1. Agenda

Documents:

2016-05-10 Public Works And Streets Agenda.pdf

1.I. Meeting Materials

Documents:

2016-05-10 Financial Report.pdf
2016-05-10 Public Works Department Report.pdf
2016-05-10 South Tank Design Report.pdf
2016-05-10 South Tank Project Costs.pdf
2016-05-10 Water Data April 2016.Pdf

CITY OF YACHATS
PUBLIC WORKS & STREETS COMMISSION
Civic Meeting Room, Yachats Commons
May 10, 2016
3:00 p.m.
Agenda

I. Minutes – April 12, 2016

II. Business
- **A. Yachats Clean Sweep**
- **B. Utility Billing evaluation for new business or one that changes type of business or operation; How to determine a base; Billing based on BOD's (Biochemical Oxygen Demand)**

II. Reports
- **A. Civil West Engineering – Discussion South Tank Project**
- **B. Public Works Department**
- **C. Financial Data for Water and Sewer Funds**
- **D. Solid Waste District Advisory Council**

IV. Other Business
- **A. From the Commission**
- **B. From the Staff**
- **C. From the Floor**

This meeting is open to the public and all interested citizens are invited to attend. This meeting will be audio taped. All items to be considered by the Commission must be given to the City Office one-week prior to the meeting. Minutes of all public meetings are available for review in the City Office. The facility is handicapped accessible; those needing assistance please contact the City Recorder at 547-3565, or Oregon Relay 1-800-735-2900 (T.D.D.) two days in advance.

The City of Yachats does not discriminate on the basis of race, color, religion, creed, gender, national origin, age, disability, marital or veteran status, sexual orientation, or any other legally protected status.

Posted March 4, 2016 Nancy Batchelder, City Recorder

Fiscal Year 2015-2016

Water System	Budget for Year	Actual To Date 4/30/2016	% of Budget 83%
Operations			
Revenue			
Cash Carried Forward	$ 28,395.00	$ 28,395.37	100%
Services	$ 530,000.00	$453,147.54	85%
Installations	$ 3,000.00	$ 5,199.92	173%
Capital Reserve Fee	$ -	$ 9,327.43	
Other income	$ 300.00	$ 300.00	100%
Total Revenue	$ 561,695.00	$ 496,370.26	88%
Personnel Expenses	$ 271,992.00	$ 211,181.78	78%
Materials & Services	$ 163,515.00	$ 142,835.89	87%
Capital Expenditures	$ 38,808.00	$ 2,264.34	
Transfer to Reserve	$ 47,400.00	$ 47,400.00	100%
Transfer to Debt Service			
Revenue Bonds & Fees	$ 39,980.00	$ 39,980.00	100%
Total Expenses	$ 561,695.00	$ 443,662.01	79%

	Budget	Actual
Revenue From Rates	$ 530,000.00	$ 453,147.54
Expenses paid by rates	$ 514,295.00	$ 396,262.01
available for reserve	$ 15,705.00	$ 66,212.96

Personnel Expenses and Materials/Services Capitalized & Transferred to Fund 15	$ 50,772

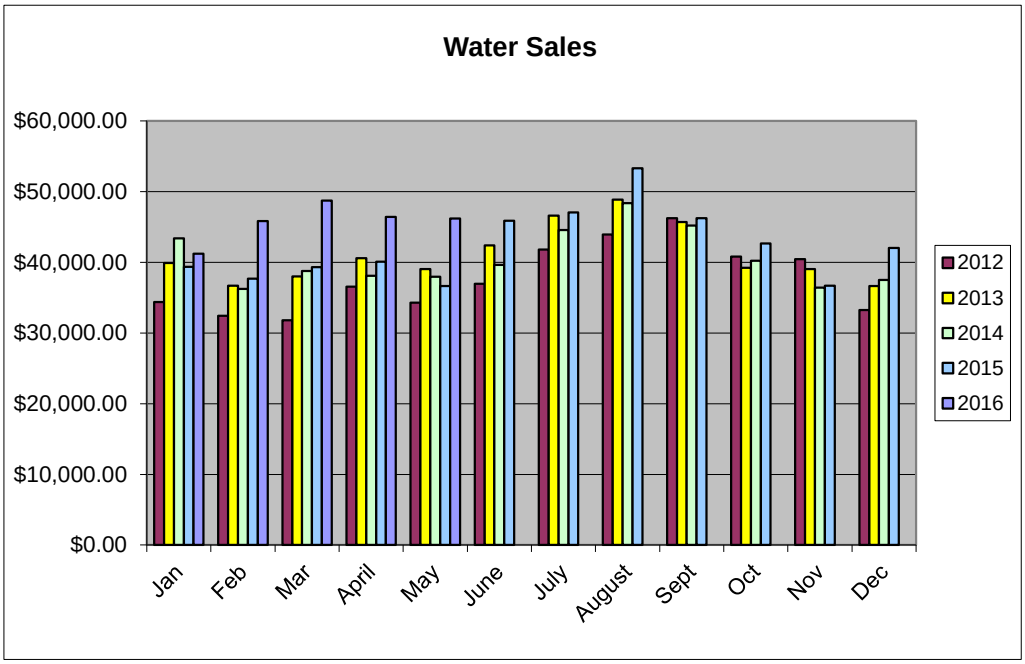
Sewer System	Budget for Year	Actual To Date 2/29/2016	% of Budget 83%
Operations			
Revenue			
Cash Carried Forward	$ 20,255.00	$ 20,255.81	100%
Services	$ 495,000.00	$429,991.49	87%
Installations	$ 600.00	$ 1,500.00	250%
Capital Reserve Fee		$ 8,900.43	
Other income	$ 600.00	$ 689.77	
Total Revenue	$ 516,455.00	$ 461,337.50	89%
Personnel Expenses	$ 225,239.00	$ 195,351.21	87%
Materials & Services	$ 169,086.00	$ 114,923.28	68%
Capital Expenditures	$ 36,538.00	$ 2,264.33	
Transfer to Reserve	$ 25,000.00	$ 25,000.00	
Transfer to Debt Service	$ 60,592.00	$ 60,592.00	100%
Revenue Bonds			
Total Expenses	$ 516,455.00	$ 398,130.82	77%

	Budget	Actual
Revenue From Rates	$ 495,000.00	$ 429,991.49
Expenses paid by rates	$ 491,455.00	$ 373,130.82
available for reserve	$ 3,545.00	$ 65,761.10

Personnel Expenses and Materials/Services Capitalized & Transferred to Fund 15	none

Other Income

	Budgeted	Received	%
Urban Renewal Receipts	$ 200,000.00	$ 223,439.67	112%
Food & Beverage Tax	$ 284,000.00	$ 301,755.37	106%


Water Sales
$60,000.00
$50,000.00
$40,000.00
$30,000.00
$20,000.00
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2013
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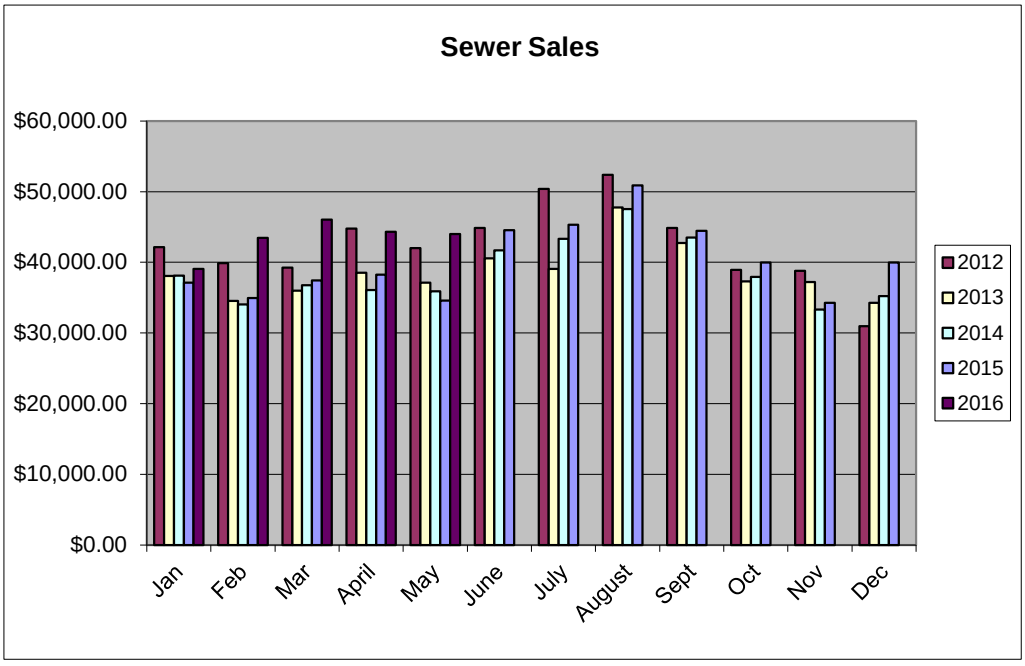
2016


Sewer Sales
$60,000.00
$50,000.00
$40,000.00
$30,000.00
$20,000.00
$10,000.00
$0.00
Jan
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Mar
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Nov
Dec
2012
2013
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City of Yachats

Public Works Department
500 W. 7th St.
P.O. Box 345
Yachats, OR 97498

Date: May 9th, 2016
To: City Council and Public Works & Streets Commission
From: Rick McClung & David Buckwald
Re: April 2016 Public Works Report **Subject:** Work Outside of Normal Operations

Department	Subject	Description
Emergency Management	Crestview Landslide FEMA Grant approval	Achieving grant approval has been a result of several City Silos working together -both City Staff & Volunteers. Good Job!
Parks	Baseball Field	Filled in ruts with top soil and grass seeded after it was vandalized. Baseball field needs to be considered for a Capital Improvement Project in the future.
Public Works	Public Works yard Clean-up	5 5yd loads to Dahl Disposal (3-Scrap metal 2-debris) 2 5yds loads of dirt to the City fill site.
CIPWastewater	Decant Center	Contract has been awarded. 25% complete. City staff is doing the prep work.
Water/Wastewater	5 years CIP Planning	Capital Improvement Projects & Budget requests for 2016/17 + an additional 4 year forecast.
CIP- Water	South Reservoir	Civil West Engineering is giving a report at this month's Public Works & Street Commission meeting. We are going to be discussing the best options for this project.
CIP- Water	Hwy 101 Waterline Replacement	100% complete after trenches are paved

CIP- Water	Reeves Circle Waterline Replacement	100% Complete
CIP-Water	Surfside St. Waterline Replacement	100% Complete

PHONE (541)547-3243 RELAY OREGON (800)735-2900 (T.D.D.)
FAX (541)547-3063
E-MAIL Rick@MailYachatsOregon.org Dave@MailYachatsOregon.org WEB SITE www.ci.Yachats.or.us

Civil West Engineering Services, Inc.
www.civilwest.com

Missoula, MT Office
1500 Clark Fork Lane
Missoula, MT 59801
541-290-4055

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

Albany Office
937-3 Geary Street
Albany, OR 97321
541-223-5130

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

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

DESIGN REPORT

Date: April 25, 2016 Work Order Number: 3401-002

To: Rick McClung, City of Yachats

From: Matt Wadlington, PE, Civil West Engineering Services, Inc.

