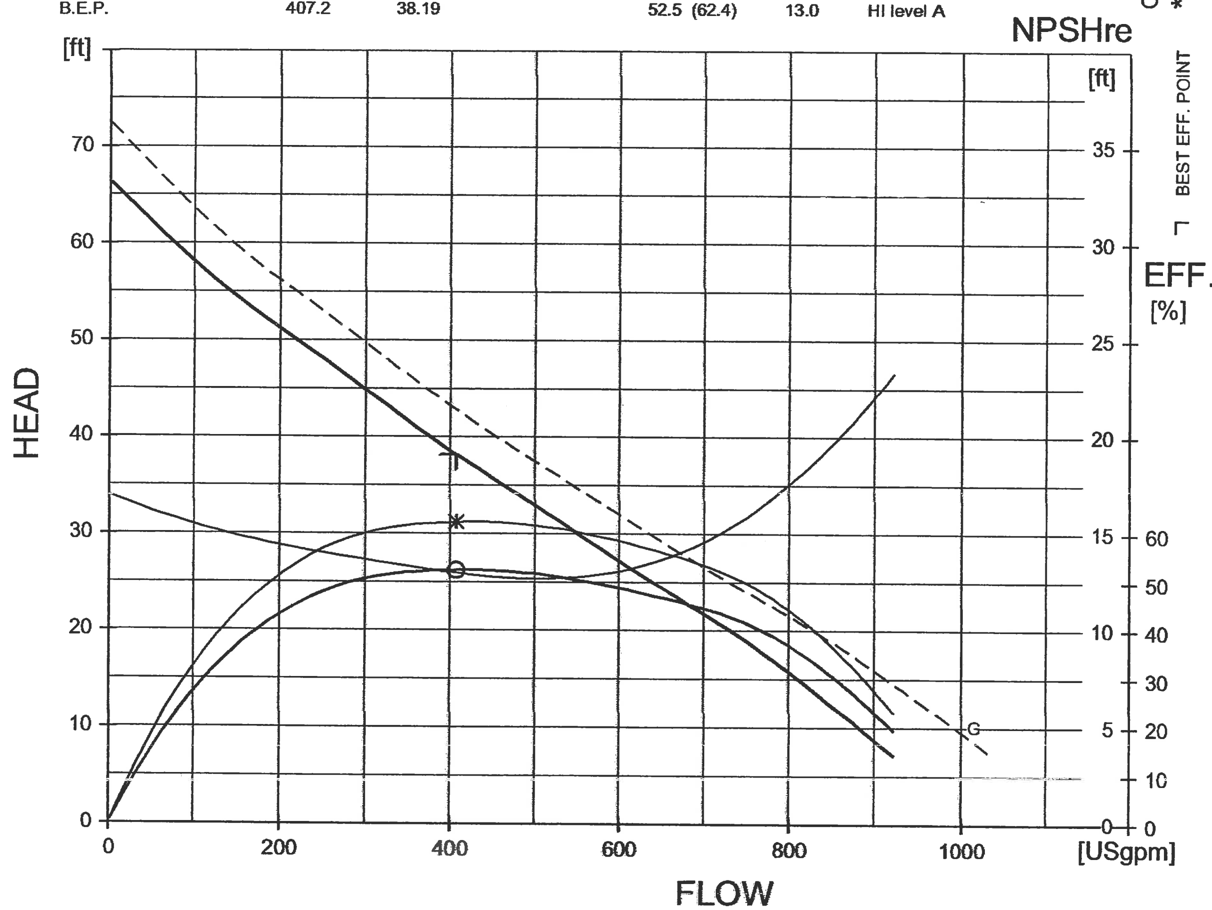
GEARTYPE	RATIO
—	—

COMMENTS

INLET/OUTLET	IMP. THROUGHLET
-/ 4 inch	—



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	EFF. [%]	NPSHre[ft]	GUARANTEE
B.E.P.	407.2	38.19	52.5 (62.4)	13.0	HI level A



FLYPS3.1.6.5 (20090313)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

GRAPHIC SCALE

90 0 45 90 180

1" = 90'

ELKLAND PUMP STATION

NOT FOR CONSTRUCTION

NO.	DATE	BY	REVISION COMMENTS

Design	Drawn	Checked	Date	Initial Issue Date:
JGF	ADD	JAH		

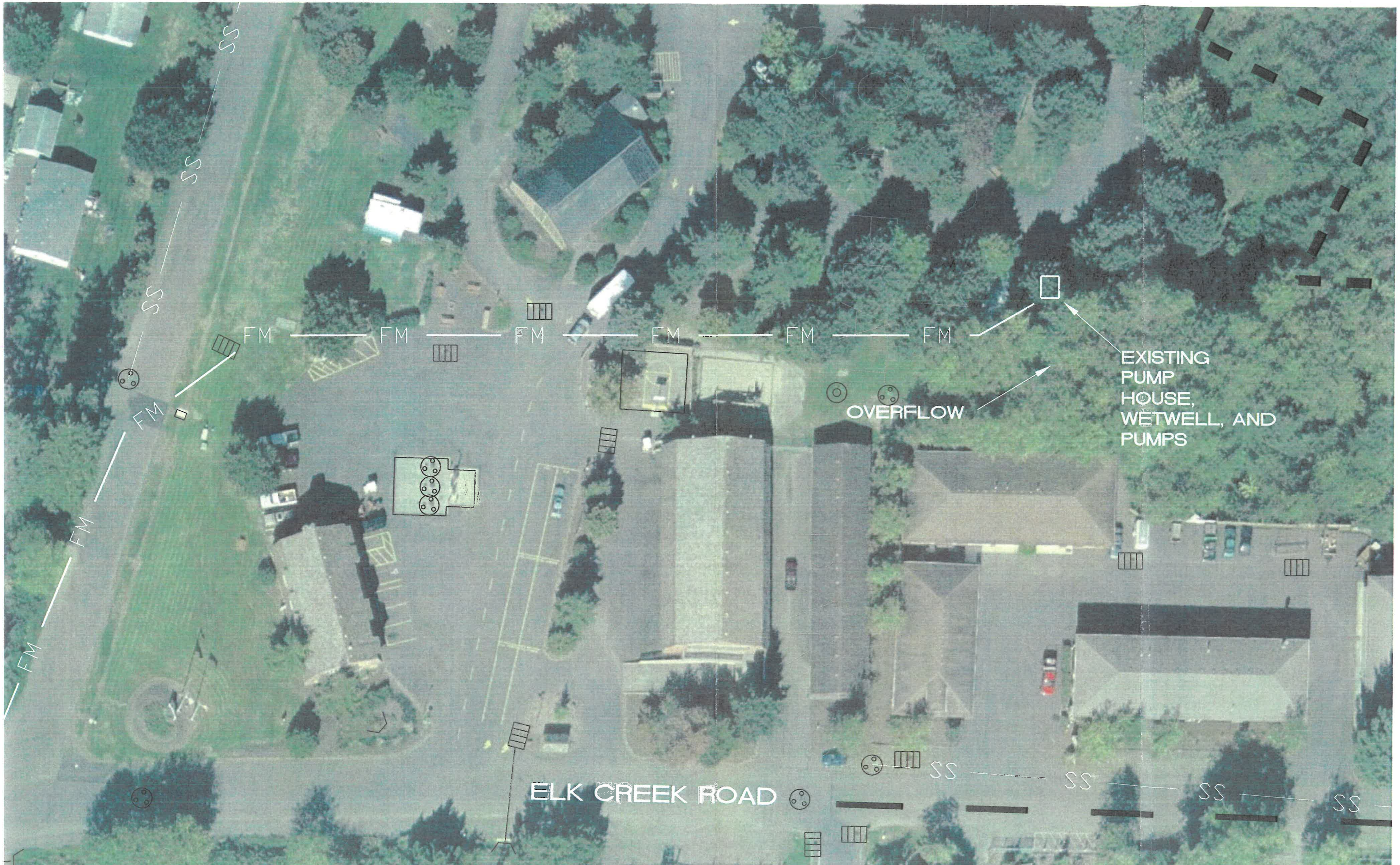
CITY OF CANNON BEACH
PUMP STATION EVALUATION
ELKLAND PUMP STATION
AIR PHOTO 1
CANNON BEACH, OREON

HLB otak Incorporated
4253-A HWY 101 N.
GEARHART, OREGON 97138
Phone: (503) 738-3425
FAX: (503) 738-7455
Internet: WWW.HLB-OTAK.COM

66088 C088P004.DWG
Project No. Drawing No.

1
Sheet No.

N:\Engr\Govt\Cannon Beach\Pump Station Evaluation – 66088\Drawings\C088P004.dwg Plotted: May 11, 2009 – 2:26pm By: add



GRAPHIC SCALE

50 0 25 50 100

1" = 50'

ELKLAND PUMP STATION

NOT FOR CONSTRUCTION

NO.	DATE	BY	REVISION COMMENTS

Design	Drawn	Checked	Date	Initial Issue Date:
JGF	ADD	JAH		

CITY OF CANNON BEACH
PUMP STATION EVALUATION
ELKLAND PUMP STATION
AIR PHOTO 2
CANNON BEACH, OREON

HLB otak Incorporated
4253-A HWY 101 N.
GEARHART, OREGON 97138
Phone: (503) 738-3425
FAX: (503) 738-7455
Internet: WWW.HLB-OTAK.COM

66088 C088P004.DWG
Project No. Drawing No.

1.1
Sheet No.

N:\Engr\Govt\Cannon Beach\Pump Station Evaluation - 66088\Drawings\C088P004.dwg Plotted: May 04, 2009 - 10:53am By: add

HAYSTACK

Lift Station Data

APPENDIX C

PUMP CURVES AND DEQ FLOW RATE CHECK FORM
WITH ELEVATION SKETCH

FLOW RATE CHECK FORM for DUPLEX, SUBMERSIBLE SEWAGE PUMPS

INSTALLATION DATA		CALCS	P - South	P - North
1. Pump Eye Elevation *(Calc'd from survey data)*	USER INPUT =>	A	89.24	89.24
2. Discharge guage offset from pump eye *(in feet)*	USER INPUT =>	B	7.01	7.01
3. Top slab (datum) elevation, from survey or plans *(in feet)* **ASSUMED**	USER INPUT =>	C	100	100
PRESSURE DATA				
1. SHUT-OFF HEAD, *(guage reading, psig)*	USER INPUT =>		***28.00***	***31.00***
Discharge guage reading, psig x 2.31* *(converts to feet)*		D	64.68	71.61
Total shut-off head @ pump eye *(in feet)* TRACE INTO PUMP CURVE		D+B	71.69	78.62
2A. Suction head @ pump START				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	E	7.50	7.50
Water surface elevation *(in feet)*		F = C-E	92.50	92.50
Suction head @ pump START *(in feet)*		G = F-A	3.26	3.26
2B. Suction head @ pump STOP				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	H	9.00	9.00
Water surface elevation *(in feet)*		I = C-H	91.00	91.00
Suction head @ pump STOP *(in feet)*		J = I-A	1.76	1.76
3A. Discharge head *(guage reading in psi)*	USER INPUT =>		***25.25***	***25.25***
Guage reading @ pump START, psig x 2.31* *(converts to feet)*		K	58.33	58.33
Reading adjusted to pump eye *(converts to feet)*		L = K+B	65.34	65.34
3B. Discharge head *(guage reading in psi)*	USER INPUT =>		***25.50***	***25.00***
Guage reading @ pump STOP, psig x 2.31* *(converts to feet)*		M	58.91	57.75
Reading adjusted to pump eye *(converts to feet)*		N = M+B	65.92	64.76
4. Total Dynamic Head, *(in feet)*				
TDH @ pump START		L - G	62.08	62.08
TDH @ pump STOP		N - J	64.16	63.00
FLOWRATE DATA @ Pump RPM of 1775				
1. Flow rate @ pump START, gpm *(curve interpolation)*	USER INPUT =>		150	275
2. Flow rate @ pump STOP, gpm *(curve interpolation)*	USER INPUT =>		112	250
3. Average **Flow**, gpm			131	**263**

NOTES

1. This spreadsheet, sketch and the notes are based on the DEQ Guidelines, "O&M NOTES FOR GUAGES ON SEWAGE PUMPS".
2. Actual measurements used for suction lift, no suction guage readings were used for calculations.
3. If 1/2" or less, difference exists in similar or dual measurements, add, take average, use the average for both pumps, guages, etc.
4. The above testing results are an estimate of pump performance, specific to the time of testing, recommend annual testing.
5. "Use depth of wtr surface to pump centerline for suction readings. On submersible pumps this submergence must be subtracted from the discharge pressure." DEQ
6. Does pump have any special conditions? Comminutator, Mix-Flush, Start delay? **NONE**

ATTACHMENTS TO THIS FORM

1. General sketch of elevations
2. Pump curve (1)

CONVERSION FACTORS

1" Hg = 1.13 ft of water column

1 psig = 2.31 ft of water column*

STATION: HAYSTACK, CANNON BEACH, OREGON
CURVE NUMBER: NP3102.181 MT - Provided by City of Cannon Beach
DATE OF FIELD TESTING: August 13, 2008
TESTING BY: SIGNATURE 1-6-09

Pumps: FLYGT NP3102... **(EXIST. P/S)**
HP: 5
Trim: 182 mm

MODIFIED BY JGF - HAYSTACK SOUTH

FLYGT PERFORMANCE CURVE

PRODUCT	NP3102.181	TYPE	MT		
DATE	2006-11-22	PROJECT		CURVE NO	63-462-00-3703
ISSUE	4	IMPELLER DIAMETER	182 mm		
MOTOR #	18-11-4AL	STATOR	01YSER	REV	11
FREQ.	60 Hz	PHASES	3	VOLTAGE	460 V
POLES	4	GEARTYPE	---	RATIO	---

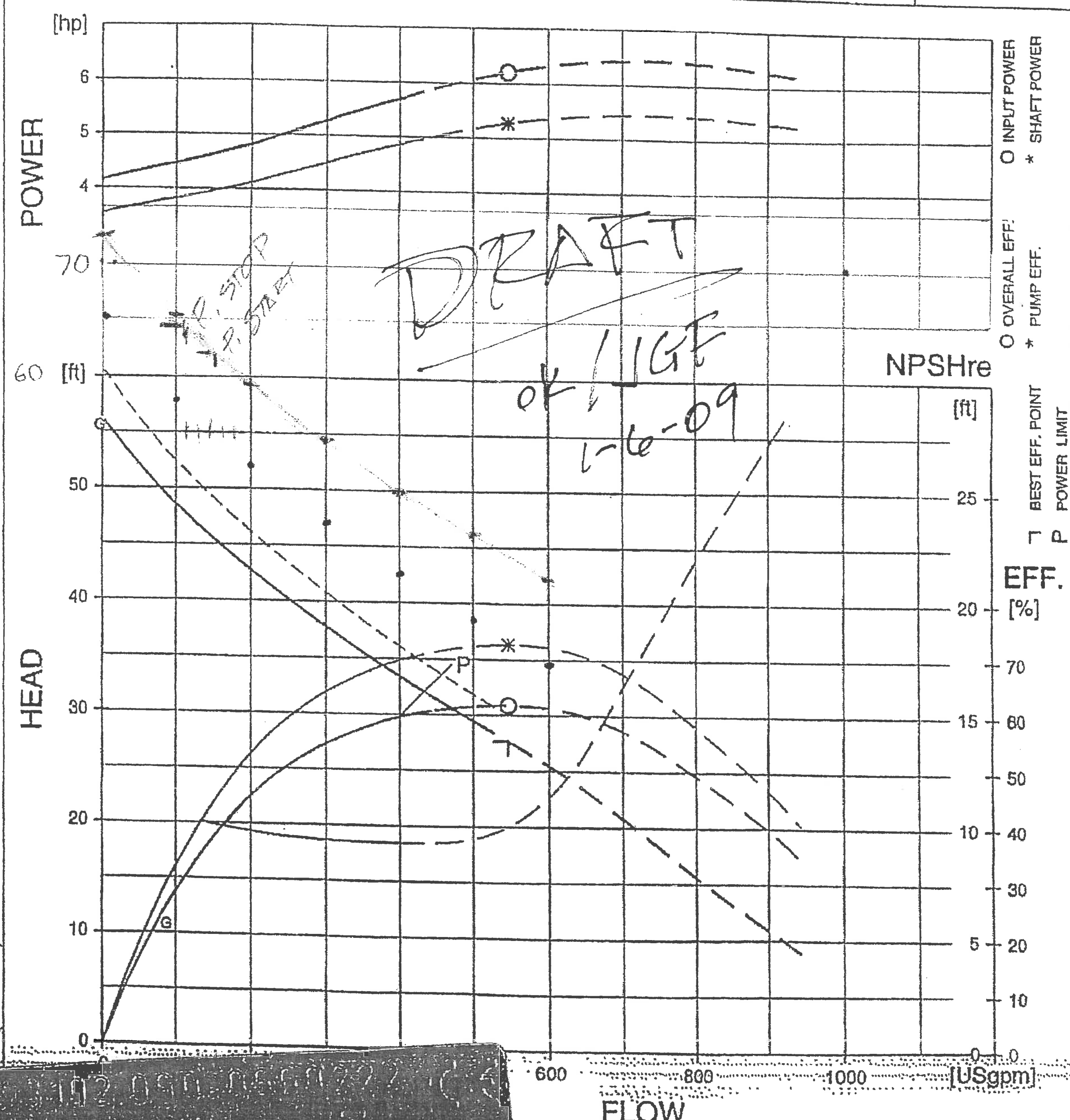
	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

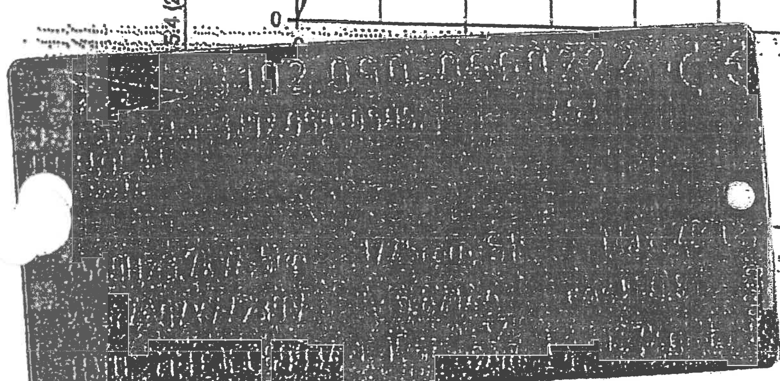
RATED POWER	5 hp
STARTING CURRENT ...	~~42~~ 84 A
RATED CURRENT ...	~~6.8~~ 13.5 A
RATED SPEED	1745 rpm
TOT.MOM.OF INERTIA ...	0.028 kgm2
NO. OF BLADES	2

COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---





GUARANTEE BETWEEN LIMITS (G) ACC. TO

Hi level A

Pumps not tested for Haystack system curve JGF.

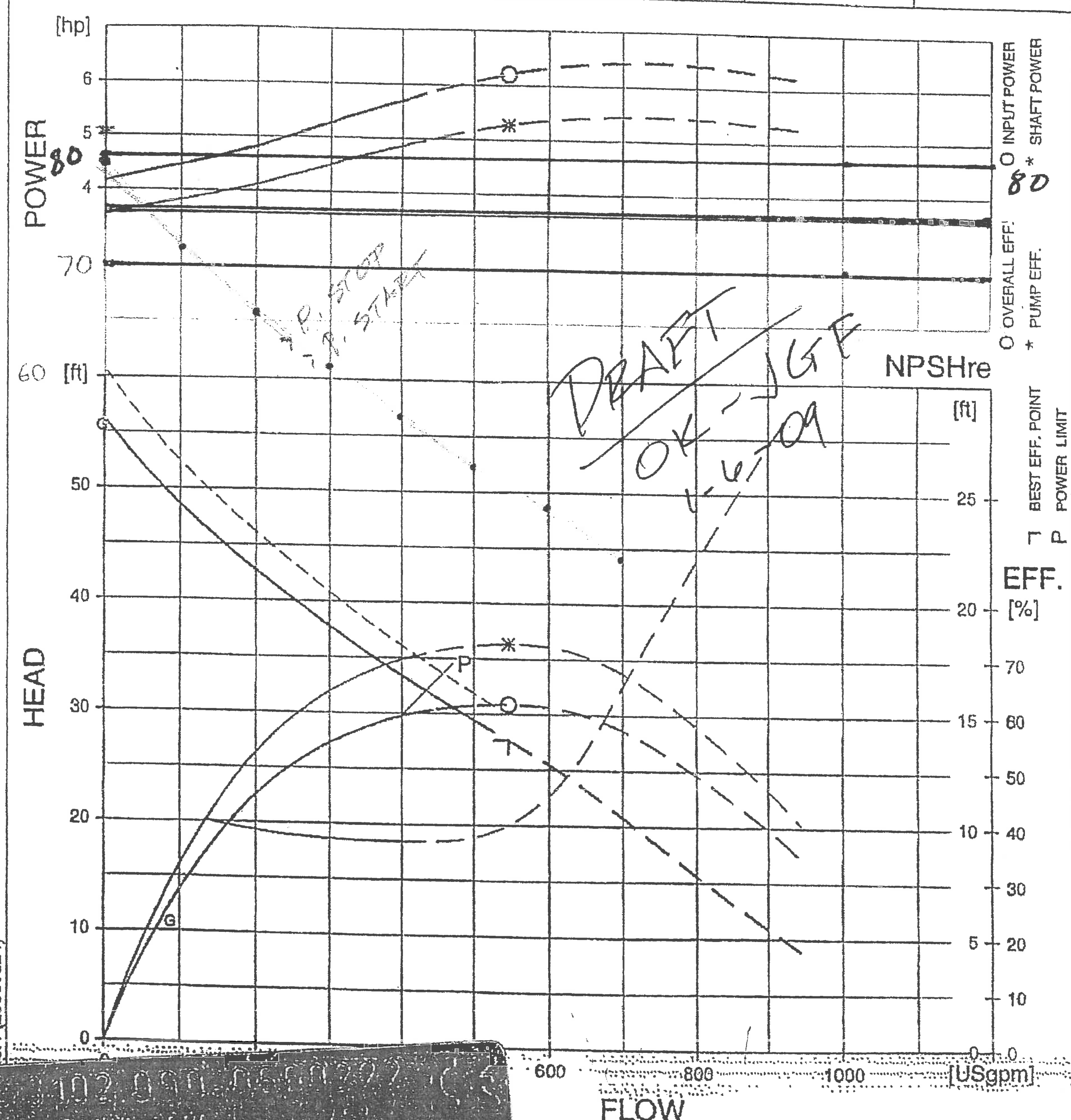
MODIFIED BY/JGF - HAYSTACK NORTH

FLYGT	PERFORMANCE CURVE	PRODUCT: NP3102.181	TYPE: MT
DATE: 2006-11-22	PROJECT	CURVE NO: 63-462-00-3703	ISSUE: 4

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

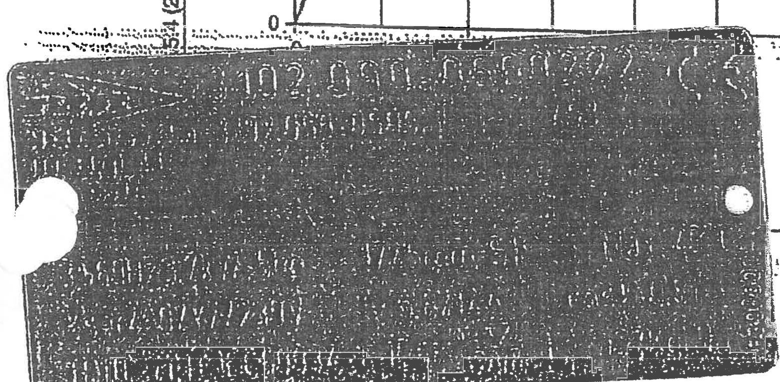
RATED POWER	5 hp
STARTING CURRENT	~~42~~ 84 A
RATED CURRENT	~~6.8~~ 13.5 A
RATED SPEED	1745 rpm
TOT.MOM.OF INERTIA	0.028 kgm2
NO. OF BLADES	2
INLET/OUTLET	-/ 4 inch
IMP. THROUGHLET	---
IMPELLER DIAMETER	182 mm
MOTOR #	18-11-4AL
STATOR	01YSER
REV	11
FREQ.	60 Hz
PHASES	3
VOLTAGE	460 V
POLES	4
GEARTYPE	---
RATIO	---

COMMENTS



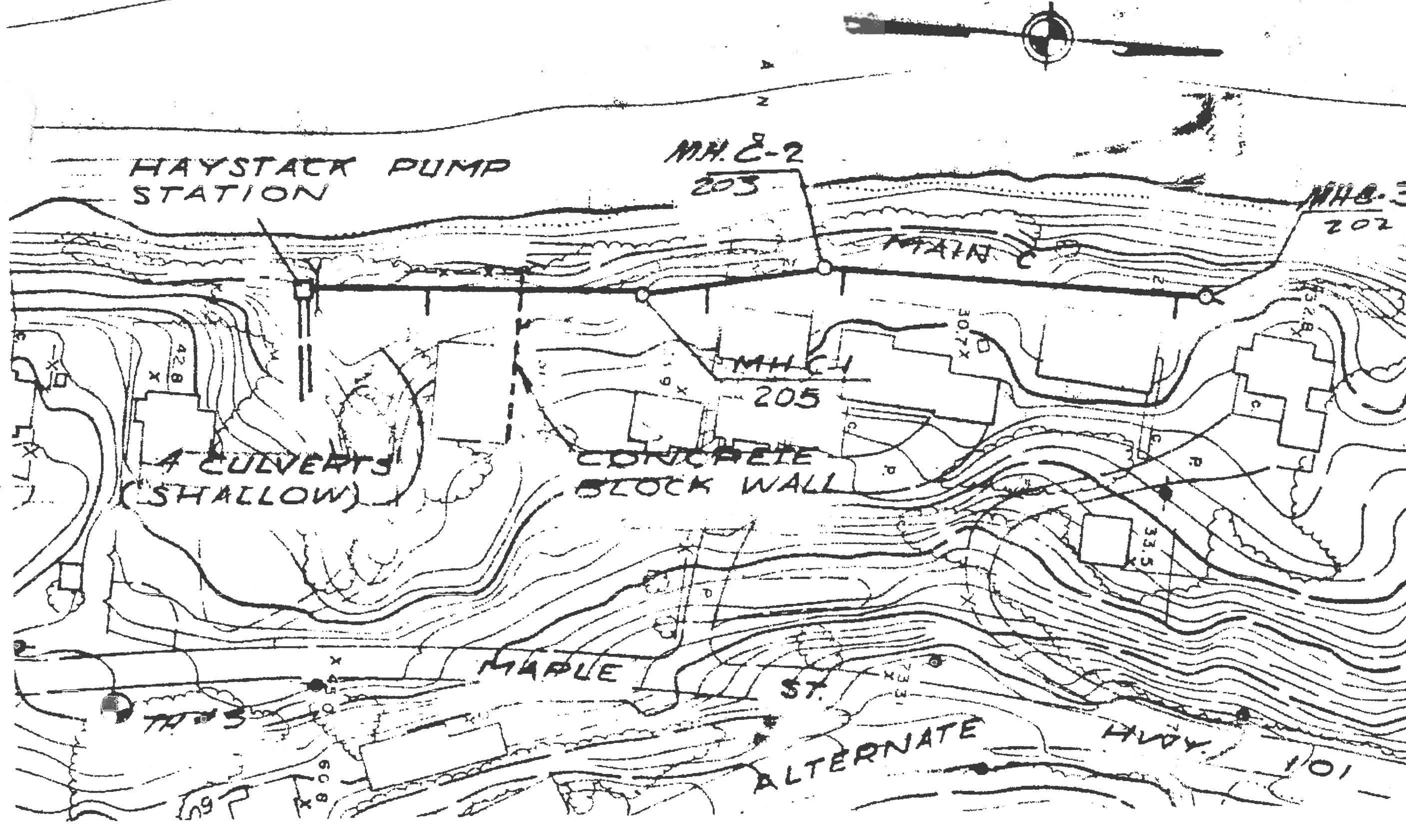
Pumps not sized for system curve

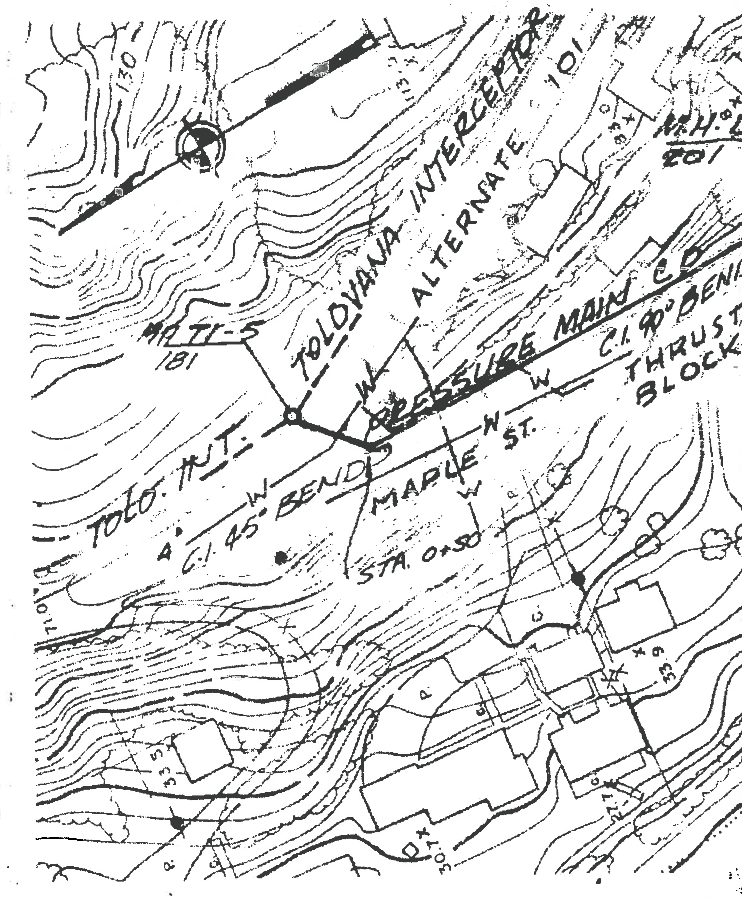
554 (20060324)



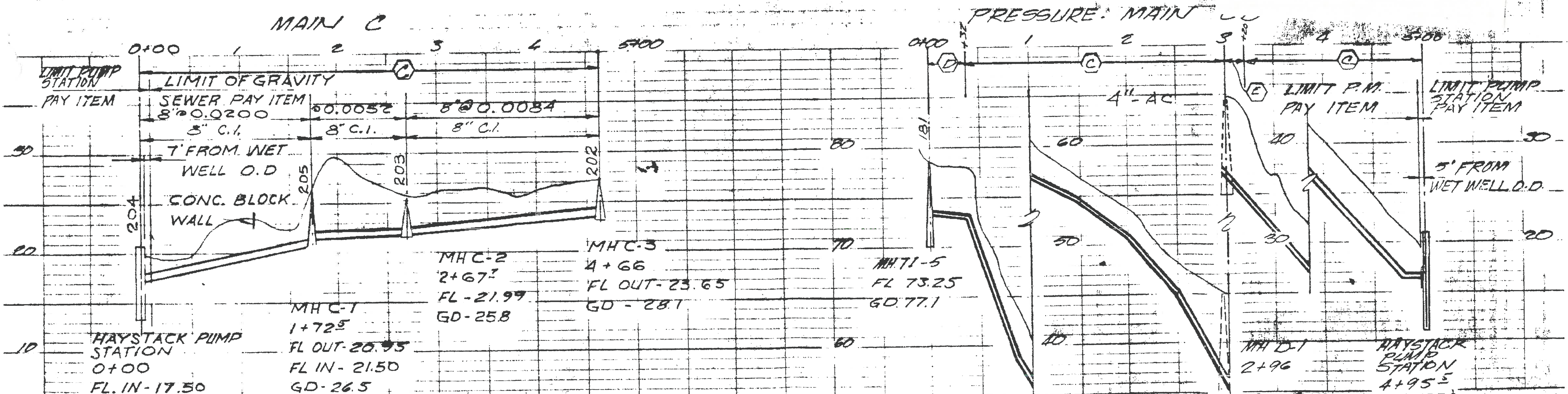
GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A





Haystack pressure main No longer discharges into Tolovana Interceptor when Matanuska was upgraded and New 10" PVC main was installed on Hemlock St. Haystack P.M. was connected to a new MH. just west of MH TI-5.