RE: Yachats South Tank and Pump Station

1 STORAGE RESERVOIR

Need for project:

The City of Yachats is located on the Oregon coast between the Cities of Florence and Newport. The Yachats River bisects the City, with approximately 80% of the City north of the river and 20% south of the river. Currently, all of the treated water storage is located north of the river. There is a valid concern that in the event of an earthquake or tsunami, that the bridge, and/or the waterline, that crosses the river could be compromised, which would effectively leave the south portion of the city without water for consumption or fire suppression.

Size Requirement:

TOTAL WATER STORAGE REQUIREMENT FOR THE CITY

The population of the City of Yachats is expected to increase to 789 by the year 2035. This information is based on the Census Bureau's projected values for the AAGR (Average Annual Growth Rate) of Lincoln County, Oregon. Lincoln County is expected to grow at an average rate of 0.64% until 2035. The table below summarizes the estimated population through the years 2015 - 2035.

Estimated Population for Yachats

Year	Population
2015	725
2020	730
2025	755
2030	780
2035	809

Total storage capacity for the City includes storage for fire suppression, equalization storage and emergency storage.

Fire Suppression

Fire suppression storage is needed to supply fire flow throughout the water system to fight a major fire. Per the 2010 Oregon Fire Code, the minimum fire-flow and duration requirements are based on the size and occupancy of facilities. Because the central commercial area of Yachats has numerous buildings larger than 6,000 s.f., including the school, we recommend using a target fire flow of 3000 gallons per minute (gpm)

Based on the table below, from the 2010 Oregon Fire Code, for a target fire flow of 3000 gpm, the required duration is 3 hours.

Fire Flow and Duration Requirements

Required Fire Flows	Required Duration
1,000 gallons per minute or less	1 hour
Between 1,000-2,750 gallons per minute	2 hours
Between 3,000-3,750 gallons per minute	3 hours
4,000 gallons per minute and above	4 hours

A fire flow of 3000 gpm for a period of 3 hours yields a required fire storage volume of 540,000 gallons.

Equalization Storage

Equalization storage is typically set at 20-25% of the Maximum Day Demand (MDD) to balance out the difference between peak demand and supply capacity. Equalization storage typically accounts for the daily rise and fall as storage tank levels fluctuate normally.

Based on data provided by the City, the 2015 Average Day Demand (ADD) was 135,500 gallons per day (gpd). The Maximum Month Demand (MMD) was 171,000 gpd (July 2014). Because meters are not recorded daily, the MDD must be estimated. Standard peaking factors can be used to estimate the peak daily flow. Typical peaking factors between ADD and MDD are between 2.0 and 2.5. For this evaluation a peaking factor of 2.25 will be used. Given the ADD flow of 135,500 gpd, the MDD is calculated at 305,000 gpd.

Demand Criteria	2015 Flow (725 persons) (Gallons per Day)	Per capita (gal)	2035 Flow (809 persons) (Gallons per Day)
Average Day Demand (ADD)	135,500	186	150,500
Maximum Month Demand (MMD)	171,000	235	190,000
Maximum Day Demand (MDD)	305,000	420	340,000

Given the growth factors based on population growth, the expected MDD for the year 2035 is approximately 340,000 gallons per day.

As described above, the equalization storage should be set at 20-25% of the MDD. 22.5% of 340,000 gallons is 76,500 gallons.

Emergency Storage

Emergency storage is required to protect against a total loss of water supply such as would occur with a broken transmission line, electrical outage, equipment breakdown, or source contamination. Emergency storage should be an adequate volume to supply the system's ADD for the duration of a possible emergency. For most systems, emergency storage should be equal to 3 times the ADD

As calculated above the ADD is estimated to be 150,500 gallons. This requires a total emergency storage of 451,500 gallons.

The total storage target for the entire City is therefore the summation of the fire suppression (540,000 gals), equalization (76,500 gals), and emergency (451,500 gals) storage needs. This comes to 1,068,000, or roughly 1.07 million gallons.

The City currently has a total treated water storage capacity of 1,210,000 gallons, which is more than enough for the 20 year forecasted need; however, all of the storage reservoirs are north of the Yachats River Bridge. During a tsunami or significant seismic event, it is likely that the water main crossing the river could be damaged, leaving the entire southern portion of the city without treated water. For this reason, the City has determined it prudent to create an emergency water storage reservoir for the south area of the City.

SIZE OF PROPOSED RESERVOIR

Based on the assumption that roughly 20% of the water is used south of the bridge (from billing records), equalization and emergency storage requirements can be reduced accordingly. Fire flow, however, should be based on the required fire suppression storage. Because the area south of the Yachats River is primarily residential, a fire flow of 1000 gpm for 2 hours should be provided (as opposed to 3000 gpm for 3 hours for the commercial areas).

Storage Requirement	**Amount Required**
Fire Suppression	120,000 gallons (1000 gpm * 120 min)
Equalization Storage	15,300 gallons (20% of 76,500)
Emergency Storage	90,300 gallons (20% of 451,500)
Total Storage Requirement:	**225,600 gallons**

Therefore, a 250,000 gallon reservoir is proposed to provide for the storage needs of the southern area of the City.

Location & Access:

The City of Yachats purchased a piece of property in 2012 for the ultimate construction of the south side reservoir. The property can be identified by Tax Lot # 14-12-34-AD-00204-00. The property is located east of the north switchback of Crestview Drive and has a low elevation of approximately 250' at the southwest corner and a high elevation of approximately 315 along the east property line. The property access was roughly graded in the summer of 2011 to

accommodate a geotechnical engineer so that soil samples could be obtained. When the property was investigated during the kickoff meeting the grading was still identifiable, as were some of the original stakes from the Dyer Partnership identifying the approximate tank location. The identified tank location appeared to be somewhat centered in a section of the hillside that was slightly flatter than other areas. For this reason, the tank site location was confirmed to match the general location identified by Dyer. Additional soils analysis was completed by Foundation Engineering Inc. to identify the capacity of the existing soils to support the weight of the tank.

Based on the recommendations provided by the Geotechnical Engineer the reservoir site will cut into the existing hillside in order to provide a level surface in native soils. A bottom elevation of 285' was chosen to meet the criteria recommended in the Geotechnical Engineering Report. Two tank proportions were evaluated. A tall, skinny tank and a wide, short tank. Although the site grading footprint would be smaller for a tall skinny tank, the estimated cost difference for the tank ($365,000 compared to $274,000) was significant and ultimately led to the decision to use the shorter, wider tank. Generally, the most economical tank configuration is when the height roughly matches the diameter. A 0.25 million gallon tank with a height of 33' and a width of 36' was chosen. This results in a high water elevation of 318' inside the reservoir.

Site Access:

In addition to purchasing the property identified above, the City was also granted a 30' wide easement for ingress, egress and utilities to access the property. The easement partially followed an old logging road or "back" access road to a neighboring property. The alignment of the proposed access road is limited to the existing easement unless other easements are obtained. The length of the easement is approximately 325' and over the course of that length grades go from a bottom elevation of 198' to a high elevation of 282'. This results in an average slope of approximately 26%. By maximizing the length of the access road within the easement the slope can be reduced to approximately 24%. If additional easements can be granted, the average slope of the road may be able to be reduced to approximately 20%.

The reservoir construction is limited by the ability of concrete trucks to access the site. If concrete trucks can gain access, then the rest of the tank manufacturing can be completed without substantial cost increase.

Operational Parameters:

Based on the calculations presented in the reservoir sizing discussion noted above, the ADD of the south side area is approximately 61,000 gallons. Based on a preliminary mixing analysis prepared by TideFlex Technologies, at a fill rate of 300 gpm, the mixing cycle should be approximately 18,000 gallons to ensure complete mixing in the tank. This results in an anticipated 3 or 4 fill cycles each day, with each fill cycle taking approximately 1 hour. A copy of their report is attached.

2 WATER LINE

Need for project:

The proposed tank referenced above is located near the end of Crestview Drive. A waterline currently runs along Crestview drive, but is made up of 4" and 6" pipe. Without upsizing the existing pipes, the headloss created in the section along Crestview Drive would be over 25' during reservoir fill cycles, and would be over 250' during fire flow (1000 gpm) events. There is not enough elevation in the system to maintain the required pressure with that amount of loss, so larger pipes are required.

Sizing requirements:

The State of Oregon requires a water distribution system be designed and installed to maintain a pressure of at least 20 psi at all service connections (at the property line) at all times, even during fire flow conditions. OAR 333-061-0050 governs the construction standards for water systems including distribution piping.

Sizing alternatives:

Replacing the 4" pipe sections with 6" pipe would reduce the total headloss to 10' and 180' for fill cycles and fire flow events respectively. While the fill cycle could overcome the 10' headloss, the system during a fire flow cycle would not have enough residual pressure (20 psi) to meet State requirements.

Replacing the entire section with 8" pipe results in a headloss of 2.3' and 44' for fill cycles and fire flow events respectively. Based on system modeling, this level of headloss is acceptable to maintain 20psi throughout the system during a fire flow event. Because of this, an 8" pipe was selected. The Dyer proposal indicated a 10" pipe, however, based on the above information provided by system modeling, an 8" pipe is sufficient.

Route alternatives:

Based on preliminary discussions with the City, Civil West evaluated multiple alternatives for routing the new waterline to the tank site. These alternatives included routing up Crestview Drive and/or Greenhill Drive. Both have the potential to be used to as a route to pipe water to and from the proposed storage tank location. Descriptions of the four water line route alternatives are provided below.