CITY OF CANNON BEACH, OREGON
TOLOVANA PARK SEWER SYSTEM – SCHEDULE S

MAIN C, PRESSURE MAIN CD

SCALE: VERT. 1" = 10'
HORIZ. 1" = 100'

SCALE: AS SHOWN	R.N. P5035.1	MAY 1969	SHEET 18 OF 46
DES Dmm / DR DI / CK Dmm	CORNELL, HOWLAND, HAYES & MERRYFIELD — SEATTLE PORTLAND CORVALLIS BOISE		E 5035-1

REGISTERED PROFESSIONAL ENGINEER 5216 OREGON JULY 10, 1961 ROBERT A. WRIGHT

MATANUSKA

Lift Station Data

GENERAL STATION DESCRIPTION

The City of Cannon Beach completed pump station improvements in 2007. This station has not received our complete evaluation, due to its new construction. However, the City of Cannon Beach has provided our staff with access to the station so that we may include it, and some of its operational characteristics in this evaluation of their pump stations.

The City of Cannon Beach has 9 pump stations, 2 main stations and 7 auxiliary stations. The MATANUSKA pump station is one of the auxiliary south stations. It is located west of Hemlock Street, at 1878 Pacific St. in the parking lot of the Stephanie Inn.

An overview of the pump station, as it relates to the location and neighborhood is provided in ***Appendix A***. This is a below grade, wet-pit, submersible style pump station, of new construction.

The controls and auxiliary generator are located in a fenced area, west of the wet well. The fenced in area is locked, with a red, emergency strobe placed in view of the street. The wet well, valve and flow meter vaults are located in an asphalted area, with parking bumpers to "protect" the station from vehicular traffic. The access covers of the wet well and valve vault are padlocked to prohibit unauthorized entry.

The original wet well was placed in service in 1970, with 2-20.0 HP pumps. In 2005, the pump station saw major improvements. Now the station has 3-35 HP pumps. The wet-well, valve, and flow meter vaults were all up-graded, and a new 10" force main were installed. New electrical control panels, a new auxiliary generator, hose-bib and small building complete the upgrades. Separate photos of the pump station are also part of this report and may be found in ***Appendix B***.

BUILDING

The building is a small, wood frame, tile-roof building which contains the pump control system, transfer switch for a mobile generator, a bubbler level control system with compressor, and a back-flow prevention device for the hose bib that is located in the valve vault. The electrical service meter panel is located on the outside of the building. Inside the fence is a HOT BOX which contains the backflow prevention valve, and a hose bib. See photographs in ***Appendix B***

WET WELL and OVERFLOW

This station has a 9.0' diameter concrete wet well, which contains 3 submersible pumps and a bubbler level control system. For redundancy, it also has a four float level control system that is designated as an overflow alarm float. The bubbler level control system controls when the pumps are "on" or "off".

In a typical, alternating, operational sequence, the lead pump turns on, (and should the level keep rising) the bubbler level control system turns the lag pump on, the third elevation of the bubbler level control reports high water, and the lowest, elevation is set to turn all pumps off.

The Mantanuska Pre-design Report, dated May, 2005 is given as a reference for all measurements, since this station did not receive the typical evaluations of the others. All measurements were taken from the top of the wet well slab. This elevation is given as 17.6'. The bottom of the wet well given as -2.70. Please note that no water was added for volumetric testing.

Level control turns the lead pump on at elevation 3.30' and turns the lead pump off at elevation -1.20'. This differential of 4.50' is the operating pool. This pool is approximately 2,150 gallons. While other measurements were given, these are the critical elevations for level control that the City can use or adjust.

This station has an automatic transfer switch and a stationary generator in the event of power grid failure or an alarm condition where the generator could come on. See the pictures provided in Appendix B.

If the pumps do not operate for a short period of time, this station has a very limited potential for overflow. First the wet well would fill to the gravity sewer, which in turn would back up as the wet well continued surcharging. The effluent would back up inton gravity sewer, in a manhole at 1878 Pacific. Then, it would back up to the south, and finally, this manhole has an emergency overflow pipe which drains into the storm drain and finally, discharge into beach grass. This is unlikely, due to the redundant provisions built into this new station.

To prevent this condition from occurring, the City has an overflow alarm float, which if triggered, lets them know that the station wet well is filling ***above*** the alarm condition of high water, which is triggered by the bubbler system.

It should be specifically noted that the City of Cannon Beach is very confident in the sewer collection system and it's ability to handle any high wet well level conditions. They have 3 separate wastewater collection specialists with the equipment available to correct situations before they become emergencies. However, this station has an extra pump, which is able to handle the FIRM capacity of the station, and would automatically come on with a high wet well. If this pump comes on, it is our understanding that DEQ would need to be notified, since this condition would be in excess of their basin flows. Typically City Wastewater personnel would be at the station just ***after*** the high water is noted, which is before the overflow float triggers an alarm or the third pump.

The manhole sections used for the wet well were well grouted. The interior of the wet well is ventilated, and we expected to find no H_2S damage, and none was found. See photos in ***Appendix B***.

PUMPS

The main pump controls were located in the building. See photos.

This station has 3 pumps. This pump set was not volumetric tested for this evaluation.

We took the liberty of contacting the FLYGT company at 2630 North Marine Drive, Portland, Oregon. They informed us that the pumping system was made up of three (3) constant speed, Model NP3171.091-275 pumps, with a quick disconnect rail system. The electrical requirements are 480 Volt, 3Φ. These pumps have a 4" discharge elbow and separate discharge piping for each pump. Each pump is equipped with a stainless steel lifting chain.

The DEQ flow testing method was not used, nor reported on for this station. However, since the station is so new, only in service approximately 2 years we would not expect much wear in the pump assemblies.

Within the electrical controls, an alternator operates each of the three pumps as the lead or the lag pump in sequence to keep wear equal. The pump operation was quiet, with no apparent vibration. Each pump has a separate discharge pipe, which is connected in the valve vault, located east of the wet well.

The operational personnel are not considering upgrades to this station, due to it's new condition. However, we would recommend some minor maintenance for future trouble free operation. See the **RECOMMENDATIONS** section of this report.

A pump curve is found in ***Appendix C***.

VALVE VAULT

A large concrete valve vault, approximately 10' x 12' contains the pump discharge piping, swing-checks and gate valves to the force main. All pump discharge piping is brought together, outside of the vault, into a single 8" force main. This force main has a concentric reducer which changes the diameter to 10" just west of the valve vault.

FORCE MAIN

Outside of the valve vault, the 8" diameter force main transitions to 10" diameter C-900 PVC pipe. Plan and profile information was provided by the City. The overall length of the force main is approximately 5300 lineal feet, and ends in a discharge manhole located in the north bound lane of Hemlock Avenue. There the force main transfers the effluent from the Matanuska pump station basin, into the City's gravity collection system.

A discharge plan and profile appears in ***Appendix D***.

DISCHARGE MANHOLE

This manhole was located at the northbound lane of Hemlock Avenue across from the intersection of Pacific and Hemlock. This manhole has a typical suburban frame and cover. With the City's assistance, we removed the cover, and examined the discharge manhole. Our investigation took place during a high-volume traffic condition, therefore our examination was limited.

No separate H_2S report was generated for this manhole. However, with the cover removed, we did probe the sides and neck of the manhole to test for the presence of H_2S damage. The probing only produced small chips or spalls in the grout coat and concrete. Some slight spalling of the grout coat was noted.

Further, our examination of the walls of the manhole did not indicate that the pump station was surcharging this manhole.

This manhole is in excellent condition. This manhole, in its present condition will allow for many years of service, however, its exact life expectancy is unknown. We were given all needed assistance by the City during the inspection process. See ***Appendix B***.

AUXILIARY POWER

This station has an automatic transfer switch, connected to the pump controls inside the control building. This control building is located approximately 20 feet west of the wet well, on an improved asphalt surface. Dedicated, on-site power generation exists for this station, in the form of an 100 kW auxiliary generator.

Please note that since this station has a dedicated generator, a generator is not being recommended for this location.

RECOMMENDATIONS

To assist Otak in making the following practical recommendations, City maintenance personnel were interviewed during the testing procedures.

The structures of this station, building, wet well, and vault with force main appear to be in good condition. No further upgrades are necessary or required here.

GRAPHIC SCALE

50 0 25 50 100

1" = 50'

MATANUSKA P

N:\Engr\Govt\Cannon Beach\Pump Station Evaluation -- 66088\Drawings\C088P011.dwg Plotted: Jun 23, 2009 -- 11:13am By: add

SUISLAW

Lift Station Data

FLOW RATE CHECK FORM for DUPLEX, SUBMERSIBLE SEWAGE PUMPS

INSTALLATION DATA		CALCS	P#1 - S	P#2 - N
1. Pump Eye Elevation *(Calc'd from survey data)*	USER INPUT =>	A	86.98	86.98
2. Discharge guage offset from pump eye *(in feet)*	USER INPUT =>	B	10.42	10.42
3. Top slab (datum) elevation, from survey or plans *(in feet)*	USER INPUT =>	C	100	100
PRESSURE DATA				
1. SHUT-OFF HEAD, *(guage reading, psig)*	USER INPUT =>		*13.00*	*12.50*
Discharge guage reading, psig x 2.31 *(converts to feet)*		D	30.03	28.88
Total shut-off head, *(in feet)* TRACE INTO PUMP CURVE		D+B	40.45	39.30
2A. Suction head @ pump START				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	E	9.02	9.20
Water surface elevation *(in feet)*		F = C-E	90.98	90.80
Suction head @ pump START *(in feet)*		G = F-A	4.00	3.82
2B. Suction head @ pump STOP				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	H	11.20	11.20
Water surface elevation *(in feet)*		I = C-H	88.80	88.80
Suction head @ pump STOP *(in feet)*		J = I-A	1.82	1.82
3A. Discharge head *(guage reading in psi)*	USER INPUT =>		*9.00*	*8.50*
Guage reading @ pump START, psig x 2.31 *(converts to feet)*		K	20.79	19.64
Reading adjusted to pump eye *(converts to feet)*		L = K+B	31.21	30.06
3B. Discharge head *(guage reading in psi)*	USER INPUT =>		*8.00*	*8.00*
Guage reading @ pump STOP, psig x 2.31 *(converts to feet)*		M	18.48	18.48
Reading adjusted to pump eye *(converts to feet)*		N = M+B	28.90	28.90
4. Total Dynamic Head, *(in feet)*				
TDH @ pump START		L - G	27.21	26.24
TDH @ pump STOP		N - J	27.08	27.08
FLOWRATE DATA @ Pump RPM of 1745				
1. Flow rate @ pump START, gpm *(curve interpolation)*	USER INPUT =>		290	310
2. Flow rate @ pump STOP, gpm *(curve interpolation)*	USER INPUT =>		295	305
3. Average **Flow**, gpm			**293**	**308**

NOTES
1. This spreadsheet, sketch and the notes are based on the DEQ Guidelines, "O&M NOTES FOR GUAGES ON SEWAGE PUMPS".
2. Actual measurements used for suction lift, no suction guage readings were used for calculations.
3. If 1/2" or less, difference exists in similar or dual measurements, add, take average, use the average for both pumps, guages, etc.
4. The above testing results are an estimate of pump performance, specific to the time of testing, recommend annual testing.
5. "Use depth of wtr surface to pump centerline for suction readings. On submersible pumps this submergence must be subtracted from the discharge pressure." DEQ
6. Does pump have any special conditions? Comminutator, Mix-Flush, Start delay?

ATTACHMENTS TO THIS FORM
1. General sketch of elevations
2. Pump curve (1)

CONVERSION FACTORS

1" Hg = 1.13 ft of water column

1 psig = 2.31 ft of water column

STATION: SUISLAW, **CANNON BEACH, OREGON**

CURVE NUMBER: 63-462-00-3703

DATE OF FIELD TESTING: August 5, 2008

TESTING BY: SIGNATURE Jon Fouesta 4-7-09

Pumps: NP3102.181 **(EXIST. P/S)**

HP: 5.0

Trim: 182 mm

FLYGT	PERFORMANCE CURVE	PRODUCT NP3102.181	TYPE MT
DATE 2006-11-22	PROJECT	CURVE NO 63-462-00-3703	ISSUE 4

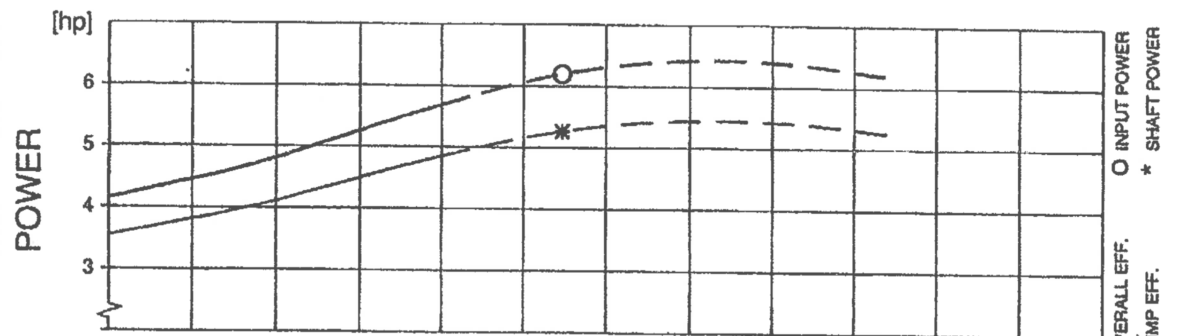
	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	5	hp
STARTING CURRENT ...	~~42~~ 64	A
RATED CURRENT ...	~~6.8~~ 13.5	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