Route Alternative #1- Greenhill Drive

Route Alternative #1 includes placement of a new 8" C900 PVC pipe by open trenching methods from approximately US Hwy 101/ Greenhill Drive, a distance of approximately 750 l.f. to a steep hill portion at the end of Greenhill Drive. From the end of the road, the pipe will be placed by horizontal directional drill methodology approximately 200 lf to the proposed booster pump location. This option encounters the same obstacles as option #2 and #4, using HDD methods to place the pipeline, but covers the shortest distance of the four options. However, Greenhill Drive is much more narrow a road then Crestview so open trench placement will be more costly. This option will also replace the undersized 2" line that is currently servicing residents on Greenhill Drive, which would lessen current pressure issues. The total estimated cost for this option is $147,251.

Route Alternative #2- Greenhill Drive and Crestview Drive

This route includes placement of a new 8" C900 PVC waterline by open trench placement from approximately US Hwy 101/ Crestview Drive, a distance of approximately 1200 l.f. to the proposed booster pump location. It also includes tying into the existing 2" waterline on Greenhill Drive via approximately 200 lf of horizontal directional drilling to loop the system. Like option #1 and #4, using HDD placement is more expensive than traditional open trenching. In addition, this option covers the longest distance of the three options and is therefore the most expensive. Because this option will loop the existing 2" waterline, it will help increase pressure for residents with low pressure on Greenhill Drive. The total estimated cost for this option is $162,292.

Route Alternative #3- Crestview Drive

This route includes placement of a new 8" C900 PVC waterline by open trench placement from approximately US Hwy 101/ Crestview Drive, a distance of approximately 1200 l.f. to the proposed booster pump location. This option is longer than option one but does not involve horizontal directional drilling methods, which makes it less expensive. The total estimated cost for this option is $112,559.

Route #4- Greenhill Drive with Connection to Crestview Drive

Option #4 includes placement of a new 8" C900 PVC pipe by open trenching methods from approximately US Hwy 101/ Greenhill Drive, a distance of approximately 750 l.f. to a steep hill portion at the end of Greenhill drive. From the end of the road, the pipe will be placed by horizontal directional drill methodology approximately 200 lf to the proposed booster pump location. Finally, this route includes open trenching an additional 150 lf to the existing 6" waterline along Crestview Drive, which will loop the system. This option encounters the same obstacles as option #1 and #2 using HDD methods to place the pipeline. This option replaces the undersized 2" line on Greenhill Drive and loops the existing 6" line along Crestview Drive, increasing pressure to residents. The total estimated cost for alternative #4 is $161,647:

Based on the relative costs, Alternative #3 was selected. This Alternative routed the 8" waterline up Crestview Drive from 101.

The proposed waterline will connect to the existing 10" main on the west side of 101 and will route beneath the State highway. This will require either a Jack & Bore method of tunneling beneath the highway or may be an open trench construction with the requirement that a significant amount of the pavement be grinded off and replaced. We recommend that the contractor be allowed to use whichever method is least expensive.

3 PUMP STATION

Need for project:

As identified in Section 1 above, the proposed new reservoir will have a normal high water surface elevation of 318'. The primary 1 million gallon reservoir in the north part of town, which pressurizes the southern portion of the City, has a high water elevation of 252'. The difference in elevation requires that the water be pumped to the new reservoir, and that flow back from the new reservoir must be routed through a pressure reducing valve (PRV) to maintain the current system pressures.

Size Requirement:

The required flow to create adequate mixing in the tank is 300 gallons per minute, therefore the pump station should be designed to pump 300 gallons per minute. As discussed in Section 1, the anticipated fire flow is 1000 gallons per minute, so the pressure reducing valve should be sized to reduce pressure from the proposed tank (318') to the system pressure (252') during normal usage and fire flow events.

Site Constraints:

The property available for the pump station is at the north end of the switchback on Crestview Drive within the existing Crestview right-of-way. The site is currently used to house an existing Conex box used to store emergency supplies for the community. The property is at an elevation of approximately 195'. Single phase electric service is available at the site.

OPERATIONAL REQUIREMENTS:

Below are the operating conditions for the pump station:

OPERATING CONDITIONS

Sensor / Reading:	***Action:***	***Override Ability***
Low side pressure loss valve at Bridge:		
Open	Operate Normally	
Closed (alarm)	Pumps will not run	No
Flow Meter:		
0-500 gpm	Operate Normally	
501-1500 gpm (alarm)	Pumps will not run	No
1501 & higher (alarm)	Pumps will not run	No
	Isolation valve closes	Yes
1 MG North Reservoir Water Level:		
20' & higher	Operate Normally	
0 – 19.9' (alarm)	Pumps will not run	Yes

Operating conditions discussion

The low side pressure loss valve will close if the valve senses low pressure on the river side of the valve. This would be indicative of a break in the line across the river. The pumps will not be able to start while this valve is closed because they won't have any supply to pump from. When the valve closes, it will have to be manually reset. An alternative is to install a flow meter and actuated valve that would close when flows were measured going south to north at a sufficient volume that would indicate a break in the line (~1000 gpm). This would have the advantage of making the valve operable from remote sites, but would come at the cost of requiring electric service to the vault.

The Flow Meter identified in the table above represents the proposed flow meter between the pump station and the storage reservoir. Flows measuring higher than 500 gpm indicate a fire demand or a break in the system, and in both instances, pumps should not be operated. Flows in excess of 1500 gpm will likely be due to a break in the system. In this case pumps will not operate and an actuated valve will close at the tank site to preserve the storage volume. This valve will be operable from remote sites, so it can be closed if smaller (but still significant) breaks are identified or opened if large flows are needed in excess of standard fire demand.

The relationship between the level of the primary reservoir, located in the north part of the City and the pump station will simply be that at below a certain water level (20'), the proposed pump station will not pump to preserve the volume in the north reservoir. This level is set well below the standard "call for water" level of 28'. Elevation difference is not a concern, even if the north tank were to drain down to empty. For this reason, this constraint may be overridden by the operators if they need to fill the new reservoir while the north reservoir is not full.

Building Design:

The pump station building is designed as a Concrete Masonry Unit (CMU) block building. The roof will be a pitched standing seam aluminum roof and will be green in color. The doors and vents/louvers will be fiberglass or aluminum to prevent corrosion. The building was designed using the prescriptive path described in the latest edition of the International Building Code. The building will have a 4' sidewalk from the door on the west side, around the south side, and to the northern door on the west side.

4 MISCELLANEOUS

Miscellaneous Requests by City:

- As identified in Section 3, the proposed pump station will be located where a current Conex shipping container is sited to store emergency supplies. The City requested that the pump station be designed in a manner to provide for the emergency supply storage that is currently housed in the shipping container. As such, a storage room has been designed into the pump station design. The room will have electrical service and a space heater.
- The City has requested a method to save water in the tank in the event of a line break. Based on this response we have added the flow meter actuated valve identified in Section 3. Because the valve will be closed near the tank, the City asked that we provide a secondary waterline down the tank access road to the pump station so residents can fill up storage containers with water in the event of water pressure loss. A 1" pipe will be routed alongside the main pipe between the reservoir and the pump station to serve this purpose. A hose bib will be provided at the pump station.
- The City requested that, since significant waterline work is progressing on Crestview Drive that drainage improvements are made to mitigate the risk of future landslides. A stormdrain system was designed on the plans to route the water through a series of pipes that will outlet near the intersection of Crestview Drive and 101.
- The overall project will be advertised for bid using current EJCDC documents as a lump sum contract with a Design-Bid-Build delivery method. The bidding and contract documents will meet the requirements of the funding agency.

TIDEFLEX MIXING SYSTEM (TMS)

PRELIMINARY DESIGN REPORT

Tank Name: South Tank 0.25MG Reservoir

Water Utility/Owner: City of Yachats, OR

Consultant: Civil West Engineering

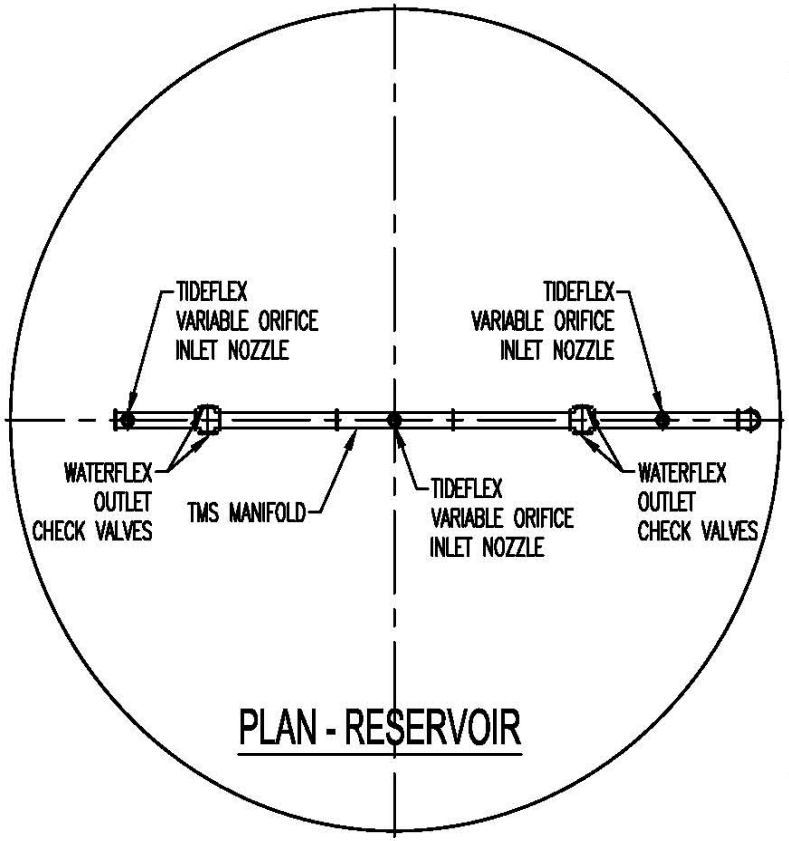
CONTENTS

Analysis by:
Kristopher Chenette, E.I.T.