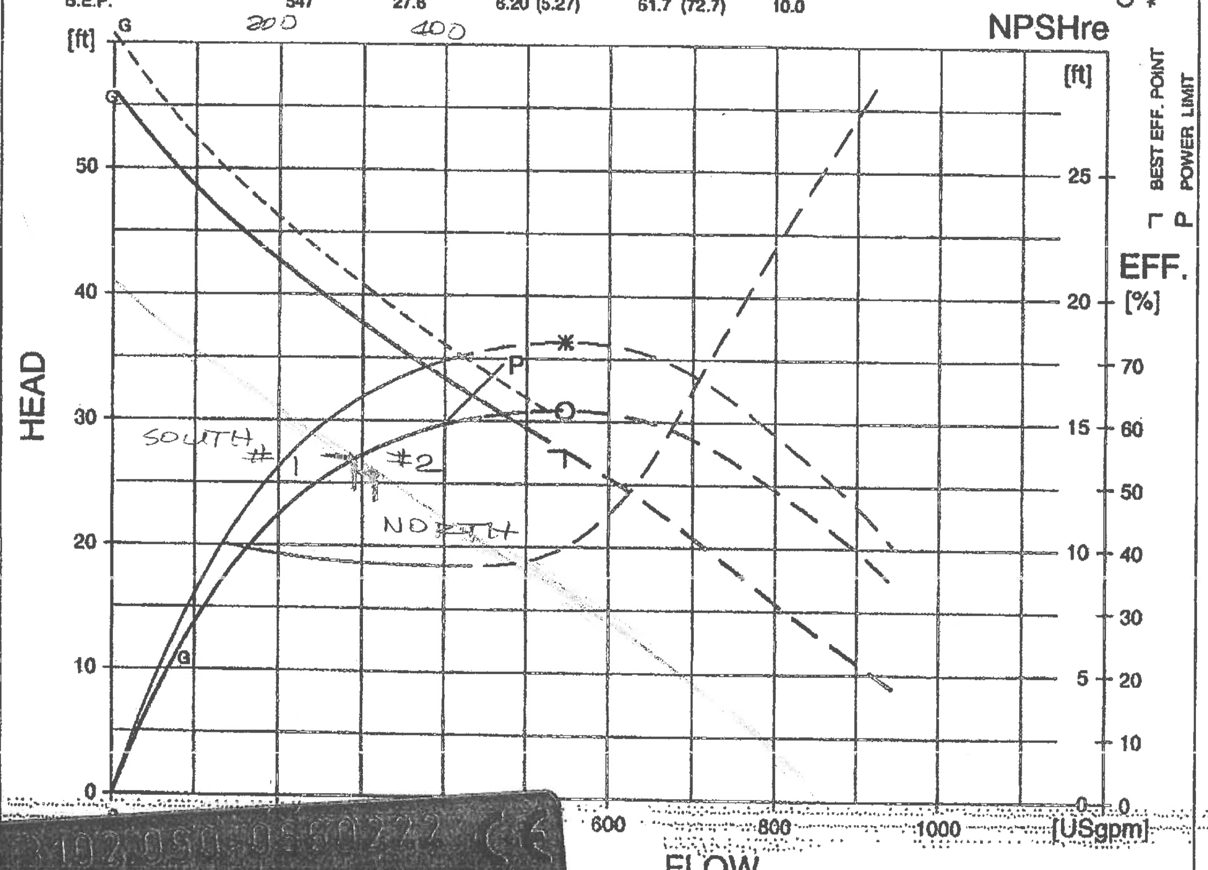
COMMENTS

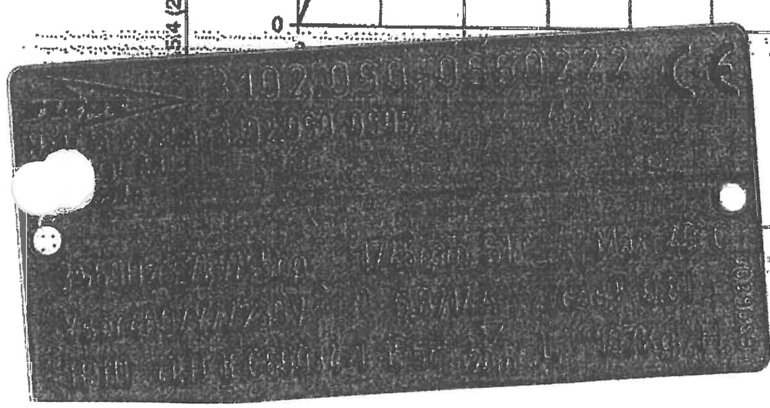
INLET/OUTLET	IMP. THROUGHLET
-/ 4 inch	---

IMPELLER DIAMETER			
182 mm			
MOTOR # 18-11-4AL		STATOR 01YSER	REV 11
FREQ. 60 Hz	PHASES 3	VOLTAGE 460 V	POLES 4
GEARTYPE ---		RATIO ---	

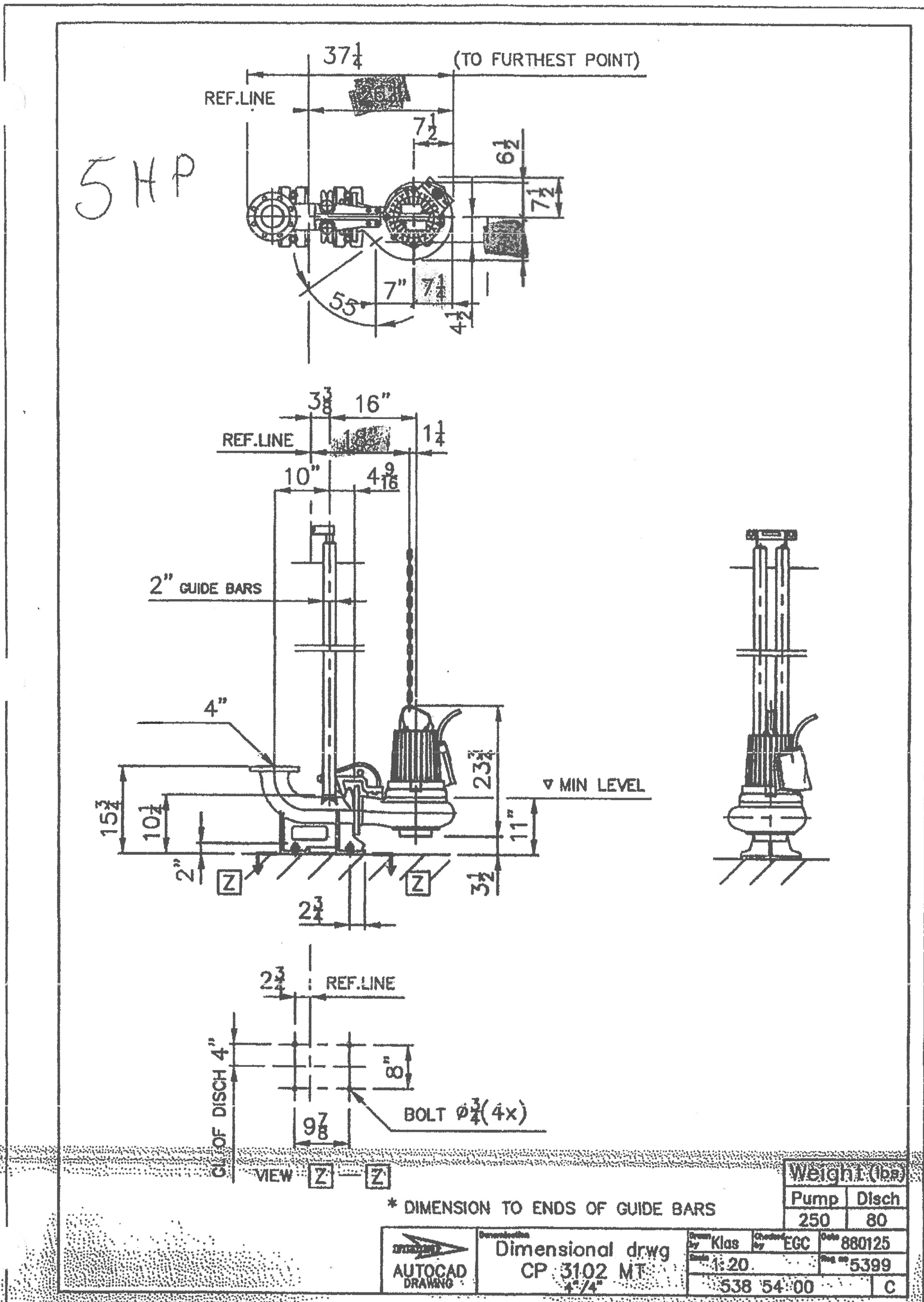


DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	547	27.6	6.20 (5.27)	61.7 (72.7)	10.0





GUARANTEE BETWEEN LIMITS (G) ACC. TO
HI level A

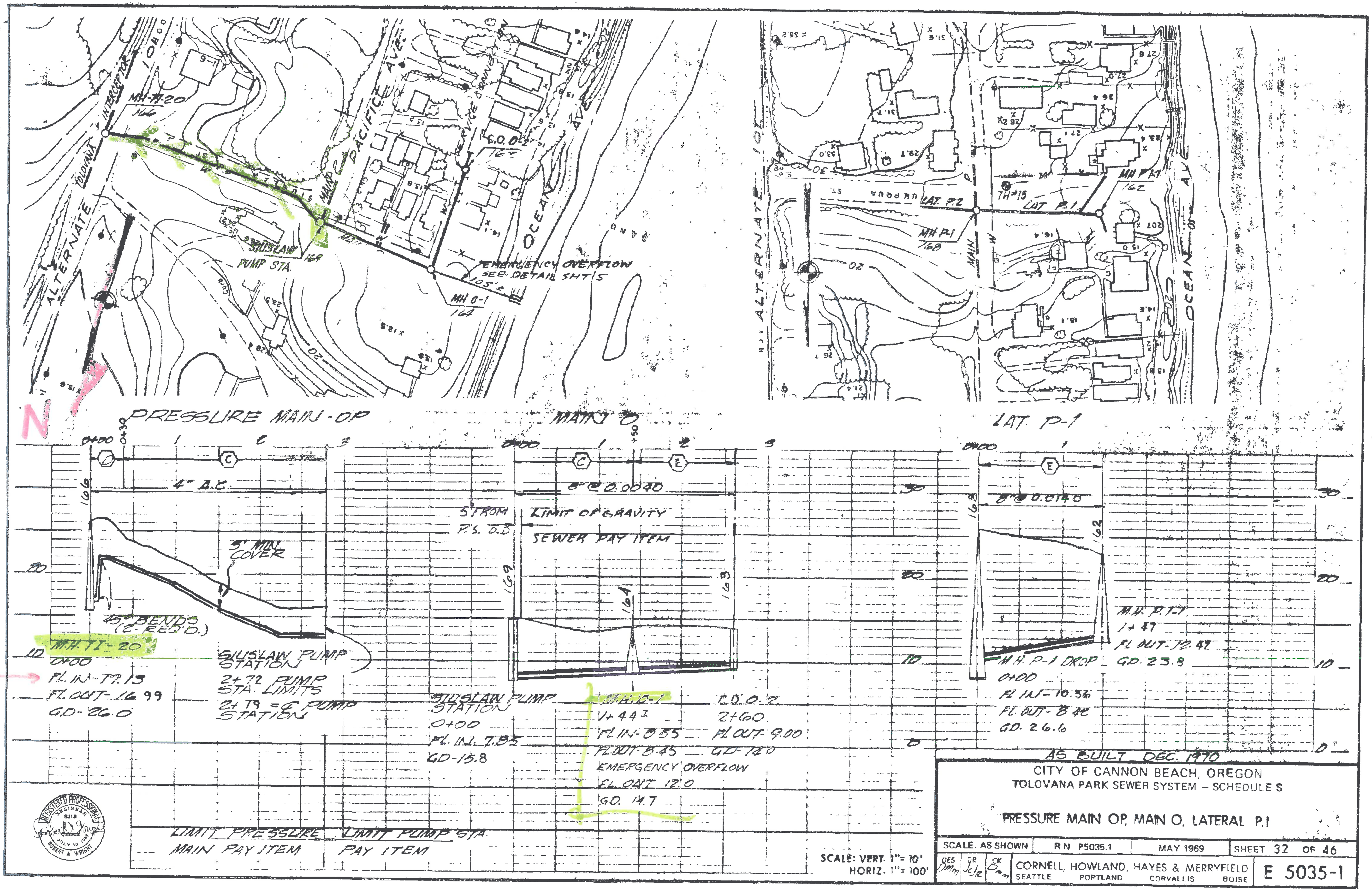


5HP
37¼
(TO FURTHEST POINT)
REF.LINE
7½
6½
7½
7"
7¼
55°
4½
3⅜
16"
REF.LINE
1¼
10"
4 9/16
2" GUIDE BARS
4"
15¾
10¼
2"
Z
23¾
▽ MIN LEVEL
11"
3½
Z
2¾
2¾
REF.LINE
C/L OF DISCH 4"
8"
BOLT ø¾(4x)
9⅞
VIEW Z — Z
* DIMENSION TO ENDS OF GUIDE BARS
Weight (lbs)
Pump
Disch
250
80
AUTOCAD DRAWING
Dimensional drwg
CP 3102 MT
4"/4"
Klas
EGC
880125
1:20
5399
538 54 00
C

APPENDIX D

EXISTING FORCE MAIN PLAN AND PROFILE

TOLOVANA INTERC



SIUSLAW

MIDWAY

Lift Station Data

FLOW RATE CHECK FORM for DUPLEX, SUBMERSIBLE SEWAGE PUMPS

INSTALLATION DATA		CALCS	P#2 - South	P#1 - North
1. Pump Eye Elevation *(Calc'd from survey data)*	*USER INPUT =>*	A	88.79	88.79
2. Discharge guage offset from pump eye *(in feet)*	*USER INPUT =>*	B	9.41	9.41
3. Top slab (datum) elevation, from survey or plans *(in feet)* ***ASSUMED***	*USER INPUT =>*	C	100	100
PRESSURE DATA				
1. SHUT-OFF HEAD, *(guage reading, psig)*	*USER INPUT =>*		***19.50***	***17.50***
Discharge guage reading, psig x 2.31* *(converts to feet)*		D	45.05	40.43
Total shut-off head @ pump eye *(in feet)* *TRACE INTO PUMP CURVE*		D+B	54.46	49.84
2A. Suction head @ pump START				
Wtr surface, *measured* from top slab or datum *(in feet)*	*USER INPUT =>*	E	7.80	7.80
Water surface elevation *(in feet)*		F = C-E	92.20	92.20
Suction head @ pump START *(in feet)*		G = F-A	3.41	3.41
2B. Suction head @ pump STOP				
Wtr surface, *measured* from top slab or datum *(in feet)*	*USER INPUT =>*	H	9.00	9.00
Water surface elevation *(in feet)*		I = C-H	91.00	91.00
Suction head @ pump STOP *(in feet)*		J = I-A	2.21	2.21
3A. Discharge head *(guage reading in psi)*	*USER INPUT =>*		***11.00***	***12.00***
Guage reading @ pump START, psig x 2.31* *(converts to feet)*		K	25.41	27.72
Reading adjusted to pump eye *(converts to feet)*		L = K+B	34.82	37.13
3B. Discharge head *(guage reading in psi)*	*USER INPUT =>*		***11.50***	***12.00***
Guage reading @ pump STOP, psig x 2.31* *(converts to feet)*		M	26.57	27.72
Reading adjusted to pump eye *(converts to feet)*		N = M+B	35.98	37.13
4. Total Dynamic Head, *(in feet)*				
TDH @ pump START		L - G	31.41	33.72
TDH @ pump STOP		N - J	33.77	34.92
FLOWRATE DATA @ Pump RPM of 1775				
1. Flow rate @ pump START, gpm *(curve interpolation)*	*USER INPUT =>*		420	270
2. Flow rate @ pump STOP, gpm *(curve interpolation)*	*USER INPUT =>*		375	250
3. Average **Flow**, gpm			**398**	**260**

NOTES

1. This spreadsheet, sketch and the notes are based on the DEQ Guidelines, "O&M NOTES FOR GUAGES ON SEWAGE PUMPS".
2. Actual measurements used for suction lift, no suction guage readings were used for calculations.
3. If 1/2" or less, difference exists in similar or dual measurements, add, take average, use the average for both pumps, guages, etc.
4. The above testing results are an estimate of pump performance, specific to the time of testing, recommend annual testing.
5. "Use depth of wtr surface to pump centerline for suction readings. On submersible pumps this submergence must be subtracted from the discharge pressure." DEQ
6. Pump opening to impeller = pump eye in calcs
7. Does pump have any special conditions? Comminutator, Mix-Flush, Start delay? **NONE**

ATTACHMENTS TO THIS FORM

1. Pump curve (1)

CONVERSION FACTORS

1" Hg = 1.13 ft of water column

1 psig = 2.31 ft of water column*

STATION: MIDWAY, CANNON BEACH, OREGON

Pumps: FLYGT NP3102... **(EXIST. P/S)**

CURVE NUMBER: NP3102.181 MT - Provided by City of Cannon Beach

HP: 5.0

DATE OF FIELD TESTING: July 30, 2008, calcs revised 3-24-09/JGF

Trim: 182 mm

TESTING BY: SIGNATURE____________________________

FLYGT

PERFORMANCE CURVE

PRODUCT	TYPE
NP3102.181	MT

DATE	PROJECT	CURVE NO	ISSUE
2006-11-22		63-462-00-3703	4

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	5	hp
STARTING CURRENT ...	~~42~~ 84	A
RATED CURRENT ...	~~6.8~~ 13.5	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

COMMENTS

INLET/OUTLET: -/ 4 inch

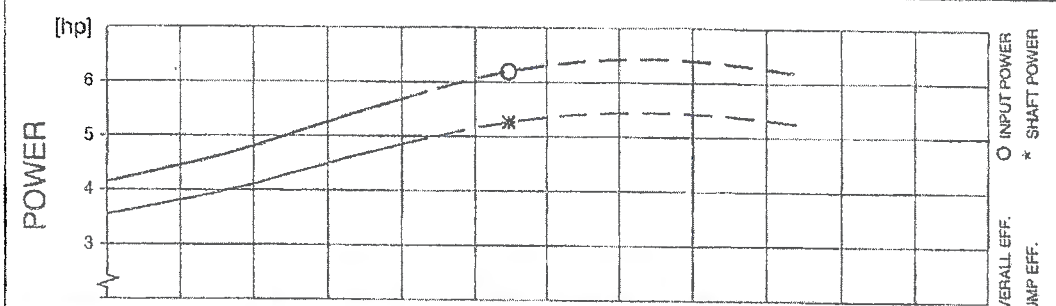
IMP. THROUGHLET: ---

IMPELLER DIAMETER: 182 mm

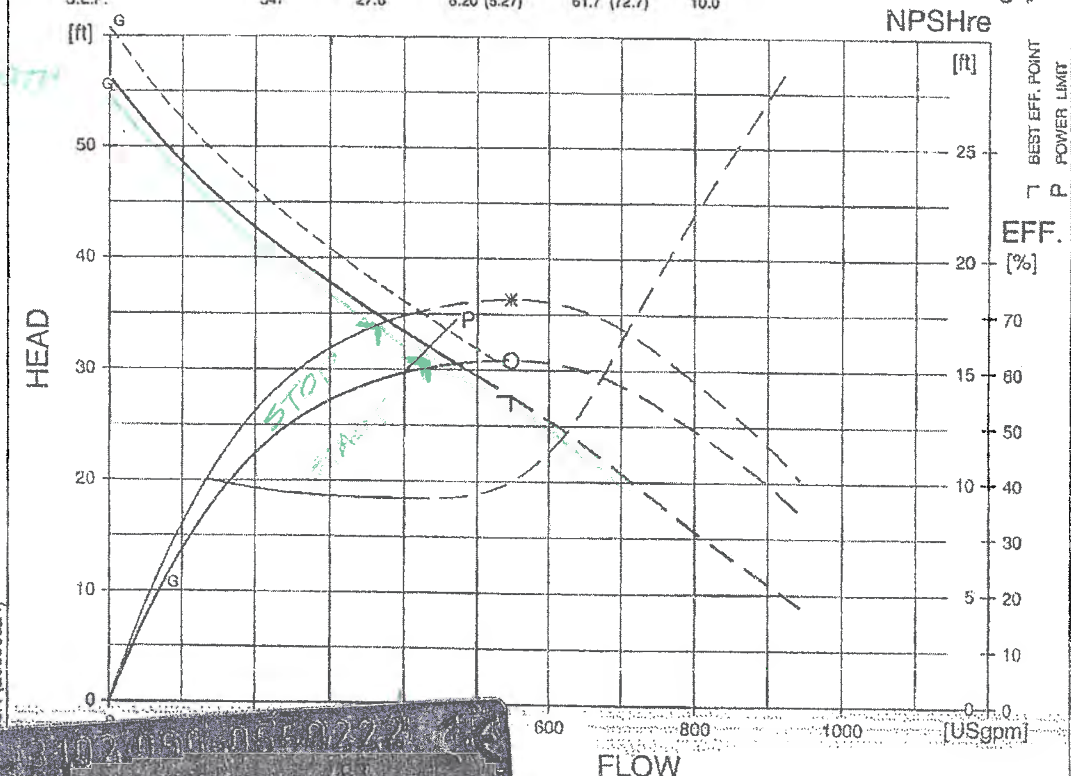
MOTOR #	STATOR	REV
18-11-4AL	01YSER	11

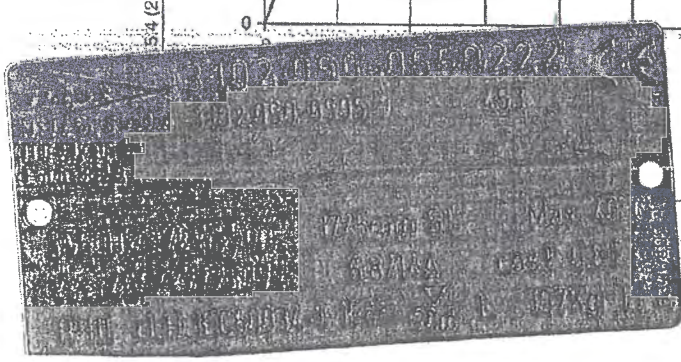
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---



	DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.		547	27.6	6.20 (5.27)	61.7 (72.7)	10.0





GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

FLYGT	PERFORMANCE CURVE	PRODUCT: NP3102.181	TYPE: MT
DATE: 2006-11-22	PROJECT:	CURVE NO: 63-462-00-3703	ISSUE: 4

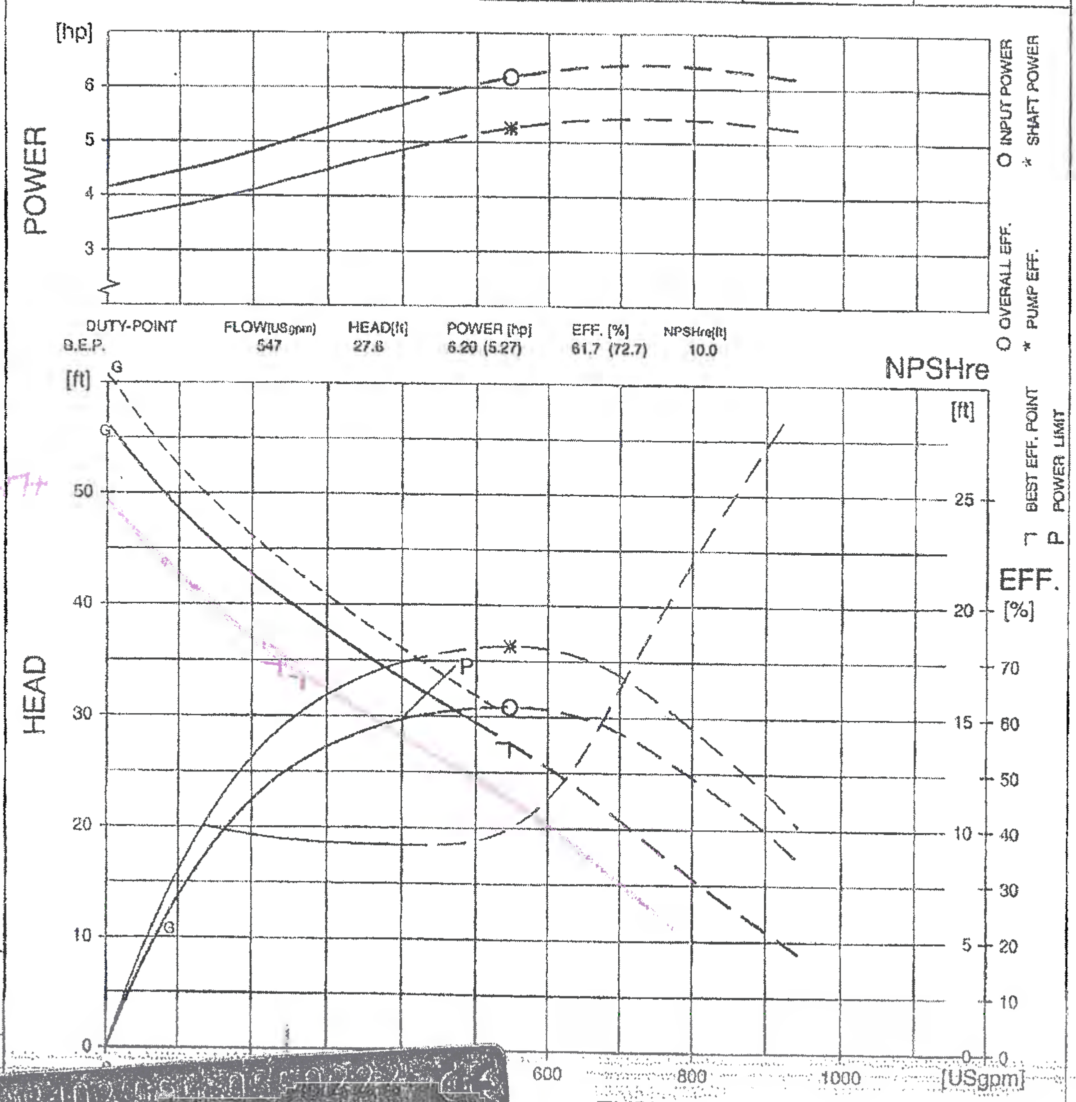
	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

COMMENTS

INLET/OUTLET	IMP. THROUGHLET
-/ 4 inch	---

RATED POWER	5	hp
STARTING CURRENT ...	~~42~~ 84	A
RATED CURRENT ...	~~6.8~~ 13.5	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

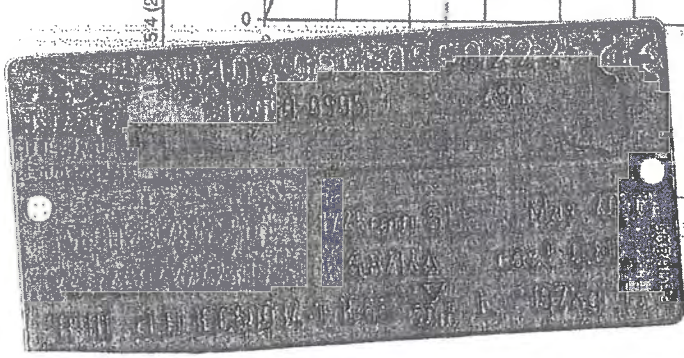
IMPELLER DIAMETER			
182 mm			
MOTOR #	STATOR	REV	
18-11-4AL	01YSER	11	
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4
GEARTYPE	RATIO		
---	---		



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	547	27.6	6.20 (5.27)	61.7 (72.7)	10.0

P2 NORTH

GUARANTEE BETWEEN LIMITS (G) ACC. TO
HI level A



MIDWAY / PROPOSED

ADDITIONAL INFO — FOR RPT

MIDWAY

PERFORMANCE CURVE

FLYGT

TYPE	ISSUE
MT	6

DATE	PROJECT
2009-03-24	

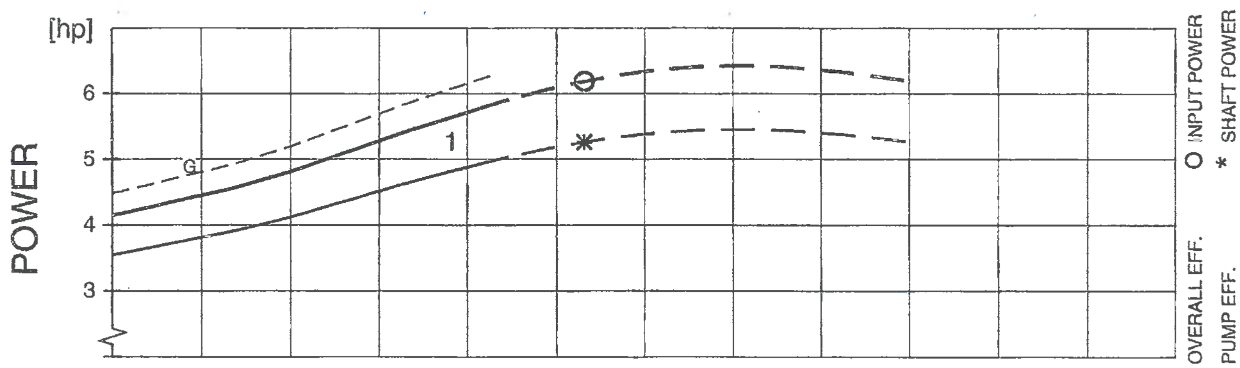
	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.83	0.77	0.67
EFFICIENCY	85.0 %	85.5 %	84.5 %
MOTOR DATA	---	---	---

RATED POWER	5	hp
STARTING CURRENT ...	---	
RATED CURRENT ...	13	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

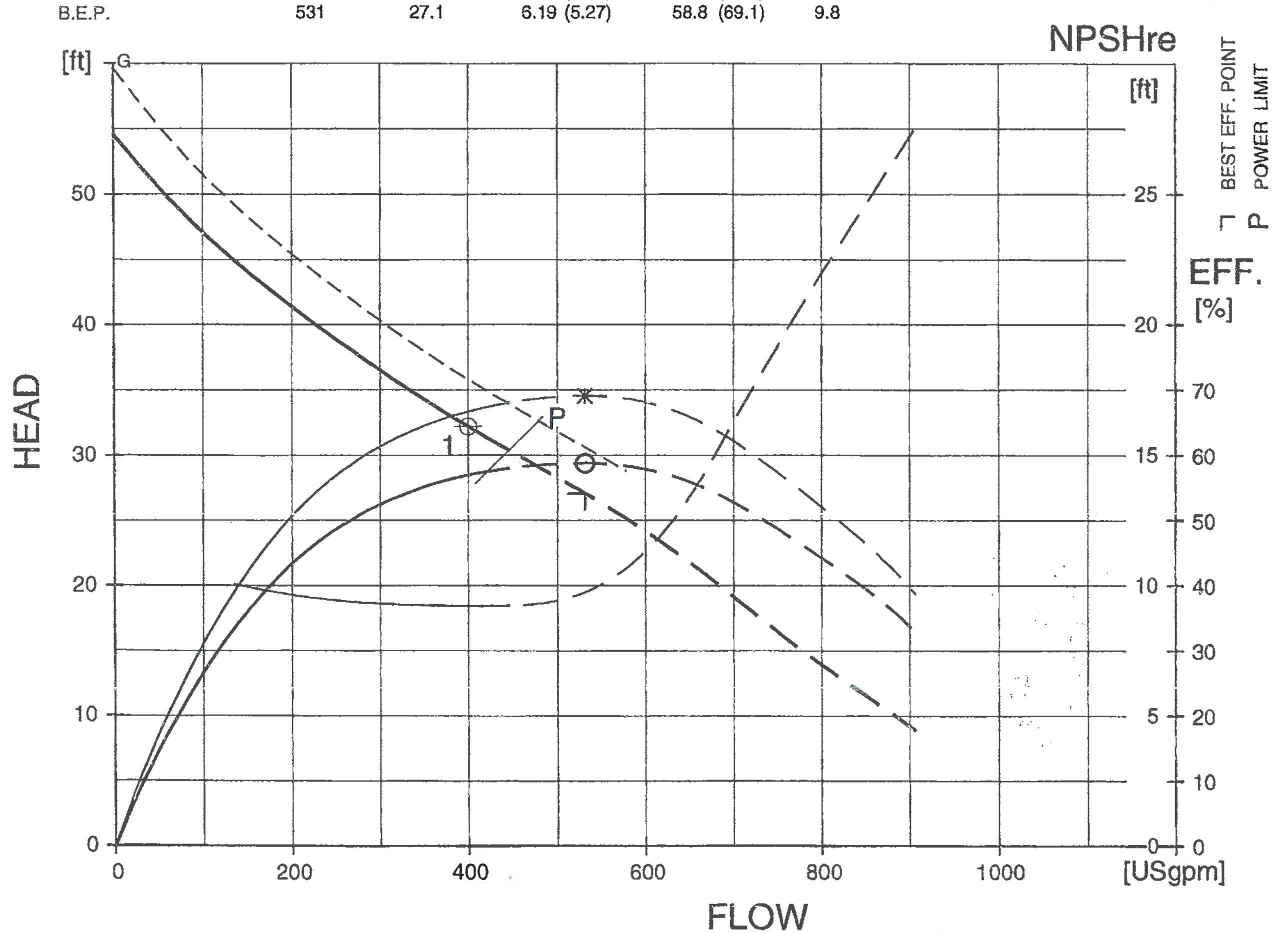
IMPELLER DIAMETER			
182 mm			
MOTOR #		STATOR	REV
18-11-4AL		66D	10
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	230 V	4
GEARTYPE		RATIO	
---		---	