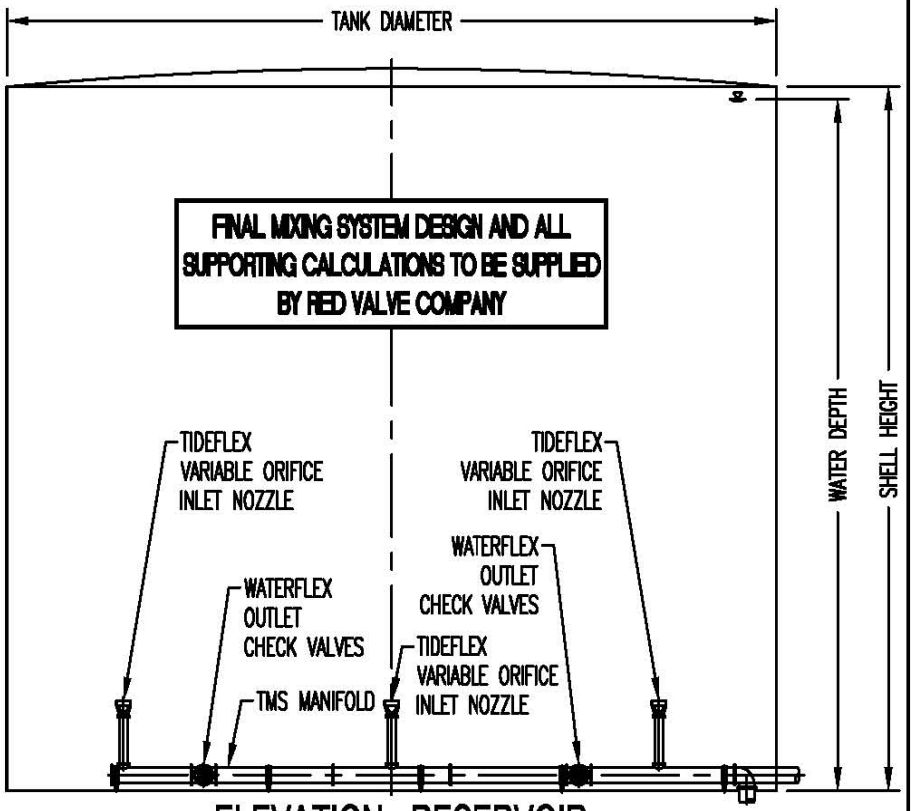
Tideflex® Technologies
A Division of Red Valve Company,® Inc.

March 15, 2016

UNITED STATES PATENT NUMBER: 7,104,279 CANADIAN PATENT NUMBER: 2,409,009



PLAN - RESERVOIR



ELEVATION - RESERVOIR

NOTES:

1. DO NOT USE THIS DRAWING FOR CONSTRUCTION. DRAWING INTENDED AS A GENERAL REPRESENTATION ONLY.
2. QUANTITY, SIZE, ELEVATIONS, LOCATIONS, AND DISCHARGE ANGLES OF TIDEFLEX INLET NOZZLES AND/ OR OUTLET CHECK VALVES ARE TANK-SPECIFIC BASED ON HYDRAULICS, MIXING AND TURNOVER CRITERIA.
3. CARBON AND STAINLESS PIPE SECTIONS MAY BE SUPPLIED WITH PLAIN ENDS TO BE BUTT WELDED IN THE FIELD.

S.O.#: QUOTE #:

NOT FOR CONSTRUCTION

REV	BY	DATE	DESCRIPTION
D			
C			
B			
A			

Tideflex Technologies
A Division of Red Valve Company, Inc.
TIDEFLEX TECHNOLOGIES
TIDEFLEX MIXING SYSTEM
700 N. BELL AVENUE
CARNEGIE, PA 15106 USA
PHONE: 412-279-0044
FAX: 412-279-5410
WEBSITE: WWW.TIDEFLEX.COM
EMAIL: INFO@TIDEFLEX.COM

TMS GENERAL ARRANGEMENT FOR GROUND LEVEL CIRCULAR RESERVOIRS AND BOLTED COMPOSITE ELEVATED TANKS

CONSULTANT:

APPLICATION: (TMS) TIDEFLEX MIXING SYSTEM

SCALE: FULL PLOT:

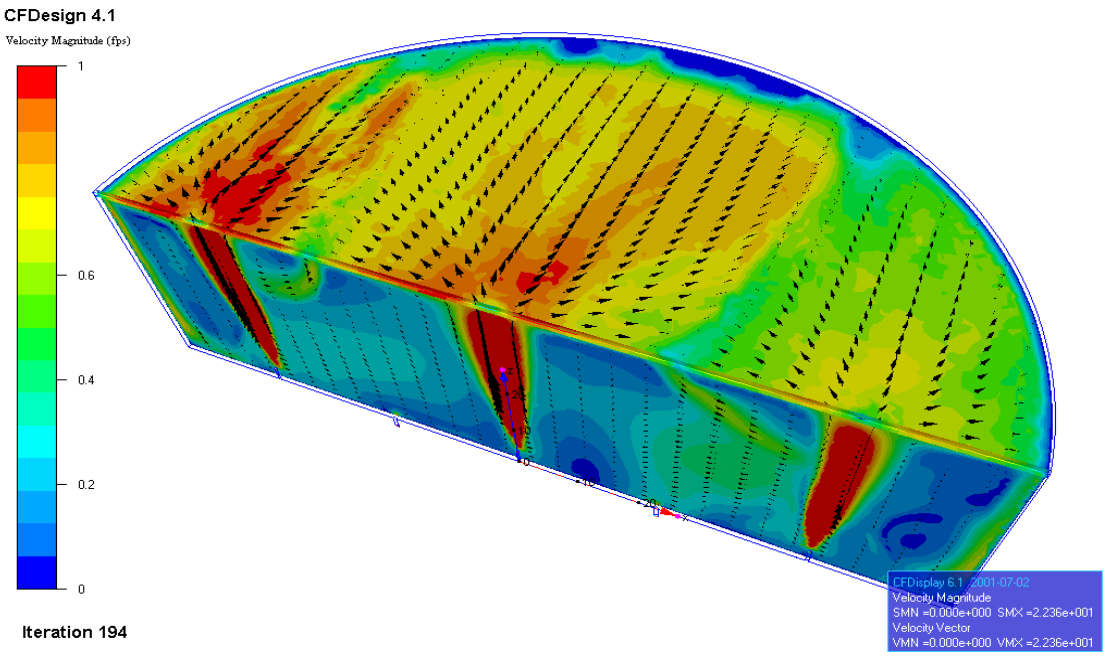
DWG. BY: GJG DATE: 11-3-03

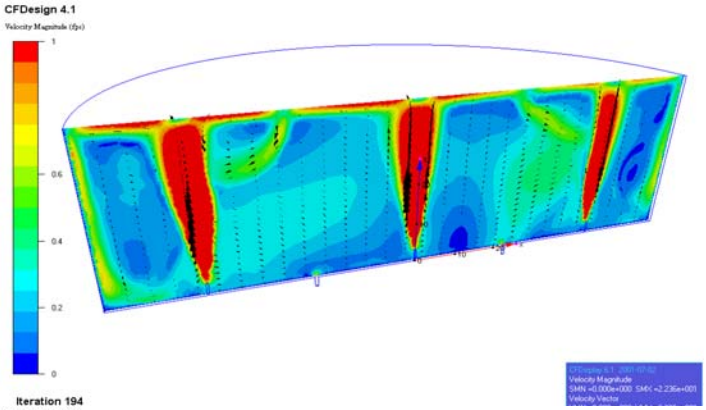
DWG. NO. TMS-CIR7

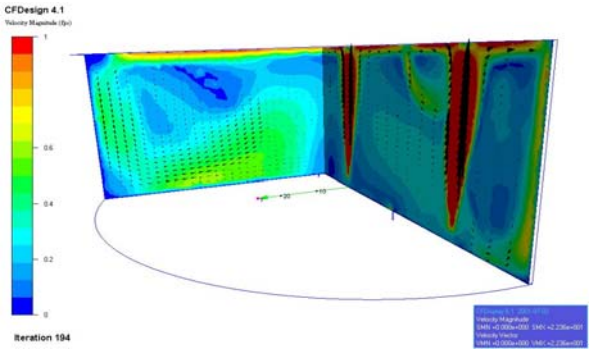
SHEET 1 OF 1

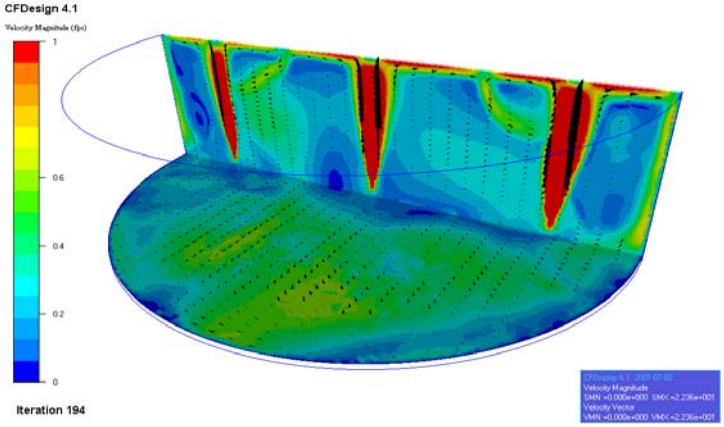
Computational Fluid Dynamics (CFD) Modeling

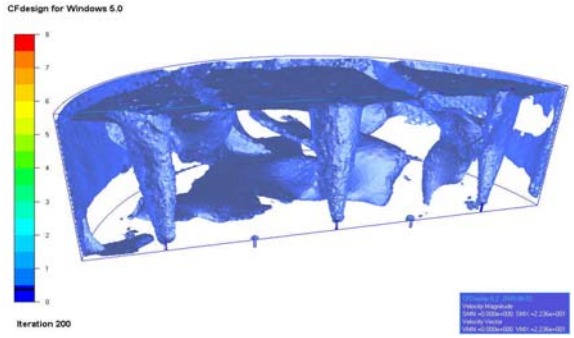
Below are CFD images showing representative velocity magnitude contour and vector images of this TMS configuration in a circular reservoir.











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TIDEFLEX RESERVOIR MIXING ANALYSIS

South Tank 0.25MG Reservoir
City of Yachats, OR

The Reservoir Mixing Analysis (RMA) is to be supplied to the water utility/owner as it provides guidance on the tank turnover/fluctuation required to ensure complete mixing with the TMS installed. Maintaining water quality in tanks and reservoirs is a combination of achieving complete mixing AND tank turnover to minimize water age. It is critical to achieve complete mixing to prevent a localized increase in water age (and associated water quality problems) due to short-circuiting and dead zones.

The RMA calculates the dependent variables and uses the mixing time formula to calculate the "Theoretical Mixing Time" (MT) at various filling flow rates. The MT is the fill time required to achieve complete mixing. The required drawdown (in feet), % turnover, and the required volume exchange (in gallons) are calculated based on these mixing times. These values are shown in the "Guide to Tank Fluctuation and Turnover" section of the RMA. A slightly greater drawdown/turnover is typically recommended to be conservative.

Within the "Guide to Tank Fluctuation and Turnover" is a "Minimum Tank Fluctuation Target". This is applicable for tanks that operate in fill-then-draw. This is the minimum amount the tank should be drawn down on the draw cycles to ensure complete mixing on the fill cycles. This data is intended to be used by operators in conjunction with SCADA and strip charts (where applicable) to verify adequate tank turnover and to determine "pump on" and "pump off" set points (where applicable). For tanks that operate in simultaneous fill and draw, the "Theoretical Mixing Time" (fill time required to achieve complete mixing) should be used to ensure the minimum fill time required is achieved.

The RMA also provides data on the time required to draw down the tank, at various draw rates, to the required level as determined by the mixing time calculations.

Note, the data provided on the required drawdown, % turnover and volume exchange are to ensure complete mixing of the tank volume to prevent water quality problems associated with short-circuiting, incomplete mixing, and increased water age. A water age evaluation of the entire distribution system may dictate greater tank turnover than provided with the RMA. As long as the actual tank turnover/fluctuation is equal to or greater than that provided with the RMA, the tank will be completely mixed.

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ING ANALYSIS (TMS)

15-Mar-2016

RESERVOIR / TANK NAME: **South Tank 0.25MG Reservoir**

CONSULTANT:	Civil West Engineering Matt Wadlington, P.E.	UTILITY / OWNER:	City of Yachats, OR Rick McClung
ddress:		Contact: ddress:	
Contact:			
	phone fax email		phone fax email
RED VALVE REP.:	Antec Corporation Matthew Davidson	ANALYSIS BY:	Kristopher Chenette, E.I.T.




RESERVOIR / TANK DATA

Tank Diameter	33	ft
Tank Depth (SWD) to HWL	33	ft
Depth to LWL	29.7	ft
Tank Volume	211,137	Gallons
Tank Volume	28,225	ft^3
Gallons Per Foot =	6,398	

INLET / OUTLET PIPES

Outlet Dia. = 8 in

* Effective Diameter of TMS (See Note 1)

	FILL / DRAW Fill Rates (gpm)	Draw Rates (gpm)
Effec. Dia (in) = T	25	250
Effec. Dia (in) = A T	150	750
Effec. Dia (in) = A T	275	1500
Effec. Dia (in) = A T	300	3000
A		

PROPRIETARY NOTICE

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FILL

NLET FLOW RATES (gpm)	T ime to Fill Tank from mpty to H.W.L (Hours)	(Days)	T ime to Fill to 1' Depth (Minutes)	(Hours)	Input Fill Time (Hours)	Resulting Increase In Water level (ft)	Volume Change (gallons)
I 25.0	140.76	5.86	255.92	4.27	6.5	1.5	9,676.89
150.0	23.46	0.98	42.65	0.71	1.7	2.4	15,049.83
E 275.0	12.80	0.53	23.27	0.39	1.1	2.7	17,404.76
300.0	11.73	0.49	21.33	0.36	1.0	2.8	17,765.94

GUIDE TO TANK FLUCTUATION AND TURNOVER

FILL

NLET FLOW RATES (gpm)	Jet Velocity (fps)	JV^2 / 2g (feet)	Reynold's Number	Inlet Momentum (ft^4 / min^2)	Velocity Gradient, G (1/sec)	(Fill T heoretical Mixing Time T ime Req'd for Complete Mixing) MT = K * V^(2/3) / M^(1/2) (Minutes)	(Hours)	Req'd Drawdown on Previous Draw to Mix on Next Fill (feet)	% Turnover Required (%)	Volume Exchange Required (gallons)
								(SEE NOTE 2)	(SEE NOTE 2)	(SEE NOTE 2)
I 25.0	2.97	0.14	56,822	596	0.85	387.1	6.5	1.5	4.6	9,712
150.0	7.37	0.84	219,214	8,870	5.14	100.3	1.7	2.4	7.1	14,991
275.0	10.11	1.59	347,515	22,290	9.54	63.3	1.1	2.7	8.2	17,313
300.0	10.58	1.74	371,400	25,459	10.44	59.2	1.0	2.8	8.4	17,736

SEE NOTE 2

MINIMUM TANK FLUCTUATION TARGET

DRAW

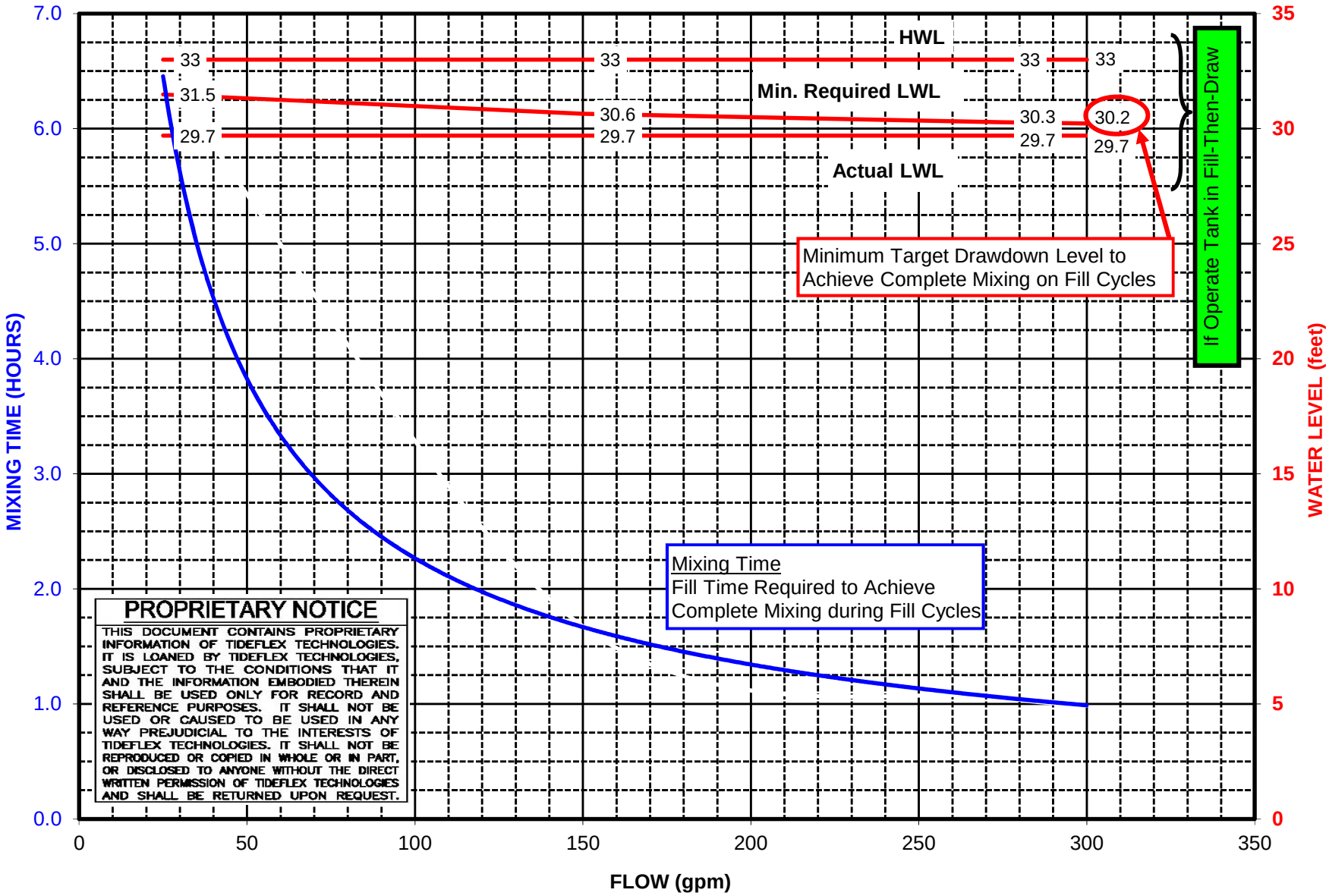
OUTLET FLOW RATES (gpm)	TIME TO DRAW TANK FROM ULL TO EMPTY (Hours)	(Days)	T ime to Draw Down 1' Depth (Minutes)	(Hours)	Pipe Velocity (fps)	Volume Exchange Required (gallons)	Draw Time Required (Hours)	
250	F 14.08	0.59	25.59	0.43	1.59	17,736	1.2 @	250 gpm Draw Rate
750	4.69	0.20	8.53	0.14	4.78	17,736	0.4 @	750 gpm Draw Rate
1500	2.35	0.10	4.27	0.07	9.56	17,736	0.2 @	1500 gpm Draw Rate
3000	1.17	0.05	2.13	0.04	19.13	17,736	0.1 @	3000 gpm Draw Rate

*** NOTE: 1. TIDEFLEX VALVES ARE INHERENTLY A VARIABLE ORIFICE SO THE TMS EFFECTIVE DIAMETER VARIES WITH FLOW RATE**

. M IXING TIME EQUATIONS DO NOT ACCOUNT FOR DIFFERENCES IN TEMPERATURE BETWEEN INLET WATER AND TANK (BUOYANT JETS) SE CALCULATIONS MAY UNDERESTIMATE THE FILL TIME REQUIRED FOR MIXING.