COMMENTS

INLET/OUTLET	IMP. THROUGHLET
-/ 4 inch	---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1	400	32.2	5.71 (4.91)	57.0 (66.7)	9.2
B.E.P.	531	27.1	6.19 (5.27)	58.8 (69.1)	9.8



FLYPS3.1.6.3 (20060531)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

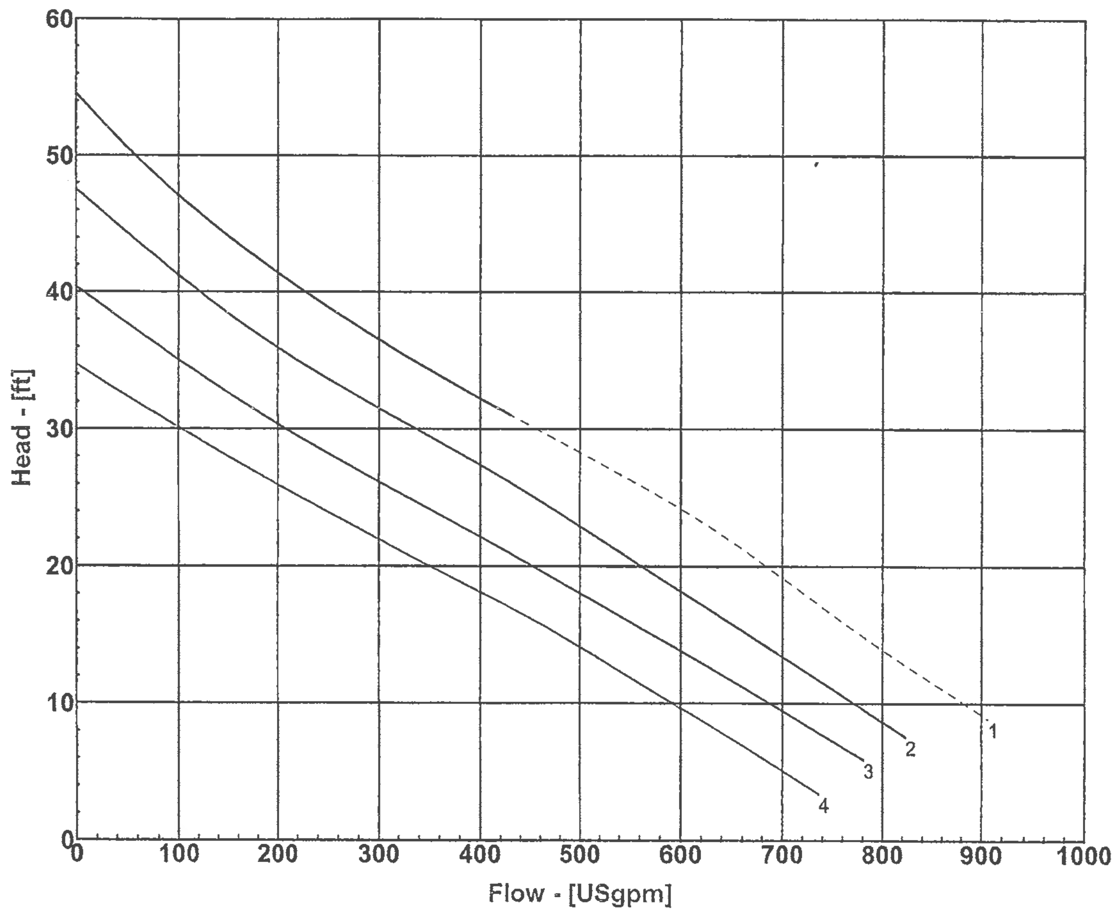
GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

Duty Analysis - Performance curves

Project:

Created by:: ITT Flygt Corporation



Performance

4" MT VERSION

1. NP 3102 - 63-462-00-3703 5 hp 182 mm
2. NP 3102 - 63-463-00-3703 5 hp 172 mm
3. NP 3102 - 63-464-00-3703 5 hp 162 mm
4. NP 3102 - 63-465-00-3703 5 hp 152 mm

MIDWAY PROPOSED

FLYGT	PERFORMANCE CURVE	PRODUCT NP3102.090	TYPE MT
DATE 2009-03-24	PROJECT	CURVE NO 63-462-00-3703	ISSUE 6

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.83	0.77	0.67
EFFICIENCY	85.0 %	85.5 %	84.5 %
MOTOR DATA	---	---	---

RATED POWER	5	hp
STARTING CURRENT ...	---	
RATED CURRENT ...	13	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 182 mm

MOTOR #	STATOR	REV
18-11-4AL	66D	10

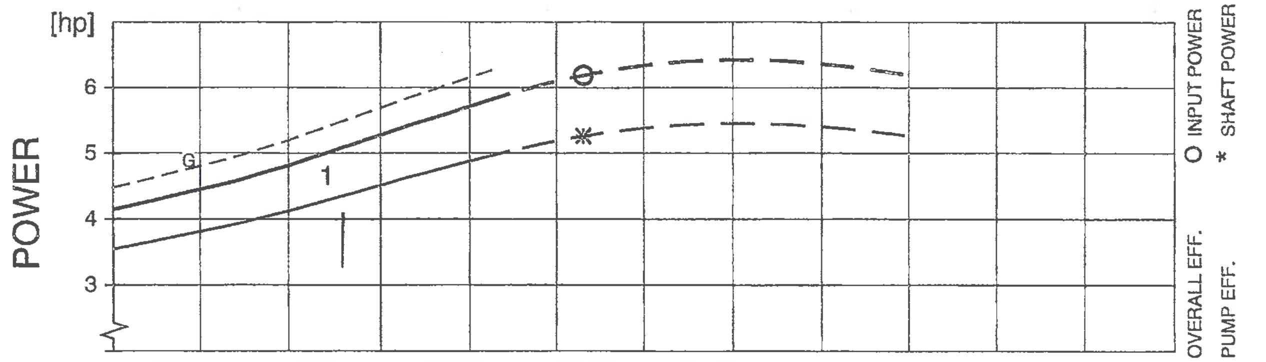
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	230 V	4

GEARTYPE	RATIO
---	---

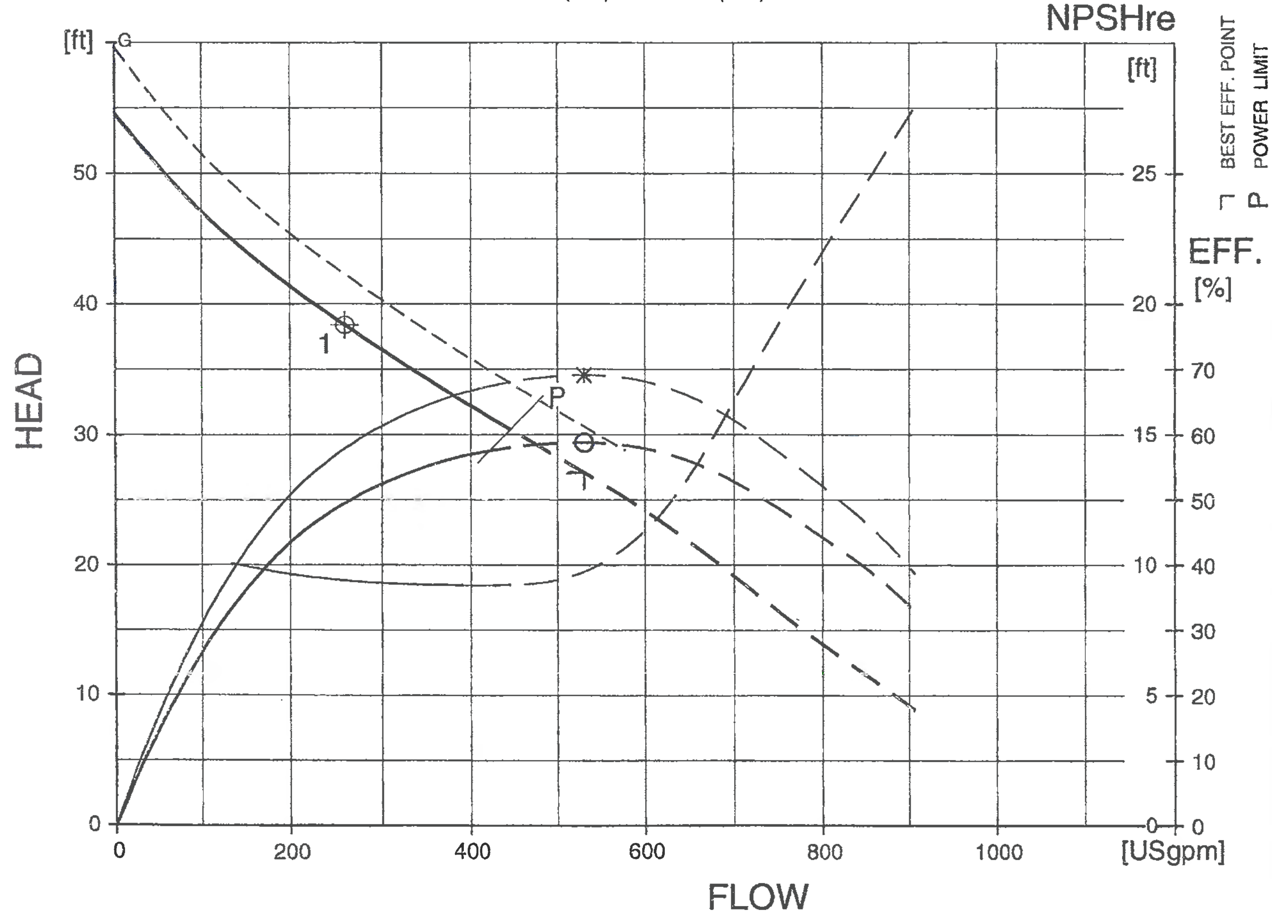
COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1	260	38.4	5.11 (4.41)	49.5 (57.9)	9.4
B.E.P.	531	27.1	6.19 (5.27)	58.8 (69.1)	9.8



FLYPS3.1.6.3 (20060531)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

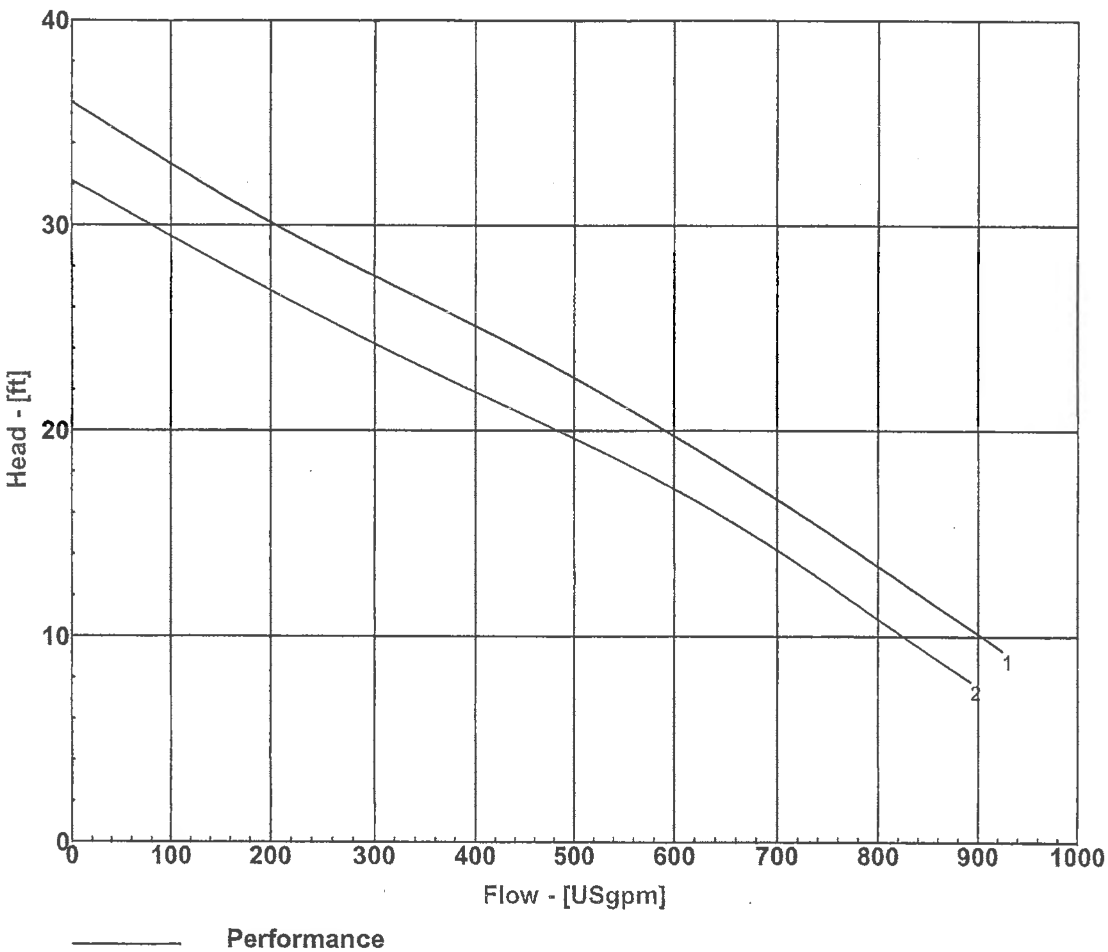
GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

Duty Analysis - Performance curves

Project:

Created by:: ITT Flygt Corporation

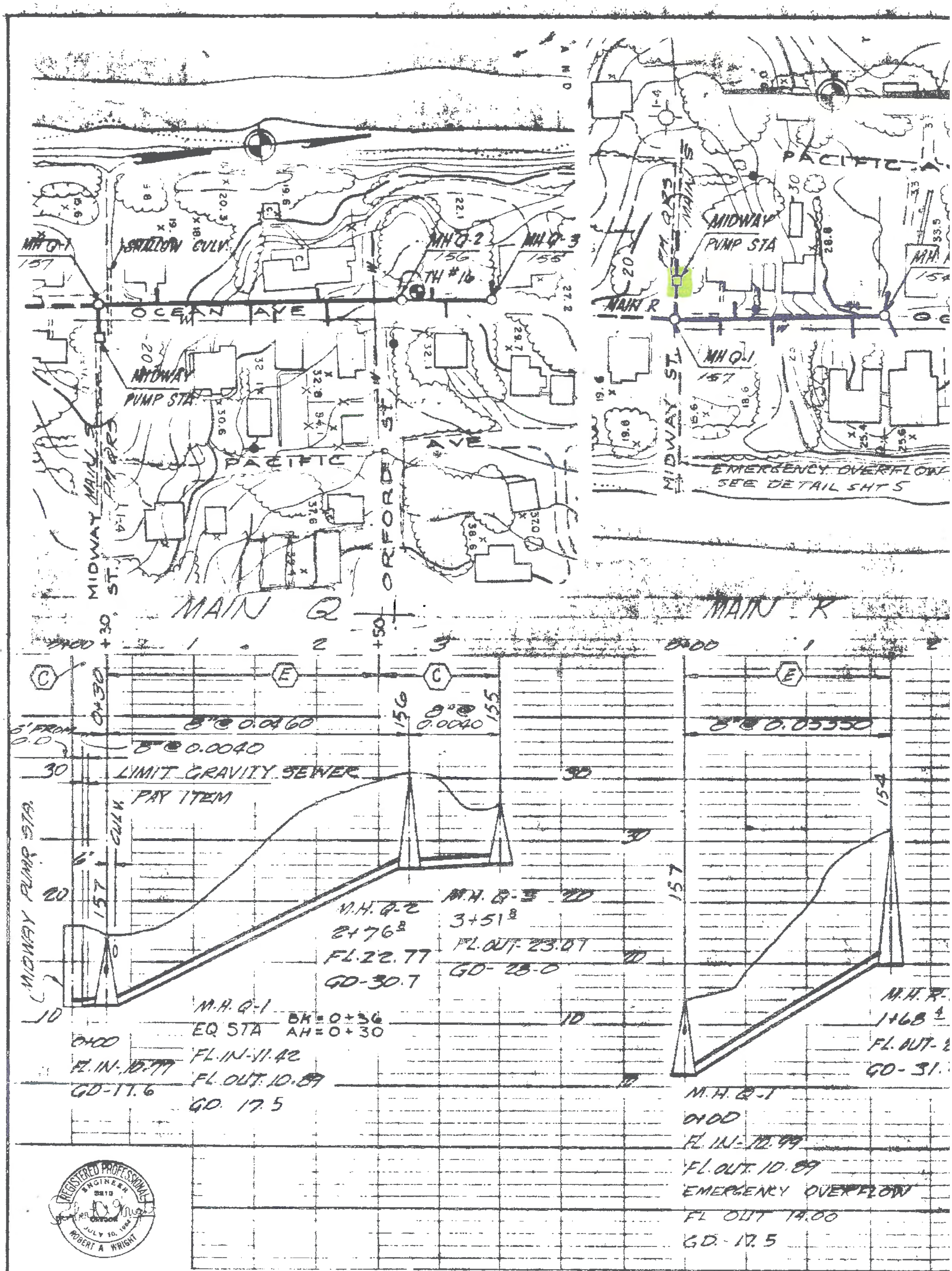


6" LT Version

1. NP 3102 - 63-422-00-3702 5 hp 165 mm
2. NP 3102 - 63-423-00-3702 5 hp 158 mm

APPENDIX D

EXISTING FORCE MAIN PLAN AND PROFILE


OCEAN AVE
PACIFIC AVE
MIDWAY ST.
ORFORD ST
MH Q-1
157
SHALLOW CULV.
MH Q-2
156
MH Q-3
155
TH #16
MIDWAY PUMP STA
MIDWAY MAIN S
FM PRS
MAIN R
MH Q-1
157
EMERGENCY OVERFLOW
SEE DETAIL SHT 5
MAIN Q
MAIN R
8" @ 0.0460
8" @ 0.0040
8" @ 0.0040
8" @ 0.03350
LIMIT GRAVITY SEWER
PAY ITEM
MIDWAY PUMP STA.
CULV.
M.H. Q-2
2+76.8
FL 22.77
GD-30.7
M.H. Q-3
3+51.8
FL. OUT- 23.07
GD- 28.0
M.H. Q-1
EQ STA
BK = 0+36
AH = 0+30
FL. IN- 11.42
FL. OUT. 10.89
GD. 17.5
0+00
FL. IN- 10.77
GD- 11.6
M.H. Q-1
0+00
FL. IN- 10.99
FL. OUT. 10.89
EMERGENCY OVERFLOW
FL OUT 14.00
GD. 17.5
M.H. R-
1+68.4
REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 10, 1964
ROBERT A. WRIGHT

26

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SITKA

Lift Station Data

FLOW RATE CHECK FORM for DUPLEX, SUBMERSIBLE SEWAGE PUMPS

INSTALLATION DATA		CALCS	P - South	P - North
1. Pump Eye Elevation *(Calc'd from survey data)*	USER INPUT =>	A	77.56	77.56
2. Discharge guage offset from pump eye *(in feet)*	USER INPUT =>	B	4.30	4.30
3. Top slab (datum) elevation, from survey or plans *(in feet)* ***ASSUMED***	USER INPUT =>	C	100	100
PRESSURE DATA				
1. SHUT-OFF HEAD, *(guage reading, psig)*	USER INPUT =>		***29.50***	***29.00***
Discharge guage reading, psig x 2.31* *(converts to feet)*		D	68.15	66.99
Total shut-off head @ pump eye *(in feet)* TRACE INTO PUMP CURVE		D+B	72.45	71.29
2A. Suction head @ pump START				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	E	15.80	15.80
Water surface elevation *(in feet)*		F = C-E	84.20	84.20
Suction head @ pump START *(in feet)*		G = F-A	6.64	6.64
2B. Suction head @ pump STOP				
Wtr surface, *measured* from top slab or datum *(in feet)*	USER INPUT =>	H	20.30	20.30
Water surface elevation *(in feet)*		I = C-H	79.70	79.70
Suction head @ pump STOP *(in feet)*		J = I-A	2.14	2.14
3A. Discharge head *(guage reading in psi)*	USER INPUT =>		***20.50***	***19.50***
Guage reading @ pump START, psig x 2.31* *(converts to feet)*		K	47.36	45.05
Reading adjusted to pump eye *(converts to feet)*		L = K+B	51.66	49.35
3B. Discharge head *(guage reading in psi)*	USER INPUT =>		***19.50***	***19.00***
Guage reading @ pump STOP, psig x 2.31* *(converts to feet)*		M	45.05	43.89
Reading adjusted to pump eye *(converts to feet)*		N = M+B	49.35	48.19
4. Total Dynamic Head, *(in feet)*				
TDH @ pump START		L - G	45.02	42.71
TDH @ pump STOP		N - J	47.21	46.05
FLOWRATE DATA @ Pump RPM of 1775				
1. Flow rate @ pump START, gpm *(curve interpolation)*	USER INPUT =>		430	470
2. Flow rate @ pump STOP, gpm *(curve interpolation)*	USER INPUT =>		370	400
3. Average **Flow**, gpm			**400**	**435**

NOTES

1. This spreadsheet, sketch and the notes are based on the DEQ Guidelines, "O&M NOTES FOR GUAGES ON SEWAGE PUMPS".
2. Actual measurements used for suction lift, no suction guage readings were used for calculations.
3. If 1/2" or less, difference exists in similar or dual measurements, add, take average, use the average for both pumps, guages, etc.
4. The above testing results are an estimate of pump performance, specific to the time of testing, recommend annual testing.
5. "Use depth of wtr surface to pump centerline for suction readings. On submersible pumps this submergence must be subtracted from the discharge pressure." DEQ
6. Does pump have any special conditions? Comminutator, Mix-Flush, Start delay? **NONE**

ATTACHMENTS TO THIS FORM

1. General sketch of elevations
2. Pump curve (1)

CONVERSION FACTORS

1" Hg = 1.13 ft of water column

1 psig = 2.31 ft of water column*

STATION: SITKA, CANNON BEACH, OREGON
Pumps: FLYGT NP3127... **(EXIST. P/S)**

CURVE NUMBER: NP3127.181 HT - Provided by City of Cannon Beach
HP: 10

DATE OF FIELD TESTING: July 21, 2008
Trim: 215 mm

TESTING BY: SIGNATURE________________________

FLYGT	PERFORMANCE CURVE	PRODUCT: NP3127.181	TYPE: HT
DATE: 2006-11-22	PROJECT	CURVE NO: 63-488-00-3702	ISSUE: 1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.89	0.87	0.81
EFFICIENCY	83.5 %	85.0 %	84.5 %
MOTOR DATA	---	---	---

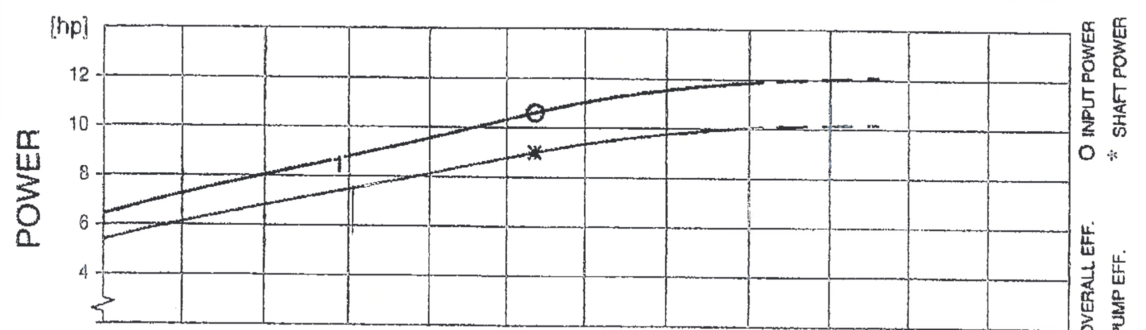
RATED POWER	10 hp
STARTING CURRENT	~~64~~ 128 A
RATED CURRENT	~~16~~ 26 A
RATED SPEED	1735 rpm
TOT.MOM.OF INERTIA	0.054 kgm2
NO. OF BLADES	2
INLET/OUTLET	-/ 4 inch
IMP. THROUGHLET	---
IMPELLER DIAMETER	215 mm

MOTOR #	STATOR	REV
21-12-4AL	12YSER	11

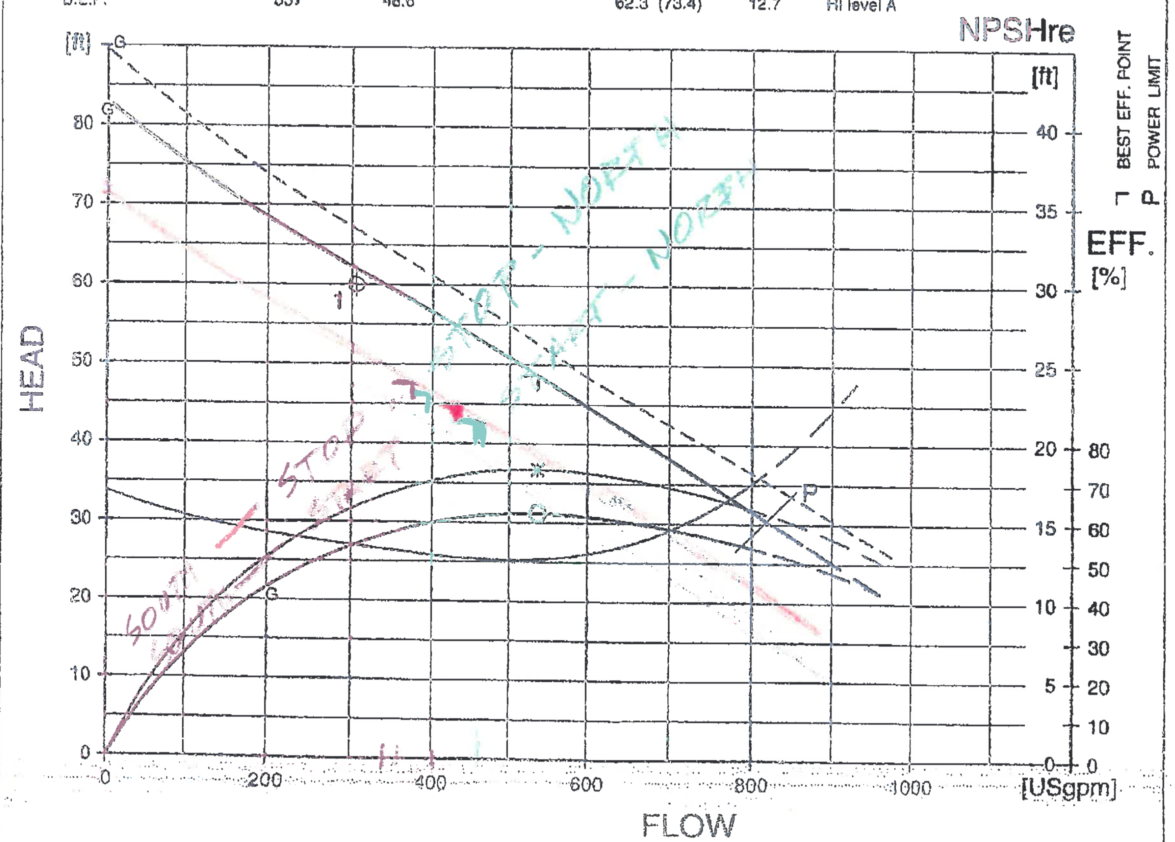
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	~~460 V~~ 230	4

GEARTYPE	RATIO
---	---

COMMENTS



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]	GUARANTEE
1	305	60.0	8.81 (7.51)	54.2 (63.6)	13.5	
B.E.P.	537	48.6		62.3 (73.4)	12.7	HI level A



FLYPS3.1.5.4 (20060324)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

APPENDIX D

EXISTING FORCE MAIN PLAN AND PROFILE

GRAPHIC SCALE

50 0 25 50 100

1" = 50'

SITKA PUMP STATION

NO.	DATE	BY	REVISION COMMENTS

Design	Drawn	Checked	Date	Initial Issue Date:
	ADD	JAH		

CITY OF CANNON BEACH

PUMP STATION EVALUATION
SITKA PUMP STATION
SITE OVERVIEW
CANNON BEACH, OREON

HLB
otak
Incorporated

4253-A HWY 101 N.
GEARHART, OREGON 97138
Phone: (503) 738-3425
FAX: (503) 738-7455
Internet: WWW.HLB-OTAK.COM

66088 C088P007.DWG
Project No. Drawing No.

1
Sheet No.

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APPENDIX E

Cannon Beach Buildout Plan

OUTLINE
PLAN FOR CANNON BEACH AT BUILD OUT

I. Review Pertinent Policy Framework in Comprehensive Plan

II. Defining the city's edge. Issues to be discussed

1. Assumption: no conversion of industrial forest land to urban uses?

   a. Treatment of small private parcels presently in county's forest zone.

   b. State Forest Land

2. Assumption: no extension of city services to the area south of Silver Point?

III. Project/establish the capacity, in terms of dwelling units, of the following areas:

1. Present city limits

2. Urban growth boundary area

3. Areas adjacent to the existing urban growth boundary - "urban growth boundary extension"

   a. In urban extension area, define logical areas for analysis. Within these areas, analyze the impact/implications of the following factors:

      1). Natural features e.g. topography and wetlands
      2). Feasibility of extending sewer/water
      3). Road accessibility
      4). Unique factors

IV. Assess the need/feasibility for providing non-residential uses to support projected housing growth.

1. Consider vision statement and general development policies in making this determination

V. Analyze feasibility of increasing the density of development within the city limits/urban growth boundary area. Objective: maximize use within the existing urban growth boundary.

VI. Population Projections

1. Utilize state population projections for Clatsop County as a base line

2. Determine potential maximum population within defined expansion area.

VII. Public Facilities

1. Analyze impact of maximum development in defined urban expansion area on sewage treatment system & water supply/treatment system.