TMS - Mixing Time and Minimum Required Drawdown

South Tank 0.25MG Reservoir



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WATER AGE ANALYSIS

For Tanks That Operate in
FILL - THEN - DRAW
(Not simultaneous fill and draw)

Actual/Predicted Daily Turnover and Water Age

High Water Level (HWL) =	33	ft	**Turnover =**	3.3	feet	**Ave. Water Age =**	10.0 days
Low Water Level (LWL) =	29.7	ft		10.0	%	*(Assumes tank is mixed. CAUTION: A single inlet pipe*	
				21,113	gal	*often does not mix. Water age could be much higher*	

Turnover Required for TMS to Achieve Complete Mixing

(GOAL: For Required Turnover for Complete Mixing to be Less Than Actual/Predicted Turnover)

The TMS will mix the tank with **Turnover =**	2.8	feet	**Ave. Water Age =**	11.9 days	
(see Mixing Analysis)	8.4	%	*(Water age if tank turnover was the minimum*		
	17,765	gal	*required to achieve complete mixing)*		

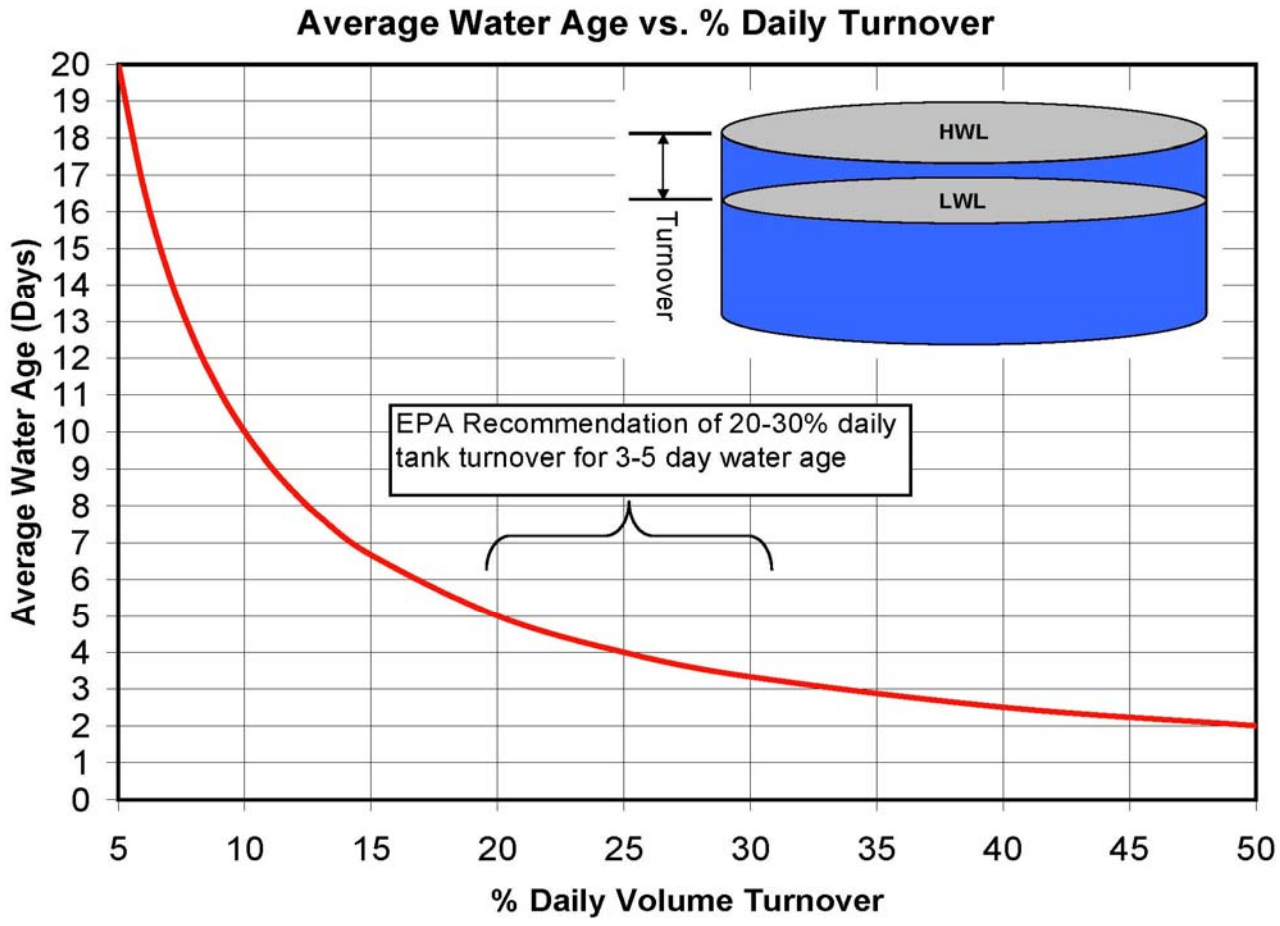
RESULT

Is Actual Turnover Greater than Required Turnover to Mix with TMS? YES

If Yes, the TMS will Completely Mix the Tank. Applicable Water Age is from Actual/Predicted Turnover
If No, Tank May not be Completely Mixed but Will Not Short-Circuit. The TMS Separates the "Inlet" and "Outlet" and will Draw the Oldest Water from the Tank First

WATER QUALITY:

* Maintaining storage tank water quality is a function of:
  1) Maximizing volume turnover to minimize water age. See Water Age vs. Turnover Guideline below.
  2) Achieving complete mixing to avoid a localized increase in water age due to incomplete mixing and short-circuiting
* The TMS design addresses #2. Consultant and/or Owner to address #1 by looking at the "operation" of the distribution system and tank in order to maximize turnover. See Water Age vs. Turnover Guideline below.



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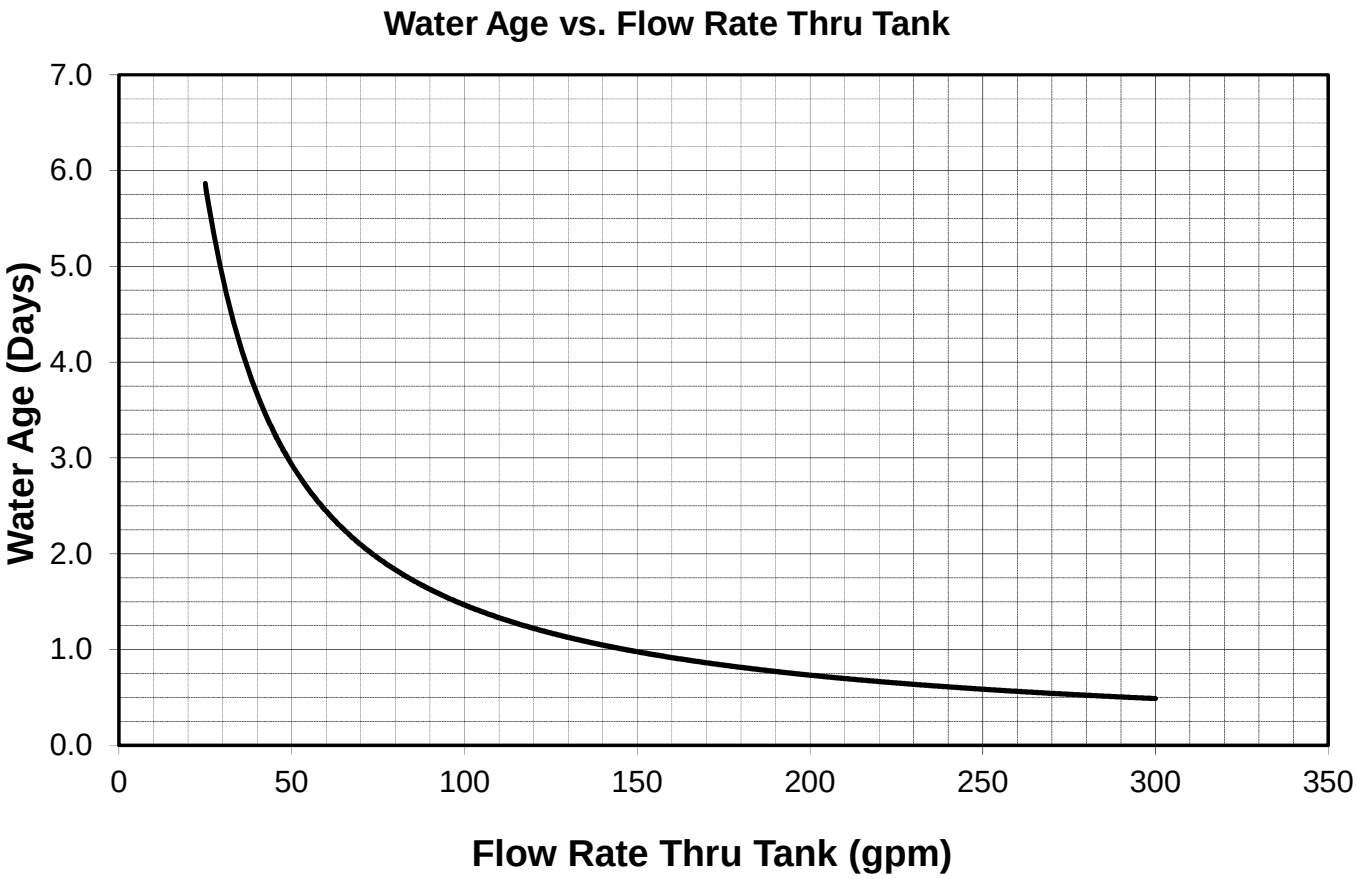
WATER AGE ANALYSIS

For Tanks That Operate in
SIMULTANEOUS FILL & DRAW
(Not fill-then-draw)

Tank Volume	Flow Rate	WATER AGE (Assumes fill/drawing 24 hours per day)			Mixing Time from Mixing Analysis
(Gallons)	(gpm)	(Minutes)	(Hours)	(Days)	(Hours)
211,137	25.0	8,445	140.8	5.86	6.5
	150.0	1,408	23.5	0.98	1.7
	275.0	768	12.8	0.53	1.1
	300.0	704	11.7	0.49	1.0

These Water Age Calculations are valid if the tank is completely mixed.
(TMS will completely mix tank if the actual fill time is greater than the theoretical mixing time as shown here and on Mixing Analysis)



WATER QUALITY:

* Maintaining storage tank water quality is a function of:
  1) Maximizing volume turnover to minimize water age. The greater the flow rate thru the tank, the lower the water age.
  2) Achieving complete mixing to avoid a localized increase in water age due to incomplete mixing and short-circuiting
     Ensure that tank is filling for longer than what is shown on the theoretical mixing time in the mixing analysis

TMS Manifold Hydraulics (FILL CYCLE)