VIII. Establish Alternative Development Scenarios for Community Discussion

POLICY FRAMEWORK

Comprehensive Plan Vision Statement:

1. “The fundamental principle of the plan is to foster a community with a strong sense of place which provides its residents the quality of life that they desire. The protection and enhancement of the following unique community characteristics form the basis for achieving this principle: . . .

> A city that is physically small in size and has well defined edges as the result of its location adjacent to the ocean and forest land.”

2. “Cannon Beach will continue to be a small town where the characteristics of a village are fostered and promoted. Both the physical and social dimensions associated with a village will be integral to Cannon Beach’s evolution during the next two decades. The elements of the town’s physical form which the plan will foster are: . . .

> - A compact development pattern where various land uses are readily accessible to residents and visitors.
> - A distinct edge to the town which defines the separation of urban from rural and natural resource areas.”

3. “Cannon Beach will continue to plan for a balance between the residential and resort elements of the community. In achieving this balance, the emphasis will be placed on managing the resort aspects of Cannon beach in a manner that is not disruptive to the residential character of the community.”

Comprehensive Plan

The Economy Policy 1 “The City seeks to achieve a moderate level of controlled growth which permits the City to maintain the important elements of its small-town character and preserve its unique natural setting.”

General Development Policy 13 “In order to maintain the scenic character of U.S. Highway 101, commercial uses along the highway shall be limited to existing commercial zones (C-1). Future public uses along the highway shall be consistent with the maintenance of the scenic character of U.S. 101.”

Urban Growth Area Policy 7 “The City is opposed tot he location of a destination resort adjacent to the City. The City will work with Clatsop County to ensure that land along Highway 101 south of the Highway 26/ Highway 101 junction is not designated as being appropriate for a destination resort.”

The Economy Policy 7 “No additional land shall be designated Residential/Motel RM.”

POPULATION PROJECTIONS
2000 - 2040

1998 PSU POPULATION ESTIMATES

CANNON BEACH	1425
CLATSOP COUNTY	34,700

STATE POPULATION PROJECTIONS
OFFICE OF ECONOMIC ANALYSIS (OEA)
CLATSOP COUNTY
2000 - 2040

2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
35,622	36,919	38,376	40,018	41,788	43,727	45,771	47,898	50,089

CANNON BEACH POPULATION
PERCENTAGE OF CLATSOP COUNTY POPULATION
US CENSUS - PSU POPULATION EST.

1970	**1980**	**1990**	**1998**
2.7%	3.7%	3.7%	4.1%

ALTERNATIVE CITY POPULATION PROJECTIONS

CANNON BEACH POPULATION PROJECTION 2000 - 2040
(4.1% OF CLATSOP COUNTY POPULATION PROJECTION)

2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
1460	1514	1573	1641	1713	1793	1877	1964	2054

CANNON BEACH POPULATION PROJECTION 2000 - 2040
(3.7% OF CLATSOP COUNTY POPULATION PROJECTION)

2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
1318	1366	1420	1481	1546	1618	1694	1772	1854

CANNON BEACH POPULATION PROJECTION 2000 - 2040
(4.5% OF CLATSOP COUNTY POPULATION PROJECTION)

2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
1603	1661	1727	1801	1880	1968	2060	2155	2254

For the purposes of establishing a population projection, the Planning Commission is proposing to apply 4.1% to the state population projections fro Clatsop County. Although the city's population as a percentage of the county's population has increased between 1970 and 1998, this trend is not expected to continue because of the city's high housing costs which are anticipated to continue in the future.

PROJECTED DWELLING UNITS REQUIRED
2000 - 2040

I. METHOD 1: POPULATION PROJECTION METHODOLOGY - 4.1% OF CLATSOP COUNTY

POPULATION 2040	2054
POPULATION 1998	1425
POPULATION CHANGE 1998-2040	629

PROJECTED DWELLING UNITS REQUIRED BASED ON DIFFERENT ASSUMPTIONS

Assumptions A:

Household Size: 2.2 person/household*	286 Permanent Dus
Permanent/second home ratio 40%/60%**	434 Second Homes
TOTAL	720 Dus

Assumptions B:

Household Size: 2.2 persons/household	286 Permanent Dus
Permanent/Second Home ratio 30%/70%***	664 Second Homes
TOTAL	950 Dus

Assumptions C:

Household Size: 2.1 persons/household****	300 Permanent Dus
Permanent/Second Home ratio 30%/70%	700 Second Homes
TOTAL	1,000 Dus

* Cannon Beach Household Size - 1990 Census
** Ratio based on Housing data in 1990 Census
*** Assumes increase in percentage of second homes due to housing costs
**** Assumes a slight decrease in household size due to Demographic changes in city - more retiree and fewer families with children

----
I. METHOD 2 : DWELLING UNIT PROJECTION METHODOLOGY

ADDITIONAL DWELLING UNITS CONSTRUCTED
1990 - 1999

1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
35	30	25	60	24	25	15	44	21	16

AVERAGE # DWELLING UNITS 1990-98: 31
AVERAGE # DWELLING UNITS 1990-99 29.5

ESTIMATED NUMBER DWELLING UNITS CONSTRUCTED: 2000 - 2040

40 YEARS x 30 Dus/Yr* 1200 Dus

40 YEARS x 25 Dus/Yr** 1000 Dus

* Based on average dwelling units added 1990 - 99
** Based on average dwelling units added 1990-98
Not including years Elk Creek Terrace & Shorewood constructed

----

POPULATION ESTIMATE - 2040
BASED ON DWELLING UNIT PROJECTION METHODOLOGY

PROJECTED POPULATION IN 2040 BASED ON DIFFERENT ASSUMPTIONS

Assumption 1:

1999-2040: 41 year x 30 Dus/Yr 1230 Dus
Household Size: 2.2 person/household 492 Permanent Dus x 2.2 person/Du = 1082
Permanent/second home ratio 40%/60% persons

1998 population 1425 + 1082: 2040 population 2507

Assumption 2:

1999-2040: 41 years x 30 Dus/Yr 1230 Dus
Household Size: 2.2 persons/household 369 Permanent Dus x 2.2 persons/Du = 812
Permanent/Second Home ratio 30%/70% persons

1998 population 1425 + 812 2040 population 2237

Assumption 3:

1999-2040: 41 years x 30 Dus/Yr 1230 Dus
Household Size: 2.1 persons/household 369 Permanent Dus x 2.1 persons/Du = 775
Permanent/Second Home ratio 30%/70% persons

1998 population 1425 + 775 2040 population 2200

Assumption 4:

1999-2040: 41 years x 25 Dus/Yr 1025 Dus
Household Size: 2.1 persons/household 308 Permanent Dus x 2.1 persons/Du = 647
Permanent/Second Home ratio 30%/70% persons

1998 population 1425 + 647 2040 population 2072

POPULATION ESTIMATE - 2040 RANGE:2072 -2507

BEST FIT WITH POPULATION PROJECTION (4.1% OF CLATSOP COUNTY) Assumption 4 2040 population of 2072

CONCLUSION: Project a growth rate of 25 additional dwelling units per year.

PROJECTED ABSORPTION RATE
VACANT RESIDENTIAL LAND IN STUDY AREA

I. Annual Growth Rate: 25 additional dwelling units/year

22 dwelling units on vacant parcels of land
3 dwelling units consisting of accessory dwellings/duplex units

II. Total Number of Dwellings on Vacant Parcels to 2040: 22 /yr. x 40 yrs. = 880

III. Potential Dwelling Units, Vacant Land:

City	491
UGB	158
UGB Extension	303
Total	**952**

IV. Absorption Rate of Vacant Land :

City	491÷22 du/yr	22.3 years
City + UGB	649÷22 du/yr	29.5 years
City + UGB+UGB Ext	952÷22 du/yr	43.2 years

V. Conclusions:

1. The existing urban growth boundary contains sufficient land to accommodate projected growth for the next twenty years.

2. The existing urban growth boundary and adjacent privately held non-industrial forest land contains sufficient land to accommodate projected growth for approximately forty years.

3. If the city follows the general state policy that an urban growth boundary must contain land adequate to accommodate twenty years of projected growth, then the city must expand the urban growth boundary within the next ten years.

IMPACT ON PROJECTED ABSORPTION RATE
OF VACANT RESIDENTIAL LAND IN STUDY AREA
OF ALTERNATIVE POPULATION ESTIMATES

I. Assumptions:

Household Size: 2.1 persons/household
Permanent/Second Home ratio: 30%/70%
Annual growth includes 3 dwelling units consisting of accessory dwellings/duplex unit

II. Alternative Population Projections

<u>3.7% of Projected Clatsop County Population Estimate</u>

Population growth to year 2040	429
Permanent Dus: 429÷2.1	204
Second homes	475
Total Dus	679
Dus/yr	17
Dus/yr - Vacant land	14
Total Dus - Vacant land	560

<u>4.5% of Projected Clatsop County Population Estimate</u>

Population growth to year 2040	829
Permanent Dus: 429÷2.1	395
Second homes	920
Total Dus	1315
Dus/yr	33
Dus/yr - Vacant land	30
Total Dus - Vacant land	1200

III. Potential Dwelling Units, Vacant Land:

City	491
UGB	158
UGB Extension	303
Total	**952**

IV. Absorption Rate of Vacant Land - 3.7% of Projected Clatsop County Population Estimate

City	491÷13 du/yr	37.8 years
City + UGB	649÷13 du/yr	49.9 years
City + UGB+UGB Ext	952÷13 du/yr	73.2 years

V. Absorption Rate of Vacant Land - 4.5% of Projected Clatsop County Population Estimate

City	491÷30 du/yr	16.4 years
City + UGB	649÷30 du/yr	21.6 years
City + UGB+UGB Ext	952÷30 du/yr	31.7 years

POTENTIAL DEVELOPMENT
UGB EXTENSION AREA
WITHOUT CITY SERVICES

A.	SEAL ROCK BEACH ADDITION		4 DUs
	ASSUME NEED MINIMUM OF 40,000 SQ.FT.		
B.	CAMBERG SUBDIVISION EXISTING LOTS		3 DUs
C.	SWIGART F-80 FOREST LAND		0 DUs
D.	HARRINGTON AF FOREST LAND		0 DUs
E.	ELKWOOD MTN/CURRIER		
	1. ASSUME ELKWOOD MTN - DEED RESTRICTION NO ADDITIONAL UNITS	6 DUs	
	2. CURRIER EXISTING LOTS		15 DUs
	3. TAX LOT 100	0 DUS	
F.	EAST HIGHWAY 101	16 DUs	
	ASSUME TWO ACRE MINIMUM		
G.	ANDERSON F-80 LAND		2 DUs
H.	SILVER POINT		1 DU
	TOTAL		**47**

ACREAGE IN EXISTING URBAN GROWTH BOUNDARY
&
URBAN GROWTH BOUNDARY EXTENSION

I.	URBAN GROWTH BOUNDARY	
	NORTH UGB AREA	29.23 ACRES
	MIDTOWN UGB AREA	29.96 ACRES
	EAST HIGHWAY 101 UGB AREA	27.88 ACRES
	TOTAL	**84.07 ACRES**
II.	URBAN GROWTH BOUNDARY EXTENSION	
	SEAL ROCK BEACH ADDITION	17 ACRES
	HARRINGTON PROPERTY	36.15 ACRES
	CAMBERG SUBDIVISION	30.2 ACRES
	SWIGART PROPERTY	28.21 ACRES
	ELKWOOD MT./CURRIER	65.78 ACRES
	EAST HIGHWAY 101	36.31 ACRES
	ANDERSON PROPERTY	5 ACRES
	SILVER POINT	16.9 ACRES
	TOTAL	**235.55 ACRES**

SUMMARY
BUILDABLE RESIDENTIAL LAND INVENTORY
CITY LIMITS

I. POTENTIAL DWELLING UNITS: EXISTING RVL, R-L, R-1, R-2, RAM ZONES:

A.	VACANT RESIDENTIAL LOTS		237	
B.	VACANT BUILDABLE WETLAND LOTS	81		
C.	REDEVELOPMENT EXISTING BUILT LOTS		85	
	SUB-TOTAL IN DWELLING UNITS (DU)			**398**

II. POTENTIAL DWELLING UNITS: R-3 ZONE

A.	VACANT LOTS: POTENTIAL DUs	53		
B.	VACANT / WETLAND LOTS:POTENTIAL DUs		2	
C.	REDEVELOPMENT EXISTING BUILT LOTS POTENTIAL DUs		10	
	SUB-TOTAL IN DWELLING UNITS (DU)			**65**

III. POTENTIAL DWELLING UNITS: REZONE/OTHER

A.	WRIGHTS CAMPGROUND (OSR - R2):		22	
B.	RAM PORTION OF RV PARK		6	
	SUB-TOTAL IN DWELLING UNITS (DU)			**28**
	TOTAL DWELLING UNITS			**491**

SUMMARY
BUILDABLE RESIDENTIAL LAND INVENTORY
EXISTING URBAN GROWTH BOUNDARY (UGB)

A. NORTH UGB

1.	HARRINGTON -		
	ASSUME PROPOSED SUBDIVISION	10 LOTS	10DUs
2.	TL 501 (WETLAND)	1 LOT	1 DU
3.	TL 502(WETLAND)	1 LOT	1 DU
4.	TL103 - ,63 ACRES	4 LOTS	4 DUs
5.	TL 104 .46 ACRES	4 LOTS	4 DUs
6.	TL 105/100	6 LOTS	4 DUs
7,	HILDEBRAND 12.77 ACRES		
	ASSUME 3 DU/ACRE	36 LOTS	36 DUs
	SUB - TOTAL		**60 DUs**

B. MIDTOWN UGB

1.	TL 101 (HAY) 4.98 ACRES	3 LOTS	3 DUs
2.	TL 500 1.7 ACRES	2 LOTS	2 DUs
3.	TL 303/400/401 20.28 ACRES	40 LOTS	40 DUs
	SUB - TOTAL		**45 DUs**

C. EAST HIGHWAY 101

1.	TL 101/121 17.26 ACRES		
	ASSUME 2 DU/ACRE	34 LOTS	34 DUs
2.	TL 118 5.02 ACRE	5 LOTS	5 DUs
3.	TL 200 1 ACRE	3 LOTS	3 DUs
4.	TL 300 1.37 ACRE	4 LOTS	4 DUs
5.	TL 400 1.15 ACRE	3 LOTS	3 DUs
6.	TL 101 .61 ACRE	2 LOTS	2 DUs
7.	TL 100 .61 ACRE	2 LOTS	2 DUs
	SUB-TOTAL		**53 DUs**
		TOTAL	**<u>158</u>**

SUMMARY
BUILDABLE RESIDENTIAL LAND INVENTORY
UGB EXTENSION

A.	SEAL ROCK BEACH ADDITION		
	1. ASSUME 15,000 SQFT	42 LOTS	42DUs
B.	CAMBERG SUBDIVISION	3 LOTS	3 DUs
C.	SWIGART F-80	0 LOTS	0 DUs
D.	HARRINGTON A-F	22 LOTS	22DUs
	1. ASSUME 7 ACRES BUILDABLE 5.5 ACRES NET/4 DU/ACRE		
E.	ELKWOOD MTN/CURRIER		
	1. ASSUME ELKWOOD MTN - DEED RESTRICTION NO ADDITIONAL UNITS	6 LOTS	6 DUs
	2. CURRIER ASSUME 2DU/ACRE	72 LOTS	72 DUs
	3. TAX LOT 100 (1.56 ACRES)	3 LOTS	3 DUs
F.	EAST HIGHWAY 101	108 LOTS	108 DUs
	1. 36.31 ACRES: ASSUME 3DU/ACRE		
G.	ANDERSON	20 LOTS	20 DUs
	1. 5 ACRES: ASSUME 4DU/ACRE		
H.	SILVER POINT		
	1. 16.9 ACRES	27 LOTS	27 DUs
		TOTAL	**303**

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