Tideflex Technologies
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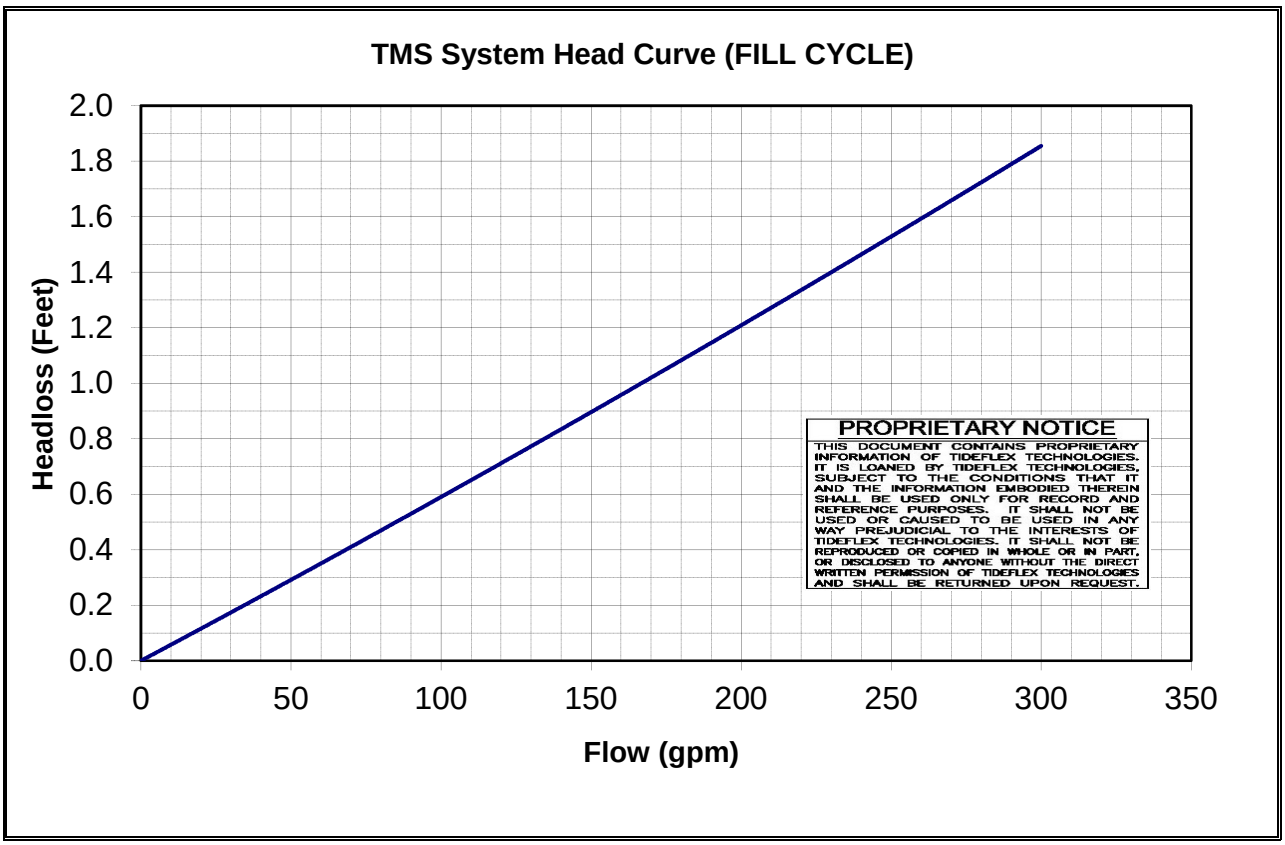
Reservoir Name:	**South Tank 0.25MG Reservoir**	Ambient Density =	**62.4** lbm/ft^3
Reservoir Size:	**36' Dia. x 33.5'**	Effluent Density =	**62.4** lbm/ft^3
Reservoir Capacity:	**0.25 MG**	dS/S =	**0**
End User:	**City of Yachats, OR**	C =	**100** Hazen Williams Coeff.
Consultant:	**Civil West Engineering**	Cd =	**0.95** Cd

Flow Rate (gpm)	Jet Velocity (fps)	Friction Headloss (ft)	Total Headloss (ft)
25.0	3.0	0.00	0.1
150.0	7.4	0.01	0.9
275.0	10.1	0.02	1.7
300.0	10.6	0.03	1.9



TMS Manifold Hydraulics (DRAW CYCLE)

Tideflex Technologies
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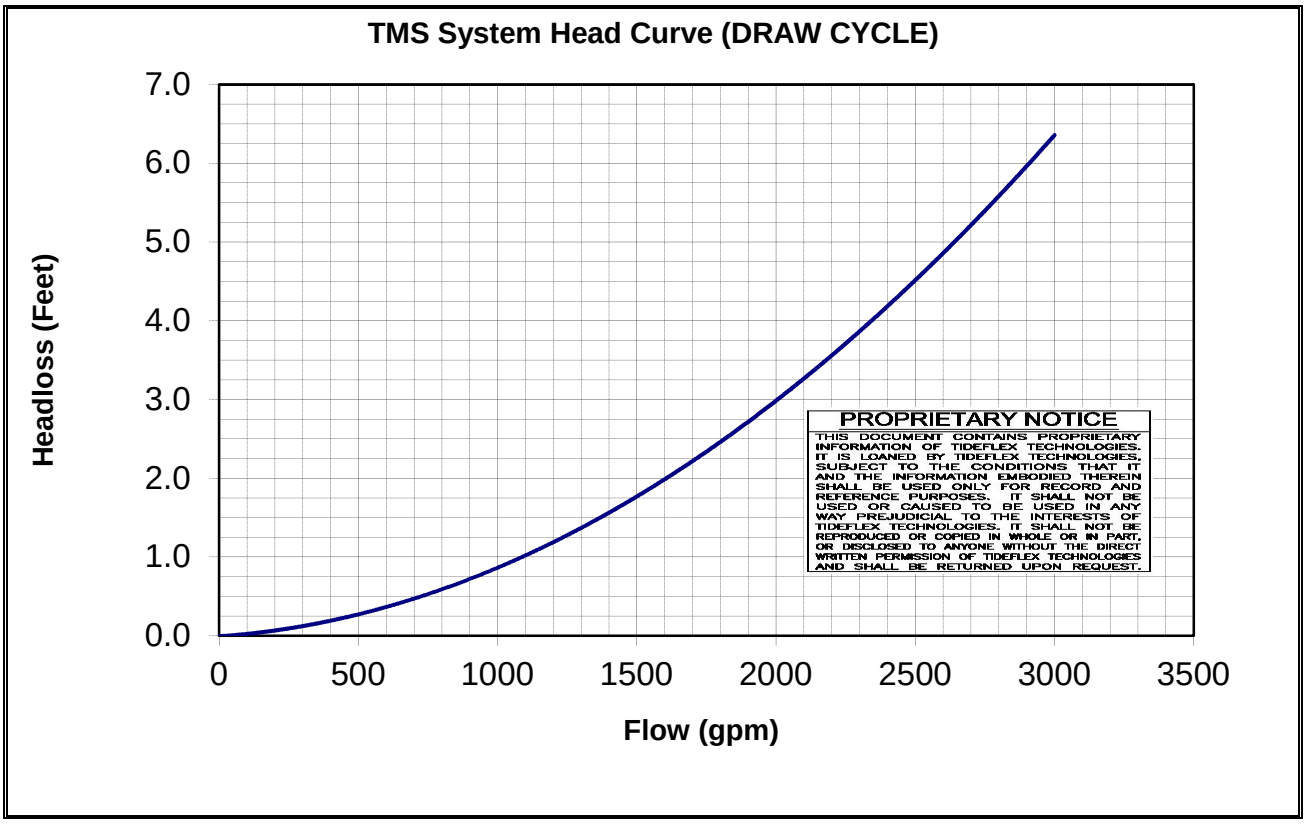
Reservoir Name:	**South Tank 0.25MG Reservoir**	Ambient Density =	**62.4** lbm/ft^3
Reservoir Size:	**36' Dia. x 33.5'**	Effluent Density =	**62.4** lbm/ft^3
Reservoir Capacity:	**0.25 MG**	dS/S =	**0**
End User:	**City of Yachats, OR**	C =	**100** Hazen Williams Coeff.
Consultant:	**Civil West Engineering**	Cd =	**0.95** Cd

Flow Rate (gpm)	WF-3 Headloss (ft)	Friction Headloss (ft)	Total Headloss (ft)
250.0	0.1	0.03	0.1
750.0	0.3	0.25	0.5
1500.0	0.9	0.89	1.8
3000.0	3.2	3.20	6.4

TMS DRAW HYDRAULICS ONLY APPLIES IF WATER IS DRAWN FROM TANK THRU TMS

QUANTITY OF WF-3 OUTLET VALVES = 4
WATERFLEX SIZE = 8 inch



City of Yachets

South Tank - Pump Station and Waterline Improvements

MEH

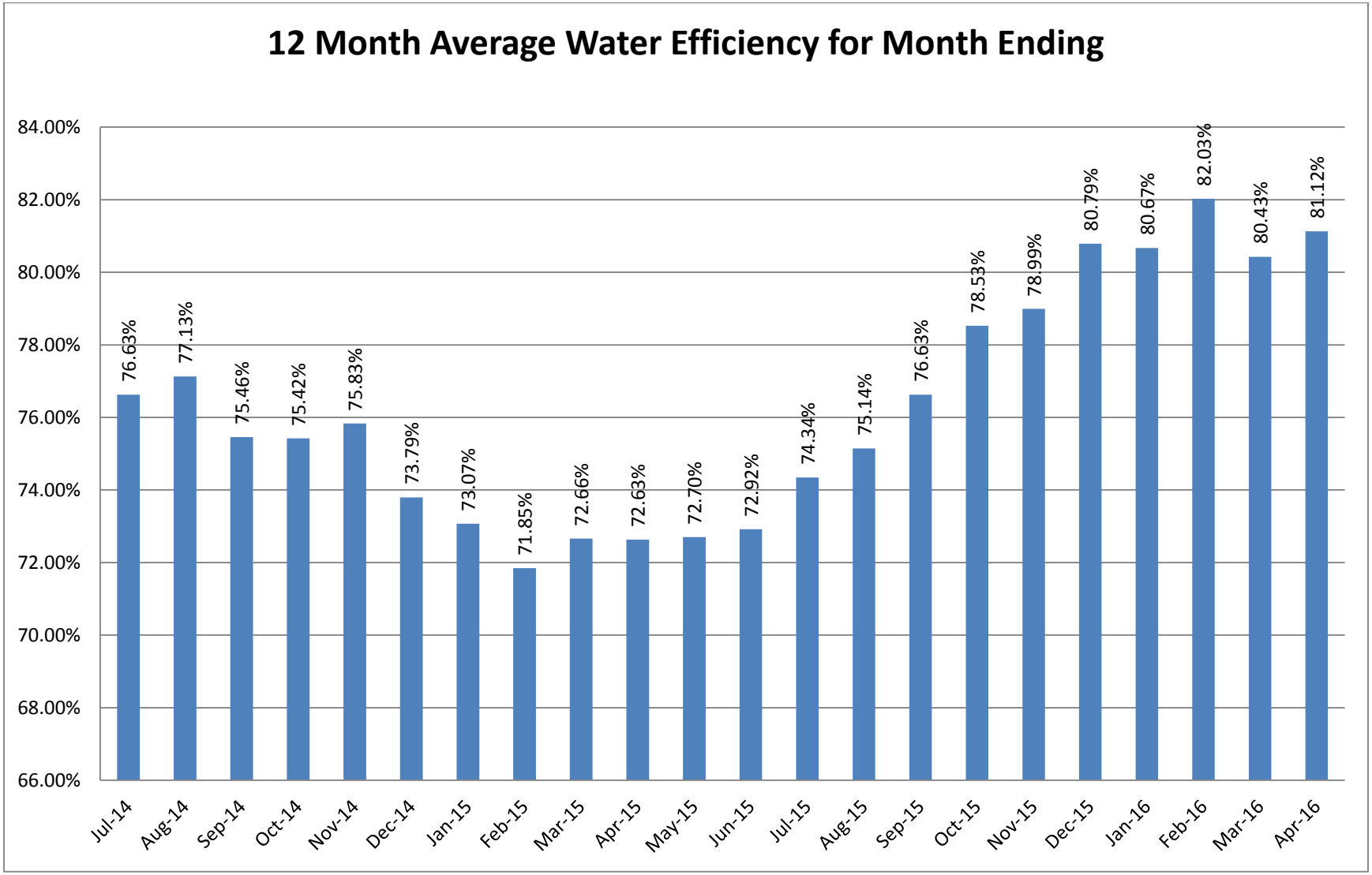
Engineers Cost Estimate

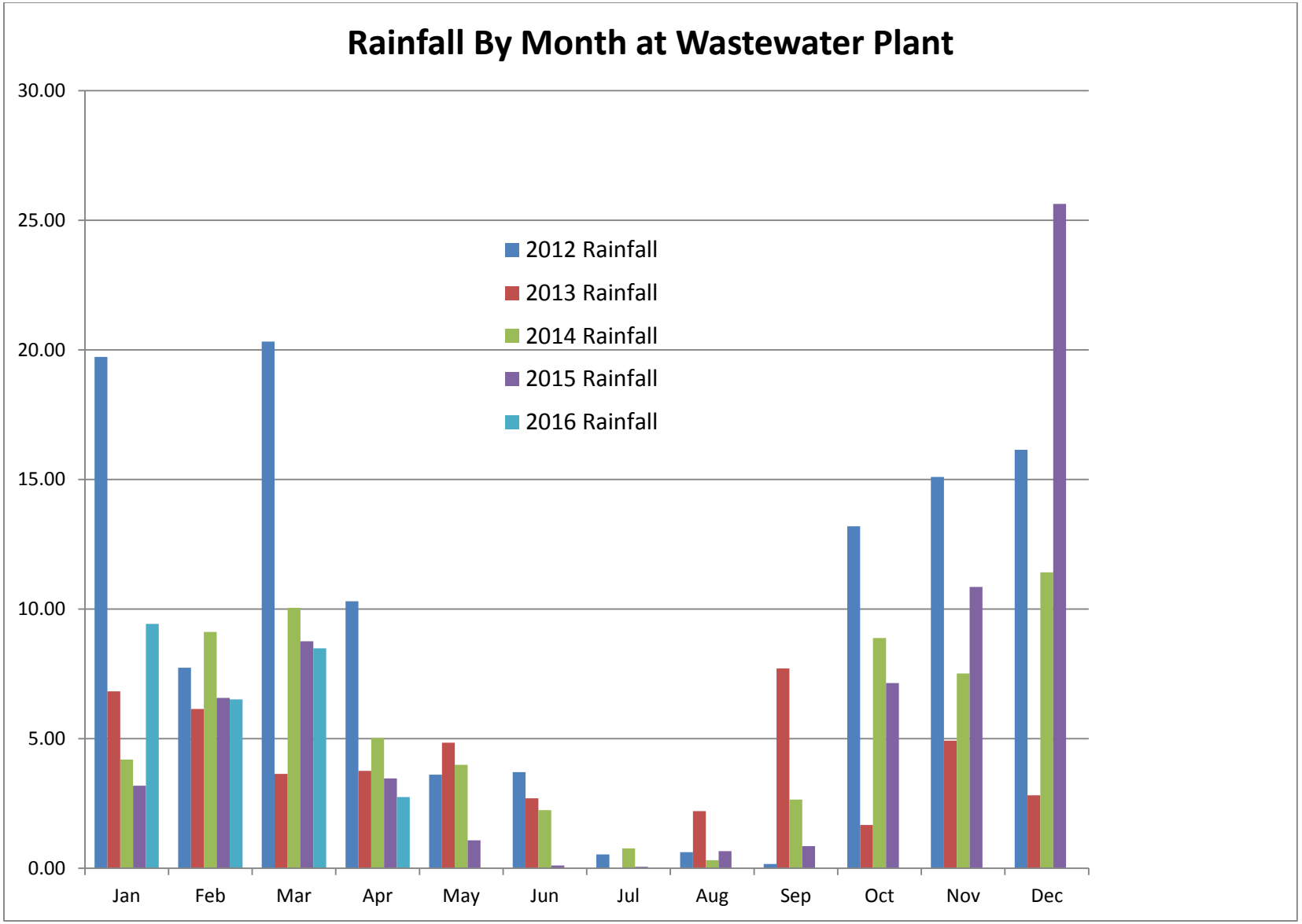
April 10 - 2016

Bid Item No.	Description	Units	Est Amount	Cost per Unit	Total Est Cost
	General				
1	Mobilization Bonds & Insurance	Ls	1	$ 144,286	$ 144,286
2	Temporary Facilitiess & Controls	Ls	1	$ 48,095	$ 48,095
3	Demolition & Site Preperation	Ls	1	$ 42,083	$ 42,083
4	Foundation Stabilization	Cy	40	$ 46	$ 1,840
	General Subtotal	**$**			**236,304**
	Water System Improvements				
5	1" Water Service Line	Lf	75	$ 28	$ 2,100
6	Service Reconnection	Ea	5	$ 450	$ 2,250
7	2" Communication Conduit to Tank	Lf	425	$ 18	$ 7,650
8	8" Hot Tap w/ 8" Gate Valve	Ea	1	$ 6,500	$ 6,500
9	Restraints for 8" WL - Crossing	Ea	3	$ 4,600	$ 13,800
10	Bore n Jack for 8" WL - Crossing	Lf	45	$ 658	$ 29,599
11	8" 22 1/2 Degree Elbow	Ea	7	$ 410	$ 2,870
12	8" 45 Degree Elbow	Ea	10	$ 430	$ 4,300
13	8" C 900 PVC Waterline	Lf	1525	$ 45	$ 68,625
14	8" C900 PVC Carrier Pipe	Lf	45	$ 50	$ 2,250
15	New F-Hyd Assembly	Ea	1	$ 5,500	$ 5,500
16	Ditch Inlet Catch Basin	Ea	8	$ 2,250	$ 18,000
17	18" HDPE Storm Drain Pipe	Lf	75	$ 110	$ 8,250
18	24" HDPE Storm Drain Pipe	Lf	1000	$ 135	$ 135,000
19	New V-Ditch w/ Filter Fabric	Lf	270	$ 85	$ 22,950
20	Gravel Surfacing	Cy	87	$ 3	$ 216
21	Rip Rap 8"-0	Cy	3	$ 38	$ 114
22	Roadway Excavation Site Prep	Ls	1	$ 18,500	$ 18,500
23	3/4"-0 Aggregate Leveling Course	Cy	41	$ 37	$ 1,521
24	3"-0 Access Road Base Rock	Cy	164	$ 18	$ 2,960
25	Ac Trench Patching	Ton	18	$ 145	$ 2,610
26	Pressure Loss Valve	Ls	1	$ 15,000	$ 15,000
27	Landscape Restoration & Cleanup	Ls	1	$ 6,012	$ 6,012
	Construction Subtotal - Waterlines	**$**			**376,577**
	Pump Station Improvements				
28	Site Improvements/ Excavation	Ls	1	$ 15,000	$ 15,000
29	Site Piping/ Complete	Ls	1	$ 23,000	$ 23,000
30	CMU Building/ Complete	Ls	1	$ 80,300	$ 80,300
31	4" Thick Concrete Walkway	Sf	250	$ 15	$ 3,750
32	Retaining Wall (Block Style)/ Complete	Lf	75	$ 225	$ 16,875

33	Electrical Improvements/ Complete	Ls	1	$ 30,000	$ 30,000
34	Integration/SCADA	Ls	1	$ 22,500	$ 22,500
35	35Kw Gen-set/ Complete	Ls	1	$ 35,000	$ 35,000
36	Pump Skid w/ BY-Pass/ Complete	Ls	1	$ 38,000	$ 38,000
37	Type B Catch Basin	Ea	2	$ 2,000	$ 4,000
38	12" HDPE Storm Drain Pipe	Lf	120	$ 85	$ 10,200
39	Landscape Restoration	Ls	1	$ 3,607	$ 3,607
	Construction Subtotal -Pump Sta	**$**			**282,232**
	South Tank Improvements				
39	Site Improvements/ Excavation	Ls	1	$ 93,000	$ 93,000
40	Site Piping & Appurtenances	Ls	1	$ 46,500	$ 46,500
41	Under Tank Piping	Ls	1	$ 18,500	$ 18,500
42	Concrete (Footing/ Floor)	Ls	1	$ 40,500	$ 40,500
43	Water Storage Tank/ Complete	Ls	1	$ 142,500	$ 142,500
44	Aluminum Dome Roof / Complete	Ls	1	$ 53,250	$ 53,250
45	Tank Accessories	Ls	1	$ 22,500	$ 22,500
46	Interior Tank Piping	Ls	1	$ 16,500	$ 16,500
47	Hydro Testing of Tank	Ls	1	$ 4,200	$ 4,200
48	Disinfection of Tank	Ls	1	$ 4,200	$ 4,200
49	Electrical	Ls	1	$ 2,700	$ 2,700
50	Fence and Gate	Lf	200	$ 15	$ 3,000
51	Retaining Wall Tank Site	Sf	1700	$ 70	$ 119,000
52	Landscape Restoration	Ls	1	$ 3,006	$ 3,006
	Construction Subtotal - Tank Site	**$**			**569,356**
	Construction Sub Total - Complete	$			1,464,469
	Contingency	$			146,447
	Constrction Total - Complete	$			1,610,916

Water Data For April 2016




Rainfall By Month at Wastewater Plant
30.00
25.00
20.00
15.00
10.00
5.00
0.00
2012 Rainfall
2013 Rainfall
2014 Rainfall
2015 Rainfall
2016 Rainfall
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec