

CONSOLIDATION FEASIBILITY STUDY

SEPTEMBER 2016



RAINIER TRACTS WATER ASSOCIATION

WSDOH System ID No. 70910

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CITY OF OTHELLO

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WSDOH WATER SYSTEM ID No.70910

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1.0 INTRODUCTION

1.1 Background

In 2015, the Drinking Water State Revolving Fund (DWSRF) awarded the City of Othello several grants to study the feasibility of consolidating small water systems into Othello's water system. The goal of these consolidation feasibility studies is to provide the City of Othello and each small water system owner a basis for considering integration of the small water system into the City of Othello's water system. The analysis and alternatives for each system will vary depending on the specific locations, conditions, and situations within the small system and its potential impact on the City of Othello's water supply and infrastructure. The need for subsequent financial or technical investigations may become evident as a result of the consolidation studies.

1.2 Scope

The project scope of work includes the following:

- Inventory of the small water system existing facilities (supply, treatment, storage, distribution, water rights)
- Assessment of the condition of the small water system existing facilities
- Estimate existing small water system demands
 - ADD: Average Day Demand
 - MDD: Maximum Day Demand
 - PHD: Peak Hour Demand
- Develop criteria for small water system supply, treatment (disinfection or other water quality), storage, distribution system, and water rights
- Estimate capacity of small water system existing facilities and identify deficiencies
- Estimate ongoing operation and maintenance cost of small system if not consolidated
- Identify small water system components that do not meet Othello's standards and estimate cost of bringing the small water system facilities up to Othello standards.
- Identify likely system consolidation options
- Identify infrastructure needed to physically connect the small water system(s) to Othello's water system and estimate construction costs
- Estimate impacts to Othello's water system facilities and long term water supply; estimate need for and feasibility of additional water supply facilities.
- Compare ongoing operation and maintenance costs of unconsolidated system to the cost of consolidation
- Comment on possible barriers to consolidation that become evident during the evaluation
- Identify next steps if Othello and the small water system desires to pursue consolidation

DWSRF awarded Othello grants to evaluate the feasibility of consolidating with the following small water systems (see **Figure 1**):

- Adams County Water District No.1 WSDOH System ID No.22525
- Basin View Water Association WSDOH System ID No.04530
- Bird Dog Family LTD Partnership II WSDOH System ID No.52172

- Highland Estates Water System WSDOH System ID No.32736
- Meadow Lane Water Association WSDOH System ID No.53190
- Othello Manor Water System WSDOH System ID No.64845
- Rainier Tracts Water Association WSDOH System ID No.70910
- Summerset West Water Association WSDOH System ID No.85080

1.3 Contact Information

The contact information for the Rainier Tracts Water Association (RTWA) is shown on the WFI is as follows:

Primary Contact

Tammy Rodriguez, Operator
Certification No. 012434

Secondary Contact

Teresa Black, Secretary

Address

2288 W Rainier Rd
Othello, WA 99344

Phone

Daytime: 509.488.5847

Phone

Daytime: 509.331.2641
Mobile: 509.855.6073

2.0 EXISTING SYSTEM

2.1 Report Limitations

Several attempts were made by Varela and Associates and the City of Othello to contact Rainier Tracts Water Association. Initial phone contact was made but the representatives of the system did not provide direct information regarding the system nor did they provide access for a field visit to observe the existing system.

Existing system information, evaluation and analysis is therefore limited to the indirect information obtained through the following sources:

- WSDOH Water Facilities Inventory
- DOH Sentry website
- ECY Water Resources Explorer database
- Reports, records and verbal information provided by the WSDOH Eastern Regional Office personnel

2.2 System Information

Rainier Tracts Water Association (RTWA) is located on the north side of Rainier Rd, south of the Meadow Lane Water Association and north of the Summerset Water Association; approximately 1.5 miles west of the City of Othello city limits, in Adams County in the southwest quarter corner of Section 5, Township 15 N, Range 29 E. (see **Figure 1**).

RTWA provides domestic water service to 20 lots. There are currently 20 active connections serving 27 single family residences (7 connections serve two single-family residences on a single lot) and there are 0 vacant lots. The connections are not metered.

Irrigation water is provided by ECBID.

2.3 Service Area

The RTWA service area is shown on **Figure 2**.

Topography

The service area is generally flat and varies in elevation from approximately 926 to 958 amsl.

2.4 Inventory of Facilities

The RTWA water system is shown on **Figure 2**. Based on the available information the water system is a closed system with a well pump, batch chlorination system, cylindrical steel storage tank, booster pump, replacement booster pump, and distribution pipe.

The DOH Water Facilities Inventory (WFI) form lists the RTWA system as a Group A Community system serving a residential community with a population of 61. The system is owned by an Association.

Supply

Supply is provided via one permanent well (S01). The supply and service connections are not metered. The system supply is summarized in the following table.

Table 2-1 Rainier Tracts Water Association Source Inventory ⁽¹⁾

Source Number	Source Name	Use	Metered	Treatment	Current Pumping Rate (gpm)
S01	Well #1 – ABS607	Permanent	No	Chlorination	45
Total:					45

⁽¹⁾ Information obtained from the Water Facilities Inventory (last updated 10/05/2015 as of this writing)

Storage

The RTWA system is a closed system with one steel storage tank with a volume of 1,000 gallons. The tank does not provide distribution system pressure.

Distribution System

Based on photographs obtained from the WSDOH Eastern Regional Office the exiting piping from the pump house to the distribution system is a 3-inch galvanized steel pipe. Distribution and service pipe diameter and material is unknown. Individual service connections are not metered. There are two 5 hp booster pumps which are plumbed to the water system. The distribution system is pressurized by one of the booster pumps while the second pump is valved “off” and is available as a backup.

Fire Flow

The RTWA system does not contain fire hydrants and does not provide fire flow.

Summary of Existing System

The following table summarizes the major components of the RTWA.

Table 2-2 Summary of Rainier Tracts Water Association System Components

System	Component	Description
Supply	Well	ECY Well ID Tag: ABS607 Status: Online Log available: No Depth: Unknown Casing: Unknown Screen: Unknown Date constructed: Approx. 1970 SWL: Unknown Approx. wellhead elev.: 947' Present pumping rate: 45 gpm (well pump) Pump/motor: Submersible Centrifugal, 5 HP Enclosure: Pump house (wood framed building with wood siding and metal roof) Location: 2276 Rainier Rd, Othello, WA 99344, USA
	Booster Pump	Pump/motor: Booster pump, Continuous, 5 HP

System	Component	Description
		Replacement pump: Booster pump, Continuous, 5 HP (valve "off") Present pumping rate: unknown Discharge pressure: unknown
Storage	Tank	Construction type: Cylindrical steel tank (above ground) Approx. base elevation: 947' Date constructed: Approx. 1970 Volume: 1,000 gallons Pressure zones served: One Location: 2276 Rainier Rd, Othello, WA 99344, USA
Distribution System	Assumed 3"	3,375 LF Estimated based on length of development service area
	Total	3,375 LF
	Main materials	unknown
	Service Pressure	unknown

2.5 Assessment of the Condition of the Existing Facilities

An assessment of the condition of the existing facilities could not be verified for RTWA. RTWA was unresponsive to repeated inquiries by Varela to perform a site assessment of the system.

An assessment of the condition of the existing facilities was completed using information available on the DOH Sentry site and information provided by WSDOH Eastern Regional Office personnel.

Supply

Site photos provided in the 2011 Sanitary Survey showed the well head as being capped with no observable defects. An ECY tag was not visible. The well pump was reported to be operating trouble free and has had no problems per the 6/29/2011 Sanitary Survey. The well is neither equipped with an in-line sample tap for source water monitoring nor is the well equipped with a source meter.

Storage

The storage consists of one steel cylindrical storage tank with a total reported volume of 1,000 gallons. The tank has not been cleaned in recent memory and has no hatch to enter or view the inside. There is a direct line into the storage tank from the well which also includes an attachment for the batch chlorinator. There is a sample tap at the outlet of the tank post-treatment.

Pump House

The pump house is a wood structure with wood siding and metal roof. The water system building is equipped with a lock.

The piping is primarily galvanized steel with isolation valves. The interior piping, storage tank, chlorine injection system and electrical power are located within the pump house. According to the 2011 Sanitary Survey the facility appeared to be in relatively good condition but rat droppings were noted as being found by the booster pumps.

Distribution

The condition of the distribution system was not observed during either the 2006 or 2011 Sanitary Surveys. No information is known as to the condition of the distribution system. Service meters have not been installed for service connections. The DOH sanitary surveys reported 20 connections serving 27 single-family residential units (7 connections serve two residential units). Based on provided photos the interior piping leaving the pump house to the distribution system appears to be 3-inch galvanized steel pipe.

2.6 Water Use, System Demands and Water Rights

2.6.1 Population/Connections

Existing

RTWA is a 20 lot residential subdivision with 27 occupied single-family residential units. The water system serves the 27 current residences via 20 active residential connections (one connection to each lot with 7 connections serving two residents on a single lot).

- Existing Connections: 20 (residential). Report will assume 27 connections to account for the multiple connections

The WFI provided a population count for 2015 which is represented below.

- Existing Population: 61

Projected

The development is fully built out and no growth is expected. Projected future water use will assume that no new residences are plumbed to the distribution system. Projected future connections are as follows:

- Projected Connections: 20 (residential). Report will assume 27 connections to account for the connections serving multiple residential units.

The future population is not expected to increase because no new connections are expected to be added to the water system.

- Projected Population: 61

2.6.2 Water Use

RTWA does not have a source meter or individual service meters to meter the domestic water use. Irrigation water is provided by ECBID which is also not metered.

The WSDOH WSDM states if metered water use is not available analogous water system data may be used. RTWA is located in close proximity to the Meadow Land Water Association (MLWA) and the RTWA service area appears to be similar to MLWA. Because of the lack of source meter data and the similarities to MLWA the water use for RTWA will be estimated based on current MLWA water use.

Table 2-3 summarizes the MLWA water use from the MLWA Consolidation Feasibility Study Table 2-3.

Table 2-3: MLWA Water Use Summary ⁽¹⁾

Description	Year					
	2013		2014		2015	
	(gal.)	(gpd)	(gal.)	(gpd)	(gal.)	(gpd)
Annual Total	1,686,000	4,600	1,516,000	4,200	1,318,000	3,600
Maximum Month	328,000	10,800	227,000	7,500	161,000	5,300
Average Month	141,000	4,600	126,000	4,100	110,000	3,600
Minimum Month	103,000	3,400	101,500	3,300	80,000	2,600

⁽¹⁾ Source meter data provided within the Meadow Land Water Association Consolidation Feasibility Study (Table 2-3)

The following table shows MLWA’s average annual water consumption per residential connection for the years 2013 – 2015.

Table 2-4: Estimated Current RTWA Water Use

Description	MLWA Peak Water Use ⁽¹⁾				Estimated Current RTWA Water Use			
	(gal.)	(gpd)	Connections	(gpd/Conn.)	Connections ⁽²⁾	(gpd/Conn.)	(gpd)	(gal.)
Annual Total	1,686,000	4,600	22	209	27	209	5,600	2,044,000
Maximum Month	328,000	10,800	22	491	27	491	13,300	404,000
Average Month	140,500	4,600	22	209	27	209	5,600	170,000
Minimum Month	103,000	3,400	22	155	27	155	4,200	128,000

⁽¹⁾ From Table 2-3 for 2013

⁽²⁾ Number of single-family residences connected to the system. See Section 2.6.1

Leakage

Leakage is unknown. The water system does not have a source meter or service connection meters. Annual Water Use Efficiency reports do not report water use or leakage.

2.6.3 ERUs

An ERU is a unit of measure used to equate non-residential or multi-family residential water usage to a specific number of single-family residences.

This study will use ERU’s to equate the Association water use to the City of Othello water use.

Table 2-5: ERUs

Description	Estimated Water Use
Total annual water use ⁽¹⁾	2,044,000
City of Othello gpd/ERU value ⁽²⁾	453
Total System ERUs ⁽³⁾	12

⁽¹⁾ From Table 2-4

⁽²⁾ Based on current water use data from 2013, 2014 and 2015

(3) Average daily water use (total annual divided by 365) divided by 453 gpd/ERU

2.6.4 System Demands

Current/Future

Estimated current demands are shown on the following table. The development is fully built out so no new connections are expected therefore estimated current/future water use is the same.

Table 2-6: Estimated Current/Future Water System Demands

ERUs	ADD			MDD ⁽¹⁾			PHD ⁽²⁾	Annual	
	gpd/ERU	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(gal.)	(ac-ft/yr)
12	453	5,600	4	1,076	13,300	9	46	2,044,000	6.3

(1) $ADD (gpd) \times 365 \text{ days}$

(2) $MDD = MMAD(1.3)$

(3) $PHD = (MDD/1440)(CN+F)+18$, where $C = 3.0$, $N = ERUs$ and $F = 0$, DOH WSDM Eq. 5-1

2.6.5 Water Rights

Correspondence from WSDOH Eastern Regional Office dated 6/11/2015 indicates that Record Number G3-*07114CWRIS which has 60 gpm and 15.7 ac-ft was considered as potentially associated with the RTWA well. A search of the Ecology database found that the aforementioned water right belongs to O. F. Kenfield. The Certificate of Ground Water Right was signed 3/07/1969. This water right notes the legal description as Farm Unit 34, Irrigation Block 49, Columbia Basin Project S5 T15N R29. RTWA resides in Farm Unit 8, Irrigation Block 49, Columbia Basin Project S5 T15N R29.

Based on the legal description of the O.F. Kenfield well log and the Farm Unit designation in the ground water certificate it does not appear this water right is associated with the RTWA well.

Since no other water right documentation could be found which could be associated with the RTWA well it appears that a water right does not exist for RTWA. Therefore, it is assumed that RTWA is operating a permit exempt well per RCW 90.44.050 with a maximum legal withdrawal rate of 5,000 gpd which equates to a maximum annual withdrawal amount of 1.825 MG (5.6 acre/ft).

2.7 Evaluation Criteria

Each water utility must establish system design standards appropriate to meet its customers' needs and expectations. While a utility has some discretion in setting performance and design criteria, all criteria must meet the minimum standards set by the Washington State Department of Health (WSDOH) for public water supplies.

Washington Administrative Codes (WAC's) pertaining to public water systems administered by DOH and the Washington State Department of Ecology (ECY) comprise the regulatory criteria applicable to this water system (WAC 246-290).

The following standards will be used as the basis for facilities evaluation and design.

- Washington State DOH Water System Design Manual (WSDM)

- Industry practice
- Engineering judgement

The Sections following define the system design standards used for this evaluation.

2.7.1 Supply

The WSDM states supply must be able to meet the water system's maximum day demand (MDD). This is based on the assumption the system has equalizing storage to meet peak hour demands (PHD). The WSDM recommends supply is able to replenish depleted fire suppression storage (FSS) within 72 hours while supplying MDD.

The RTWA operates a "closed" system meaning the system is closed to the atmosphere with a two-part supply system consisting of a well supplying a storage tank and a booster pump supplying the distribution system from the storage tank. RTWA does not provide FSS. Each part of the supply system will be evaluated individually based on its own criteria.

Since the RTWA is a closed system with a two-part supply system and does not provide FSS, the criteria used to evaluate the RTWA well supply will be based on the criteria above and the distribution system supply will be based on the DOH WSDM criteria for closed system booster pump station, therefore the supply criteria is as follows:

Well Supply (well pump)

- Supply MDD with equalizing storage sufficient to supply PHD

Distribution Supply (booster pump)

- Supply PHD at no less than 30 psi to all service connections

2.7.2 Treatment

Per the WSDM all sources used for water service must meet water quality standards set by EPA and the State (WAC 246-290-310) and must treat sources as required to meet water quality standards.

This evaluation will compare the available water quality records to the currently mandated water quality standards per WAC 246-290-310.

2.7.3 Storage

RTWA is a closed system with an equalizing storage and standby storage.

Underground Storage Reservoir

The storage tank provides equalizing storage and standby storage and will be evaluated based on the DOH WSDM Chapter 9 "Reservoir and Storage Volume"

- Equation 9-1: $ES = (PHD - Q_s)(150 \text{ min.})$, but in no case less than zero

Where:

ES	=	Equalizing storage component, in gallons
PHD	=	Peak hourly demand, in gpm, as defined in Chapter 5 of the WSDM Manual
$Q_s^{(1)}$	=	Sum of all active supply source capacities, except emergency supply, in gpm

(1) Q_s in this case is source of supply to the reservoir which is provided by the well pump

- Equation 9-2: $SB_{TSS} = (2 \text{ days})(ADD)(N)$

Where:

SB_{TSS}	=	Total standby storage for a single source water system, in gallons
ADD	=	Average day demand for the design year, in gpd/ERU
N	=	Number of ERUs

2.7.4 Fire Flow

RTWA does not provide fire flow or FSS and therefore will not be evaluated for fire flow. Consolidation options with the City of Othello will include an evaluation for fire flow.

2.7.5 Distribution System

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during fire flow conditions during MDD with a maximum 8 fps in the system pipes.

2.7.6 Water Rights

The adequacy of the RTWA water rights shall be evaluated by comparing the available water use data to the systems' water right.

2.8 Evaluation/Deficiencies

2.8.1 Supply

The RTWA supply consists of two parts:

1. Well pump which pumps groundwater to supply the storage tank
2. Booster pump which pumps from the storage tank to supply the distribution system

2.8.1.1 Supply (well pump)

Criteria

Supply MDD with equalizing storage sufficient to supply PHD (see section 2.7.3)

Required Capacity

Current MDD = 9 gpm (Table 2-6)

Future MDD = 9 gpm (Table 2-6)

Current Capacity

Current capacity = 45 gpm (Table 2-2)

Evaluation

The current well capacity of 45 gpm is adequate to meet the estimated current/future MDD of 9 gpm.

Deficiencies

None.

2.8.1.2 Supply (booster pump)

Criteria

Supply PHD at no less than 30 psi to all service connections.

Required Capacity

Current/Future PHD = 46 gpm (Table 2-6)

Current Capacity

Current capacity = unknown (Table 2-2)

Evaluation

No information was made available regarding the booster pump and therefore this component cannot be evaluated.

Deficiencies

Unknown

2.8.2 Treatment

Criteria

Per the WSDM all sources used for water service must meet water quality standards set by EPA or the state (WAC 246-290-310) and must treat sources as required to meet water quality standards.

Evaluation

The latest IOC test data was sampled in 2007 and is shown in Table 2-7.

Table 2-7: Water Quality Test Results - IOC ⁽¹⁾

ANALYTE	RESULT ⁽²⁾	UNITS	SRL ⁽³⁾	Trigger	MCL	Exceeds MCL (X if yes)
Arsenic	0.0080	mg/l	0.0030	0.0103	0.0104	
Barium	<	mg/l	0.4000	2.0000	2.0000	
Cadmium	<	mg/l	0.0020	0.0049	0.0050	
Chromium	<	mg/l	0.0200	0.0999	0.1000	
Mercury	<	mg/l	0.0004	0.0019	0.0020	
Selenium	0.0220	mg/l	0.0100	0.0499	0.0500	
Beryllium	<	mg/l	0.0008	0.0039	0.0040	
Antimony	<	mg/l	0.0060	0.0059	0.0060	
Thallium	<	mg/l	0.0020	0.0019	0.0020	
Cyanide	<	mg/l	0.0100	0.1999	0.2000	
Fluoride	0.4800	mg/l	0.5000	1.9999	4.0000	
Nitrite – N	<	mg/l	0.2000	0.4999	1.0000	
Nitrate – N	6.8600	mg/l	0.2000	4.9999	10.0000	
Total Nitrate/Nitrite-N	6.8600	mg/l	0.5000	--	--	
Iron	<	mg/l	0.1000	0.2999	0.3000	
Manganese	<	mg/l	0.0100	0.0499	0.0500	
Silver	<	mg/l	0.1000	--	--	
Chloride	31.0000	mg/l	20.0000	249.9999	250.0000	
Sulfate	106.0000	mg/l	50.0000	249.9999	250.0000	
Zinc	<	mg/l	0.2000	4.9999	5.0000	
Sodium	64.5000	mg/l	5.0000	--	--	
Hardness	300.0000	mg/l	10.0000	--	--	
Conductivity	912.0000	µmhos/cm	70.0000	699.9999	700.0000	X
Turbidity	0.1500	NTU	0.1000	--	--	
Color	<	CU	15.0000	14.9999	15.0000	
Total Dissolved Solids	547.0000	mg/l	100.0000	499.9999	500.0000	X
Nickel	<	mg/l	0.1000	0.0999	0.1000	
Lead	<	mg/l	0.0010	--	--	
Copper	0.0210	mg/l	0.0200	--	--	

⁽¹⁾ Test results provided for September 17, 2007

⁽²⁾ "NA" indicates "not analyzed", "<" indicates "less than state reporting level"

⁽³⁾ State Reporting Level

The system chlorinates at the storage tank prior to entering the distribution system. The 2007 IOC panel showed conductivity and TDS amounts greater than the MCL. The system is scheduled to conduct another IOC panel before September, 2019. A review of the DOH Sentry website indicates the system has no current water quality violations.

Based on a review of the available data it does not appear the system has ongoing water quality issues.

Deficiencies

None.

2.8.3 Storage

2.8.3.1 Storage Tank

Criteria

- Equation 9-1: $ES = (PHD - Q_S)(150 \text{ min.})$, but in no case less than zero
- Equation 9-2: $SB_{TSS} = (2 \text{ days})(ADD)(N)$

Required Capacity

From Table 2-6 the current/future PHD is 46 gpm and from Table 2-2 the Q_S is 45 gpm.

$$ES = (46-45)(150) = 150 \text{ gallons}$$

From Table 2-6 the current/future ADD is 453 gpd/ERU and current/future N (ERUs) is 12.

$$SB_{TSS} = (2 \text{ days})(453)(12) = 10,872 \text{ gallons}$$

Current Capacity

Per Table 2-2 the current storage capacity is 1,000 gallons.

Evaluation

The current storage capacity of 1,000 gallons is inadequate for current/future equalizing and standby storage needs.

Deficiencies

The total nominal volume of the existing storage tank is deficient by 10,000 gallons (rounded).

2.8.4 Fire Flow

The RTWA does not provide fire flow therefore fire flow was not evaluated.

2.8.5 Distribution System

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD.

Evaluation

No information has been made available regarding the distribution system and therefore this component cannot be evaluated.

Deficiencies

Unknown.

2.8.6 Water Rights

Criteria

The adequacy of the RTWA water rights shall be evaluated by comparing the available water use data to the systems water right.

Existing Water Right

From Section 2.5.5 it is assumed that RTWA is operating a permit exempt well as described in RCW 90.44.050 with an allowed groundwater withdrawal rate not to exceed 5,000 gpd which equates to an annual withdrawal amount of 1.825 MG (5.6 acre/ft).

Evaluation

The following tables compare the estimated annual water use (Qa) and estimated well pump capacity (Qi) to the water right exempt well.

Table 2-8 Annual Water Use and Water Rights

ADD ⁽¹⁾ (gpd)	Exceed Daily (gal.)	MDD ⁽¹⁾ (gpd)	Exceed Daily (gal.)	Annual ⁽¹⁾ (gal.)	Annual (acre/ft)	Exceed Annual (acre/ft)
5,600	(600)	13,300	(8,300)	2,044,000	6.3	(0.7)

⁽¹⁾ From Table 2-6

Based on the above table it appears the Association exceeds its daily water right during both ADD and MDD conditions and also exceeds available annual water right.

Deficiencies

The projected water use indicates a daily water right deficiency of 8,300 gpd under MDD and annual water right deficiency of 0.7 ac-ft/yr.

2.8.7 Summary of Deficiencies

The following table summarized the deficiencies.

Table 2-9 Summary of Deficiencies

System Component	Current System Capacity	Current/Future Needs	Current/Future Deficiency
Supply (well pump)	45 gpm	9 gpm	none
Supply (booster pump)	unknown	46 gpm	unknown
Treatment	No known issues	No known issues	No known issues
Fire Flow	n/a	n/a	n/a
Distribution	unknown	unknown	unknown
Water Rights (daily)	5,000 gpd	13,300 gpd	8,300 gpd
Water Rights (Qi)	~4 gpm ⁽¹⁾	45 gpm ⁽²⁾	41 gpm
Water Rights (Qa)	5.6 ac-ft/yr	6.3 ac-ft/yr	0.7 ac-ft/yr

- (1) *The permit exemption specifies a maximum allowable daily withdrawal expressed in gpd. Qi is generally expressed in gpm. Qi calculated average allowable withdrawal rate by dividing the daily rate (gpd) by 1,440 min/day to result in gpm.*
- (2) *Minimum Qi = Well pump capacity*

2.9 System Finances

Current Water Rates are reported as follows:

Basic Fee: \$40/mo. (current fee)

RTWA increased their basic fee from \$10/mo. to \$40/mo. according to DOH correspondence from 6/11/2015. At that time it was noted some of the customers refused to pay the new rate.

RTWA financial data was not provided therefore the annual water system operation budget was estimated on the following table.

Table 2-10 Estimated Annual Operation Budget

Description	
INCOME	
Water Fees (27 unmetered private residences)	\$ 12,960
Estimated Income from Private Residences	\$ 12,960
EXPENSES	
Power (well pump, booster pump)	\$ 750
Bookkeeping (assume 4 hrs/mo. @ \$25/hr)	\$ 1,200
Maintenance person (assume 4 hrs/mo. @ \$30/hr)	\$ 2,160
Testing Lab (WQ Testing)	\$ 500
Certified Operator (assume \$200/mo. to retain)	\$ 2,400
Total Estimated Annual Expenses	\$ 7,010
RESERVES	
Well pump replacement (assume \$10,000/10yrs)	\$ 1,000
Booster Pump replacement (assume \$1,000/3yrs)	\$ 333
Leak repair (assume \$1,000/yr)	\$ 1,000
Other repairs (assume \$500/yr)	\$ 500
Total Estimated Annual Reserves	\$ 2,833
Total Estimated Annual Expenses/Reserves	\$ 9,843
BALANCE	\$ 3,117

The Estimated Annual Operation Budget is summarized below on a per user basis.

Table 2-11 Estimated Annual Operation Budget – Summary per Residence

Description	
Active Connections	27
Annual Revenue per Connection	\$ 480
Monthly Revenue per Connection	\$ 40
Annual Expenses per Connection	\$ 365
Monthly Expenses per Connection	\$ 30
Monthly net per connection (reserves)	\$ 10

Based on the above tables it appears the water system finances are sufficient to support the ongoing operation/maintenance of the system with the current rate structure.

According to DOH correspondence from 6/11/2015, the system needs a plan and funding to install a source meter, backflow assemblies, and service meters. Based on the above table RTWA has approximately \$3,000 to apply toward these required improvements which appears inadequate to implement the required improvements on a near term basis without an outside financing/funding source.

3.0 CONSOLIDATION

3.1 Improvements required to meet City Standards

The following sections evaluate the Association’s components using the City of Othello “Public Works Design Standards”, dated November 2014.

3.1.1 Supply

The existing RTWA well, with a 45 gpm capacity, is likely too low for the City to utilize cost-effectively. The well is also located on a portion of a residential lot with inadequate space for the City to operate and maintain effectively. Therefore, this well would likely be required to be abandoned by the Association as part of a consolidation.

3.1.2 Distribution

To be in compliance with the City of Othello “Public Works Design Standards”, dated November 2014, the following distribution system improvements are required:

- Replace the existing water main with a minimum 8-inch diameter DI/PVC water main
- Replace the existing service pipes with new 1-inch diameter K copper pipe
- Install a sampling station
- Install fire hydrants at the spacing required per City standards

3.1.3 Storage

The existing storage tank is incompatible with the City gravity storage and provides no benefit to the City, therefore the storage tanks will likely be required to be abandoned by the Association as part of the consolidation.

3.1.4 Estimated Cost of Improvements

The table below contains a unit length cost breakdown for distribution system costs used in estimating RTWA improvements.

Table 3-1 Estimated Improvements Unit Cost – Water Mains, Services and Surface Restoration

Diameter (in.)	Estimated Cost per LF							
	Main & Install (1)	Valves, Fittings, Restrains		Fire Hydrants (4)	Service Connections		Surface Replacement	
		T-Main (2)	Dist. Main (3)		T-Main (5)	Dist. Main (6)	T-Main (7)	Dist. Main (8)
8	\$28	\$7	\$13	\$9	\$2	\$36	\$2	\$10
10	\$32	\$8	\$15	\$9	\$2	\$36	\$2	\$10
12	\$35	\$10	\$19	\$9	\$2	\$36	\$2	\$10

Diameter (in.)	Estimated Cost per LF							
	Main & Install (1)	Valves, Fittings, Restraints		Fire Hydrants (4)	Service Connections		Surface Replacement	
		T-Main (2)	Dist. Main (3)		T-Main (5)	Dist. Main (6)	T-Main (7)	Dist. Main (8)
14	\$38	\$15	\$28	\$9	\$2	\$36	\$2	\$10
16	\$42	\$20	\$38	\$9	\$2	\$36	\$2	\$10

- (1) Based on recent bid tabulations and pipe material costs – assumes PVC C900/905 mains
- (2) Based on review of recent bid tabulations and one connection detail every 400 ft.
- (3) Based on review of recent bid tabulations and one connection detail every 750 ft.
- (4) Assume one hydrant every 500 ft.
- (5) Assume one service every 1000 ft
- (6) Assume one service every 50 ft
- (7) Assume 6' wide restoration, 1 HMA patch for water/road crossing every 1,500 ft, cover crop hydroseed over remainder of ditch
- (8) Assume 6' wide restoration, 1 HMA patch for water/road crossing every 100 ft, cover crop hydroseed over remainder of ditch

Table 3-2 Estimated Improvements Unit Cost – Highway, Railroad and Canal Crossings

RAILROAD CROSSINGS / HIGHWAY CROSSINGS Bore and Jack					IRRIGATION CANAL CROSSINGS Horizontal Directional Drill				
Casing		Carrier Pipe		Est. Cost	Casing		Carrier Pipe		Est. Cost
Dia.	Material	Dia.	Material	\$/lf	Dia.	Material	Dia.	Material	\$/lf
36"	steel	14"/16"	DI	\$ 900	36"	HDPE	14"/16"	PVC	\$ 700
24"	steel	10"/12"	DI	\$ 600	24"	HDPE	10"/12"	PVC	\$ 500
16"	steel	8"	DI	\$ 500	16"	HDPE	8"	PVC	\$ 350

The cost to improve the RTWA water system to meet current City standards is estimated on the following table. Costs are estimated assuming public works bidding and state prevailing wage rates are required.

Table 3-3 Estimated Improvements Cost

Description	Est. Quan.	Units	Unit Price	Amount
Main (8-inch PVC)	3000	LF	\$ 28	\$ 84,000
Valves, fittings, restraints ⁽¹⁾	3000	LF	\$ 10	\$ 30,150
Fire hydrants	3000	LF	\$ 9	\$ 27,000
Service connections ⁽²⁾	3000	LF	\$ 18	\$ 54,000
Surface replacement	3000	LF	\$ 10	\$ 30,000
Sampling station	1	EA	\$ 2,000	\$ 2,000
Subtotal				\$ 227,000
Mobilization 10%				\$ 23,000
Contingency 20%				\$ 45,000
Estimated construction cost				\$ 295,000
Environmental approvals allowance (assuming must meet DWSRF loan requirements)				\$ 11,000
Engineering 25% (design, construction management/inspection)				\$ 74,000
ESTIMATED PROJECT COST				\$ 380,000

- (1) *Used 2/3 of table value as there are few intersecting streets and therefore will be fewer fittings/valves and restraints needed*
- (2) *Used half the table value as there are services only on one side of the street*

3.2 Infrastructure Required to Physically Connect to the City of Othello Water System

3.2.1 Transmission Main Routing

The nearest City water main is on Cunningham Rd. just east of Danielle Rd. City water service can be extended to RTWA by constructing a transmission main from this location west on Cunningham Rd. approximately 7,700 feet and south approximately 1,500 feet to connect to RTWA water system.

See **Figure 4** for the proposed transmission main extension. The connection to the City system would be made by tying into the existing City of Othello system between the PRV and ACWD#1 meter vaults. This will avoid installing an additional PRV.

If Adams County Water District No.1 (ACWD#1) consolidated with the City of Othello this would allow the connection to be moved west to the edge of ACWD#1 boundary shortening the transmission main by 3,200 feet.

See **Figure 4** for the proposed transmission main extension.

3.2.2 Transmission Main Sizing

Hydraulic Analysis Model

The transmission main was sized using a hydraulic model of the City of Othello water system created in Bentley WaterCAD V8i. The model was based on the hydraulic model used in the 2011 City of Othello Water System Plan. The hydraulic model was updated based on information provided by the City regarding water mains which have been either added or replaced after 2011.

Water system demands were updated using water use data provided by the City for the years 2013, 2014 and 2015.

Water reservoir levels used for the various demand scenarios were taken from the 2011 City of Othello Water System Plan.

Service to the City of Othello UGA

The RTWA is within the City of Othello UGA and it is presumed at some point in the future the City of Othello's water system will be extended to serve the UGA. Therefore the transmission main sizing will also be evaluated using growth figures and fire flows provided by the City.

Existing ERUs were determined via a count of existing houses as shown on the most recent aerial maps. Future ERUs within the UGA were provided by the City planner based on the recently completed City of Othello's 2015 Comprehensive Plan.

See **Appendix B** which contains the ERU counts (existing and future) used to determine system demands and evaluate the transmission main size to serve the UGA along with the proposed transmission main routing.

Criteria

The Washington State DOH Water System Design Manual (WSDM) Chapter 5 states “Engineers must consider at least two demand scenarios when using a hydraulic analysis to size mains (WAC 246-290-230(5) and (6)).

- **PHD:** First, the water system must be able to deliver the peak hourly demand (PHD) at the required pressure of 30 psi at every existing and proposed service connection.
- **MDD/FF:** Second, if the water system provides fire flow, the distribution pipelines must be able to deliver the maximum day demand (MDD) rate, in addition to the fire flow, at the required pressure of 20 psi throughout the distribution system.”

Fire flows as follows:

- Residential fire flow = 1,000 gpm (per the City of Othello 2011 Water System Plan)

In addition, the City of Othello water system design standards include the following standards for distribution system extensions:

- Minimum size for water lines shall be 8-inch diameter except for hydrant leads less than 60 feet long
- Permanent dead-end lines are not allowed
- Residential service pipe shall be one-inch
- Water services shall end within road right-of-way or easement
- One sampling station is required per 50 lots (no less than one per development)
- 2-inch blow off valves shall be installed on all dead-end water mains

Evaluation/Conclusion

The transmission main sizing was evaluated under both scenarios required in the WSDOH WSDM for both RTWA and City of Othello needs. The demand scenarios and resulting transmission main size are shown on the following table:

Table 3-4 Transmission Main Sizing

Description	ERUs	System Demands			Scenario	Scenario Demand (gpm)	Pipe Size
		MDD (gpm)	PHD (gpm)	FF (gpm)			T-Main ⁽³⁾ Dia. (in.)
RTWA ⁽¹⁾	12	9	46	1000	PHD	46	8
City of Othello UGA Area 2 ⁽²⁾	285	133	215	1000	PHD	215	8
RTWA ⁽¹⁾	12	9	46	1000	MDD/FF	1009	8
City of Othello UGA Area 2 ⁽²⁾	285	133	215	1000	MDD/FF	1133	8

(1) From Table 2-6
 (2) See Appendix B
 (3) See Figure 4

3.2.3 Estimated Cost to Connect to City of Othello Water System

The cost to physically connect to the City of Othello Water System is estimated on the following table.

Table 3-5 Estimated Cost to Connect to City of Othello Water System

Description	Est. Quantity	Units	Unit Price	Amount
Main (8-inch PVC)	9,200	LF	\$28	\$257,600
Valves, fittings, restraints	9,200	LF	\$7	\$61,333
Fire hydrants	9,200	LF	\$9	\$82,800
Service connections	9,200	LF	\$2	\$16,560
Surface Replacement	9,200	LF	\$2	\$18,400
Subtotal				\$ 437,000
Mobilization 10%				\$ 44,000
Contingency 20%				\$ 87,000
Estimated construction cost				\$ 568,000
Environmental approvals allowance (assuming must meet DWSRF loan requirements)				\$ 15,000
Engineering 25% (design, construction management/inspection)				\$ 142,000
ESTIMATED PROJECT COST				\$ 725,000
ESTIMATED PROJECT COST/LF				\$ 79

3.3 Estimated Impact to City System

The impact of consolidating the RTWA into the City of Othello water system is evaluated below by system component including supply, distribution and storage. The evaluation will be based on the current City of Othello water system demands as shown on the following table and estimated existing and future RTWA system demands from Table 2-6.

Table 3-6 Current City of Othello Water System Demands

Year	ERUs ⁽¹⁾	ADD (gpm)	MDD (gpm)	PHD (gpm)	Annual (MG)	Annual (acre/ft)
2013		3,340	4,570	7,410	1,757	5,390
2014		3,420	5,070	8,250	1,796	5,510
2015		3,100	4,460	7,250	1,628	5,000
Average	10,490	3,300	4,700 ⁽²⁾	7,600 ⁽³⁾	1,700	5,300

⁽¹⁾ Calculated based on ADD using 453 gpd/ERU

⁽²⁾ Resulting ADD:MDD peaking factor 1.43

⁽³⁾ Resulting MDD:PHD peaking factor 1.62

3.3.1 Supply

Criteria

The WSDOH WSDM provides the following criteria for public water supply:

- Supply must meet MDD
- Supply should meet MDD and replenish Fire Suppression Storage within 72 hours while supplying MDD

Current Capacity

The City’s water is supplied via eight groundwater wells. The current supply capacity of the City’s wells is shown on the following table.

Table 3-7 Current City Supply

Well No.	DOH ID No.	Current Capacity (gpm)
2	01	-
3	02	800
4	06	430
5	07	900
6	05	2,500
7	08	630
8	09	395
9	10	1,500
Total Supply Capacity		7,155

Evaluation

The impact of consolidating the RTWA into the City of Othello water supply is evaluated in the following table.

Table 3-8 Supply Capacity Evaluation

Description	Scenario	MDD (gpm)	Replenish FSS ⁽¹⁾ (gpm)	Total (gpm)	Current Supply Capacity ⁽²⁾ (gpm)	Excess / (Deficiency) (gpm)
City of Othello	Current ⁽³⁾	4,700				
RTWA	Current/Future ⁽⁴⁾	9				
Total		4,709	347	5,056	7,155	2,099

⁽¹⁾ Per City of Othello 2011 WSP Fire Suppression Storage = 6,250 gpm for 4 hours (1,500,000 gallons), Replenish FFS = 1,500,000/72 hrs/60 min

⁽²⁾ From Table 3-7

⁽³⁾ From Table 3-6

⁽⁴⁾ From Table 2-6

Conclusion

The City has adequate supply capacity to serve RTWA with no improvements required.

See **Appendix C** for discussion related to long-term effects on City supply.

3.3.2 Distribution

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during FF/MDD.

Hydraulic Analysis Model

As described in Section 3.2.2.

Evaluation

The hydraulic model of the City of Othello's water system was run after adding the RTWA system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the RTWA system demands and the demands estimated for the future UGA area. No deficiencies within the existing City of Othello water system were found.

Conclusion

The City has adequate distribution system capacity to serve RTWA and the future UGA with no improvements required.

3.3.3 Storage

Criteria

The WSDOH WSDM provides the following criteria for public water storage:

Operational Storage (OS): Storage volume devoted to supplying the water system when sources of supply are in the "off" status (volume between pump "on" and pump "off")

Equalizing Storage (ES): Storage volume required to meet peak system demands which exceed source capacity (min. system pressure 30 psi)

- $ES = (PHD - Q_s)(150 \text{ min.})$

Where:

- PHD = peak hour demand in gpm
- Q_s = sum of all source capacities in gpm

Standby Storage (SB): Storage volume to provide system reliability in cases where sources fail or during periods of unusually high demands (min. system pressure 20 psi)

- $SB = (2 \text{ days})[(ADD)(ERUs) - t_M (Q_S - Q_L)]$

Where:

- ADD = gpd/ERU
- $t_M = 1,440$ minutes
- Q_S = Sum of all source capacity in gpm
- Q_L = Largest source capacity in gpm

Alternatively, the WSDM recommends the standby storage volume be no less than 200 gal/ERU

Fire Suppression Storage (FSS):

Storage volume required to provide the maximum fire flow rate and duration (min. system pressure 20 psi)

- $FSS = (FF)(\text{duration})$

Where:

- FF = 6,250 gpm (largest fire flow demand)
- Duration = 4 hours (longest fire flow duration)

Dead Storage (DS):

Storage volume below the minimum required system pressure (unusable storage)

Current Capacity

The City of Othello has three reservoirs with a total nominal storage capacity of approximately 6,000,000 gallons. The useable volume available to the system varies from 1.3 MG to 2.8 MG depending on the residual system pressure for the storage component being analyzed, i.e. 20 psi for FF and SB; 30 psi for ES. The remaining volume is referred to as “dead storage”.

Evaluation

Operational Storage

Extending service to RTWA will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs ⁽¹⁾ (gpm)	Duration (min.)	ES (gal.)
Othello	7,600 ⁽²⁾	7,155	150	66,750
RTWA	46 ⁽³⁾	7,155	150	0
Combined	7,646	7,155	150	73,600

⁽¹⁾ From Table 3-7

⁽²⁾ From Table 3-6

⁽³⁾ From Table 2-6

Standby Storage

Description	Duration (days)	ADD (gpd/ERU)	ERUs	t_M	Qs (gpm)	Q _L (gpm)	SB (Eq.9-3) (gal.)	SB (200 gpd/ERU) (gal.)
Othello	2	453	10,490	1440	7155	2500	<0	2,098,000
RTWA	2	453	12	1440	7155	2500	<0	2,500

Combined	2	453	10,502	1440	7155	2500	<0	2,100,500
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Fire Suppression Storage

Description	Largest FF Demand (gpm)	Longest FF Duration (hrs)	FF Volume (gal.)
Othello	6,250	4	1,500,000
RTWA	1,000	2	120,000

Dead Storage

All service elevations in RTWA are at or below existing City of Othello service elevations so extending City of Othello water service to RTWA will not increase dead storage.

Storage Comparison

The City of Othello storage volumes with and without RTWA is shown in the following table:

Table 3-9 Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/RTWA	
	Elevation (amsl)	Volume (gal.)	Elevation (amsl)	Volume (gal.)
Overflow ⁽¹⁾	1209.0		1209.0	
OS		239,825		239,825
Bottom of OS ⁽¹⁾	1205.0		1205.0	
ES		65,952		73,600
Bottom of ES ⁽²⁾	1203.9		1203.8	
SB		2,098,013		2,100,500
Bottom of SB ⁽³⁾	1168.9		1168.7	
FSS		1,500,000		1,500,000
Bottom of FSS ⁽⁴⁾	1178.9		1178.8	
Base Elevation	1119.6		1119.6	

- ⁽¹⁾ From 2011 Water System Plan
- ⁽²⁾ Minimum elevation required to maintain 30 psi service pressure = 1195
- ⁽³⁾ Minimum elevation required to maintain 20 psi service pressure = 1167
- ⁽⁴⁾ Minimum elevation required to maintain 20 psi service pressure = 1170
- ⁽⁵⁾ SB and FSS are nested per 2011 Water System Plan

Conclusion

The City has adequate distribution system capacity to extend water service to RTWA with no improvements required.

3.3.4 Water Rights

Criteria

The criteria used to evaluate the adequacy of the City's water rights are as follows:

$$\text{Maximum instantaneous flow (based on total source capacity)} < \text{Maximum instantaneous withdrawal (Qi)}$$

Maximum annual water use (based on current water use data) < Maximum annual withdrawal (Qa)

Current Water Right

The City’s water rights were consolidated into a unified water allocation. This unified allocation is as follows:

Qi = 9,550 gpm
 Qa = 7,100 acre-ft/yr

Evaluation

The impact on the City’s water rights of consolidating the RTWA into the City of Othello water system is evaluated in the following table.

Table 3-10 Water Rights Evaluation

Description	Qi	Qa
	Capacity of all sources (gpm)	Annual water use (acre-ft/yr)
City of Othello	7,155	5,300.0 ⁽¹⁾
RTWA	0	6.3 ⁽²⁾
Total	7,155	5,306.3
Water Right	9,550	7,100.0
Excess/(deficiency)	2,395	1,793.7
RTWA Water Rights Transfer	45 ⁽³⁾	5.6 ⁽⁴⁾
City of Othello Water Rights post Consolidation ⁽⁵⁾	9,595	7,106

(1) From Table 3-6
 (2) From Table 2-6
 (3) Estimated based on current RTWA well pump capacity
 (4) 5,000 gpd x 365 days
 (5) Estimated amounts, actual amount would be determined by ECY

Conclusion

The City of Othello has adequate water rights to provide service to RTWA.

Based on estimated future water use from Table 2-11, extending water service to RTWA will not affect Qi and will use 6.3 acre-ft/yr of the City’s Qa. Consolidating with RTWA and acquiring the water right associated with RTWA’s exempt well could potentially add 45 gpm (current RTWA PHD) to the City’s Qi and 5.6 acre-ft/yr (maximum convertible Qa for exempt well) to the City’s Qa which would offset the RTWA annual water use impact to the City’s Qa. Actual Qi/Qa amounts would be determined by ECY.

3.3.5 Summary of Impacts of Consolidation on City Water System

The following table summarizes the impacts to the City of Othello’s water system components:

Table 3-11 Summary of Impacts to City of Othello Water System Components

Component	Deficiencies Identified	Impacts to City System (required improvements)
Supply	none	none
Distribution	none	none
Storage	none	none
Water Rights	none	none

3.4 Comparison of Costs – Unconsolidated vs Consolidated

3.4.1 Unconsolidated System

The capital cost for the improvements needed to correct the system deficiencies identified in Table 2-9 are estimated as follows.

FUNDING

The estimates assume the project will be funding using public agency funding. Available funding sources include:

DWSRF: Drinking Water State Revolving Fund

This funding source provides funds for drinking water infrastructure projects aimed at increasing public health protection. This funding source prioritizes water quality projects which primarily focus on eliminating water quality issues such as microbial, primary inorganic chemical, other primary chemical and secondary chemical contaminations before infrastructure replacement or other distributions improvements projects.

In general, DWSRF provides funding at 1% interest for 20 year term.

CDBG-GP: Community Development Block Grant

This funding source funds drinking water projects which principally benefit low- to moderate-income people. This is a highly competitive funding source with a maximum grant amount of \$750,000.

This funding source is grant and repayment is not required.

USDA-RD: United States Department of Agriculture Rural Development

This is a Federal funding source which will fund rural water utility projects. This is an easy source to qualify for but has a difficult and lengthy application/award and funding process.

Interest rates for this source vary with market rates with terms up to 40 years but the term should not exceed the expected life of the improvements.

COST ESTIMATE

Table 3-12 Estimated Capital Improvements Cost

Description	Est. Amount
Install source meter (3-inch Badger meter, installation)	\$3,000
Install individual source meters (estimate 27 meters, meter boxes, service pipe, mainline connections, surface restoration etc. @ \$1,500/ea.)	\$40,500
Replace existing 1,000 gallon storage tank with new 8,000 gallon underground storage tank (precast tank(s), piping, level controls, etc.)	\$12,000
Install doublecheck backflow assemblies (estimated at \$500 per connection; 27 connections)	\$13,500
Increase water rights (purchase 1.0 acre-ft/yr @ \$3,400/acre-ft) ⁽¹⁾⁽²⁾	\$3,400
Subtotal	\$72,000
Mobilization 10%	\$7,000
Contingency 20%	\$14,000
Estimated construction cost	\$93,000
Environmental approvals allowance (assuming NEPA per USDA-RD loan requirements)	\$25,000
USDA-RD Engineering Report Requirements, Funding Application, Interim Financing, etc.	\$30,000
Engineering 25% (design, construction management/inspection)	\$23,000
ESTIMATED PROJECT COST	\$171,000
Estimated Annual Debt Service (assuming USDA-RD funding at 4.5% for 20 yrs)	(\$13,000)

(1) Based on "Trends in water market activity and price in the western United States" by Thomas C. Brown, published 2006; median price for sales for municipal uses (\$2120 per ML, 2003 dollars) converted to acre-ft and 2016 dollars.

(2) This value is acknowledged to have a high probability for a large variability based on unknown availability a water rights holder willing to sell his/her water rights.

(3) Assumes the distribution system pipe and booster pumps are adequate and do not require replacement

The ongoing operation and maintenance costs are estimated in the following table.

Table 3-13 Estimated Operation and Maintenance Cost

Description	Amount
Annual O&M ⁽¹⁾	\$ 13,000
Estimated annual debt service on capital improvements	\$ 13,000
Total Estimated Annual System Cost	\$ 26,000

(1) Based on Table 2-10 and rounded to nearest \$1,000

3.4.2 Consolidated System

Considered below are several consolidation scenarios that affect the cost impacts of the consolidation on RTWA. These scenarios include Adams County Water District No.1 (ACWD#1) and/or Meadow Lane Water Association (MLWA) consolidating with City of Othello Water System and sharing the consolidation costs with RTWA. In each scenario the cost of connection may be shared based on the

total length of transmission main required to connect each of the water systems to the City of Othello Water System (shared with ACWD#1 and MLWA).

Table 3-14 Estimated Cost Sharing with ACWD#1 and MLWA ⁽¹⁾

Description	Est. Quan.	Unit	Unit Price ⁽²⁾	Amount	ACWD#1 only	MLWA Only	Both
Portion of shared consolidation transmission Main ⁽³⁾	3,300	LF	\$79	\$260,000	(\$260,000)	(\$130,000)	(\$260,000)
Portion of shared consolidation transmission Main ⁽⁴⁾	3,200	LF	\$79	\$252,000		(\$126,000)	(\$126,000)
ESTIMATED SHARED PROJECT COST				\$512,000	(\$260,000)	(\$256,000)	(\$386,000)

⁽¹⁾ See Figure 5

⁽²⁾ From Table 3-5

⁽³⁾ This length of transmission main would be eliminated if ACWD#1 consolidates with the City of Othello and shared with MLWA if ACWD#1 did not consolidate

⁽⁴⁾ This length includes the length of transmission main would be eliminated if ACWD#1 consolidates with the City of Othello

The capital cost for the improvements needed to extend City of Othello water service to serve RTWA under the various consolidation scenarios are estimated in the following table.

Table 3-15 Estimated Improvements Cost and Annual Debt Service

Description	Consolidation Scenario			
	RTWA	RTWA and ACWD#1	RTWA and MLWA	RTWA, ACWD#1 and MLWA
Estimated Cost to Improve RTWA ⁽¹⁾	\$380,000	\$380,000	\$380,000	\$380,000
Estimated Cost to extend service to RTWA ⁽²⁾	\$725,000	\$725,000	\$725,000	\$725,000
Cost sharing reduction ⁽³⁾		(\$260,000)	(\$256,000)	(\$386,000)
Total Capital Cost	\$1,105,000	\$845,000	\$849,000	\$719,000
Annual Debt Service ⁽⁴⁾				
DWSRF Loan (1% interest for 20 yrs) ⁽⁵⁾	\$61,200	\$46,800	\$47,000	\$39,800
DWSRF Loan w/50% Loan Forgiveness (1% interest for 24 yrs) ⁽⁶⁾	\$26,000	\$19,900	\$20,000	\$16,900

⁽¹⁾ From Table 3-3

⁽²⁾ From Table 3-5

⁽³⁾ From Table 3-14

⁽⁴⁾ Assume consolidation funded by City via. City application to WSDOH for DWSRF construction loan funds

⁽⁵⁾ Assumes a not economically disadvantaged system with project completed within 24 months of contract execution.

⁽⁶⁾ DWSRF will provide 50% principal forgiveness for eligible consolidation projects with repayment extended to 24 yrs. Consolidation of these water systems may qualify due to the water rights issue with BVWA and the ECY letter stating BVWA is to cease operations until adequate water rights are secured. This will have to be discussed with DWSRF prior to applying for funding.

3.4.3 Comparison of Costs

The estimated cost to remain a separate water system is compared with the estimated cost to consolidate with the City of Othello on the following table.

Table 3-16 Comparison of Costs

Description	RTWA remain separate system	Consolidation Scenario							
		RTWA		RTWA and BDWS		RTWA and SWWA		RTWA, BDWS and SWWA	
		DWSRF Loan	DWSRF Loan (w/50% forgiveness) ⁽⁴⁾	DWSRF Loan	DWSRF Loan (w/50% forgiveness) ⁽⁴⁾	DWSRF Loan	DWSRF Loan (w/50% forgiveness) ⁽⁴⁾	DWSRF Loan	DWSRF Loan (w/50% forgiveness) ⁽⁴⁾
Annual O&M ⁽¹⁾	\$13,000								
Estimated Debt Service on Improvements ⁽²⁾	\$13,000	\$61,200	\$26,000	\$46,800	\$19,900	\$47,000	\$20,000	\$39,800	\$16,900
Estimated Annual Cost	\$26,000	\$61,200	\$26,000	\$46,800	\$19,900	\$47,000	\$20,000	\$39,800	\$16,900
Connections (2016) ⁽³⁾	27	27	27	27	27	27	27	27	27
Est. Cost Per Connection/month	\$80	\$189	\$80	\$144	\$61	\$145	\$62	\$123	\$52
City of Othello base water rate ⁽⁵⁾ (outside city)		\$51	\$51	\$51	\$51	\$51	\$51	\$51	\$51
Total Estimated cost per connection/month	\$80	\$240	\$131	\$195	\$112	\$196	\$113	\$174	\$103

(1) From Table 3-13

(2) From Table 3-13 / Table 3-15

(3) From Section 2.6.1

(4) DWSRF will provide 50% principal forgiveness for eligible consolidation projects. Eligibility will be determined by WSDOH and DWSRF.

(5) Does not include overage charges

Important notes about the above table:

- All estimated improvements costs are based on current regional costs for PUBLIC WORKS construction which require competitive bidding, prevailing wage rates, more restrictive environmental investigations and requirements, MBE/DBE requirements and generally higher overhead and administrative cost than comparable privately funding construction.
- The cost table above does not include intangible benefits from consolidation which include fire flow capacity, increased system reliability (standby storage) as well as elimination of volunteer time/effort needed to run the system (City of Othello would take over all water system administrative/maintenance tasks)
- Estimated costs are based on conceptual improvements with many potential variables and is intended to establish a “ball park” estimate of costs only
- It is recommended RTWA make contact with ACWD#1 and MLWA as others who may benefit from the City of Othello water main extension and discuss cost sharing opportunities which would likely reduce RTWA share of the above estimated costs.

3.5 Barriers to Consolidation

Potential barriers to consolidation are identified as follows:

- Overall estimated cost of the consolidation and significant impact to the monthly user rates without additional subsidies or cost sharing
- Financing of improvements (USDA-RD, DWSRF, other)
- Eligibility of system consolidation for DWSRF 50% loan forgiveness
- Coordination between the City and RTWA for funding and construction of the improvements
- Coordination between ACWD#1 and MLWA (and or other potential cost sharing partners) regarding their motivation for consolidation

4.0 NEXT STEPS/SCHEDULE

The project described in the feasibility study is not in the current Othello Water Department Water System Plan. For these projects to be eligible for DWSRF-funded construction the consolidation project(s) must be included by amendment into the existing WSP or included in the updated WSP which is scheduled to be completed in 2017. To be included by amendment the following tasks need to be completed along with the submission of a DWSRF construction funding application by the application deadline of September 30, 2016:

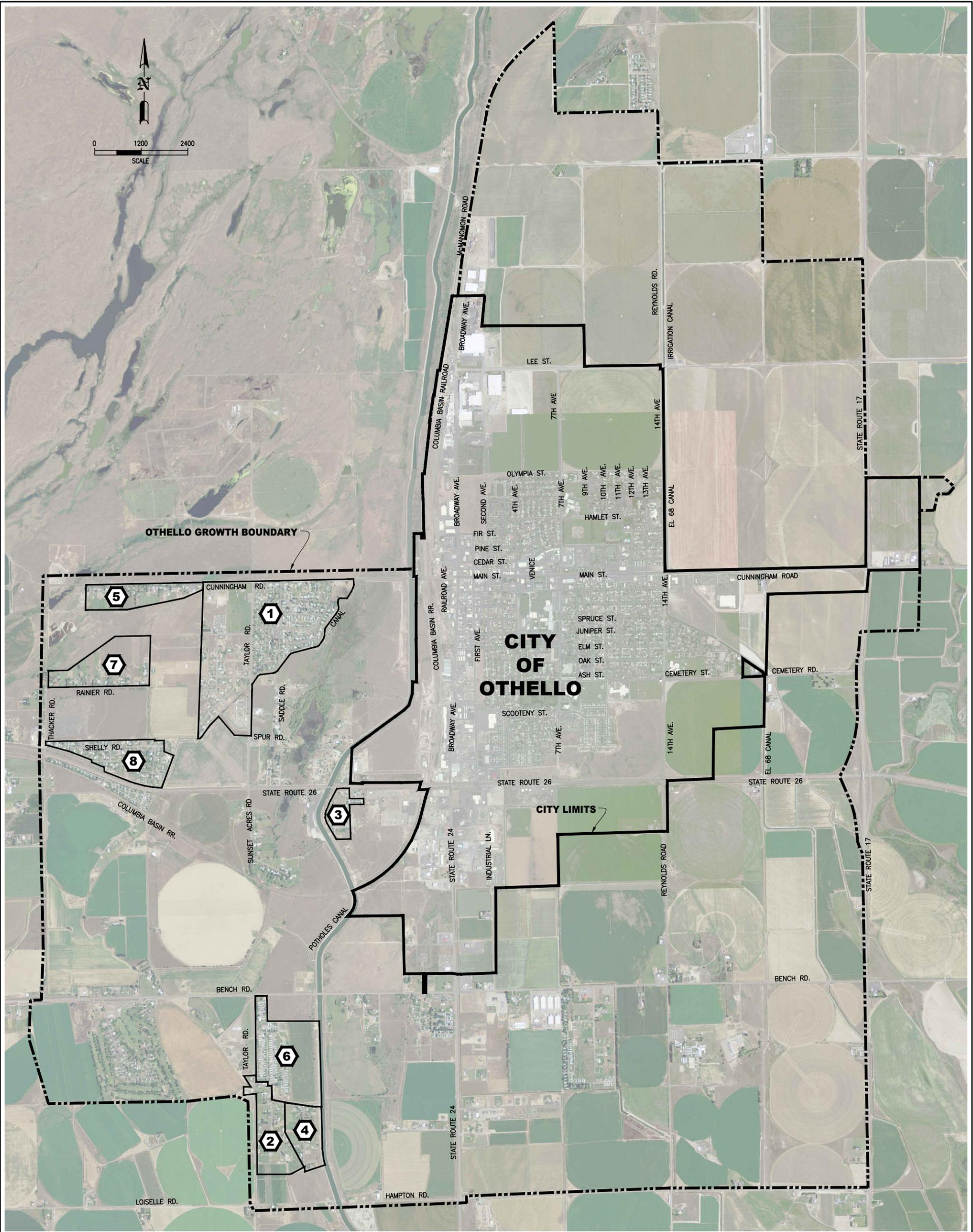
- The capital improvement program and projected budget must be updated to include the construction projects to be pursued in 2017.
- The systems contemplated for consolidation in 2017 must be included in the future service area.
- The amendment is subject to State Environmental Policy Act; the City is the lead agency.
- The amendment is also subject to the local government consistency requirement, with forms required from the City of Othello and Adams County Building and Planning.
- Amendment requires a public information meeting with appropriate public notice.
- The City must also make notice to adjacent water systems, in particular ones intended for consolidation. Their comments must be included in the WSP. (This would include the consent to be consolidated, which is required for the DWSRF application)
- The City Council must adopt the amendment
- WSDOH needs to review/approve the amendment prior to the submission of the application

At this time there is inadequate time remaining by the September 30, 2016 DWSRF application deadline to amend the existing WSP, per above, to include the consolidation project(s) and get WSDOH approval.

Therefore the following schedule reflects including system consolidation (if any) be included in the planned 2017 WSP update and submission of DWSRF application in the 2017 funding cycle.

The following steps and schedule are proposed:

Submit draft report to WSDOH for review/approval:	August 16, 2016
Submit final report to WSDOH/City of Othello for approval: (revised per WSDOH comments)	August 31, 2016
Submit to RTWA for review/consideration:	August 31, 2016
City/ RTWA schedule meeting to discuss report	September 2016
City schedule meeting with representatives from all 8 systems to discuss reports	October, 2016
Ongoing discussions/meetings between City and 8 systems to discuss report, negotiate consolidation options, etc.	November 2016 – February 2017
Deadline for City / 8 Systems to decide which (if any) systems are to be included for consolidation in the WSP update	March 1, 2017
City to complete WSP update (and all DWSRF funding application tasks/requirements noted above)	August 1, 2017
City submit DWSRF grant/loan application:	September 30, 2017
City/ RTWA negotiate consolidation/water service agreement:	October 1, 2017 – December 31, 2017
City negotiate grant/loan agreement with DWSRF:	January 1, 2018 – February 28, 2018
City sign grant/loan agreement with DWSRF:	March 1, 2018
City negotiate engineering agreement for design/construction management and inspection of improvements; environmental process and approval requirements:	March 1, 2018 – March 31, 2018
City execute engineering agreement:	April 1, 2018
Complete environmental approval process, design improvements	April 1, 2018 – June 30, 2018
WSDOH design review/approval DWSRF environmental review/approval	July 1, 2018 – July 31, 2018
Advertise for bids, bid period, award, process insurance/agreements, issue notice to proceed:	August 1, 2018 – September 15, 2018
Construct improvements:	September 15, 2018 – October 15, 2018
System(s) consolidation complete:	October 15, 2018



- 1** ADAMS COUNTY WATER DISTRICT #1 – SYSTEM ID: 22525 X
 - 341 CONNECTIONS
 - OTHELLO WATER SYSTEM INTERTIE – UNKNOWN CAPACITY
- 2** BASIN VIEW WATER ASSOCIATION – SYSTEM ID: 04530 N
 - 22 CONNECTIONS
 - OTHELLO MANOR WATER SYSTEM INTERTIE – 300 GPM
 - WELL #1 – 35 GPM
- 3** BIRD DOG FAMILY LTD PARTNERSHIP II – SYSTEM ID: 52172 8
 - 58 CONNECTIONS
 - WELL #1 – 33 GPM
- 4** HIGHLAND ESTATES WATER SYSTEM – SYSTEM ID: 32736 0
 - 16 CONNECTIONS
 - WELL #1 – 56 GPM

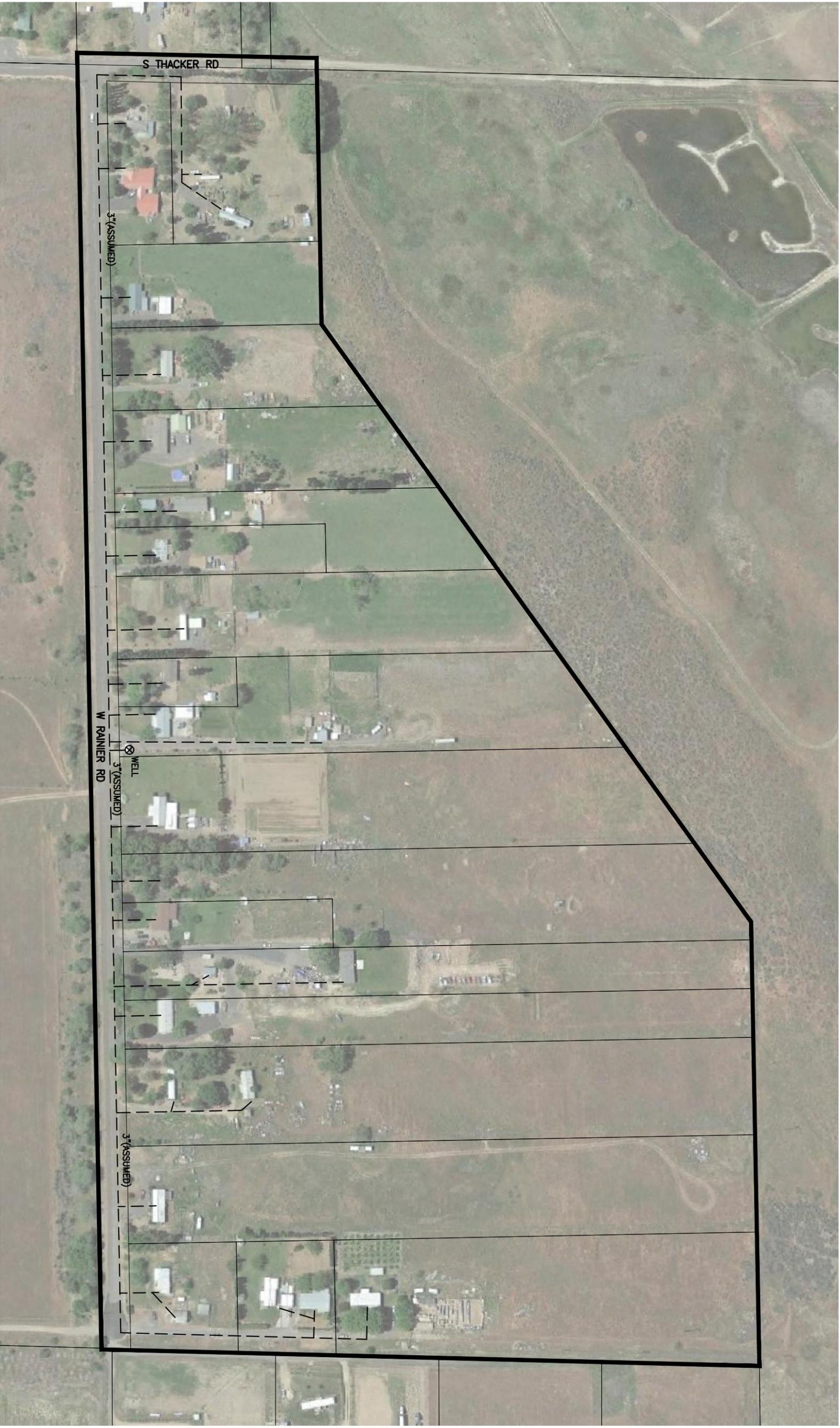
- 5** MEADOW LANE WATER ASSOCIATION – SYSTEM ID: 53190 T
 - 25 CONNECTIONS
 - WELL #1 – 70 GPM
- 6** OTHELLO MANOR WATER SYSTEM – SYSTEM ID: 64845 3
 - 152 CONNECTIONS
 - WELL #1 – 300 GPM
- 7** RAINIER TRACTS WATER ASSOCIATION – SYSTEM ID: 70910 M
 - 20 CONNECTIONS
 - WELL #1 – 45 GPM
- 8** SUMMERSSET WEST WATER ASSOCIATION – SYSTEM ID: 85080 M
 - 72 CONNECTIONS
 - WELL #1 – 200 GPM

s:\unprocessed drawings\172_othello\172-08 system consolidation\17208-figure 1

SCALE: AS SHOWN
 DESIGNED: -
 DRAWN: TVP
 CHECKED:
 APPROVED:
 PROJ. NO.: 172-08
 DATE: 8/26/16

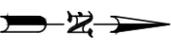


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APPROVED: TJP
PROJ. NO.: 172-08-03
DATE: 8/4/16



LEGEND

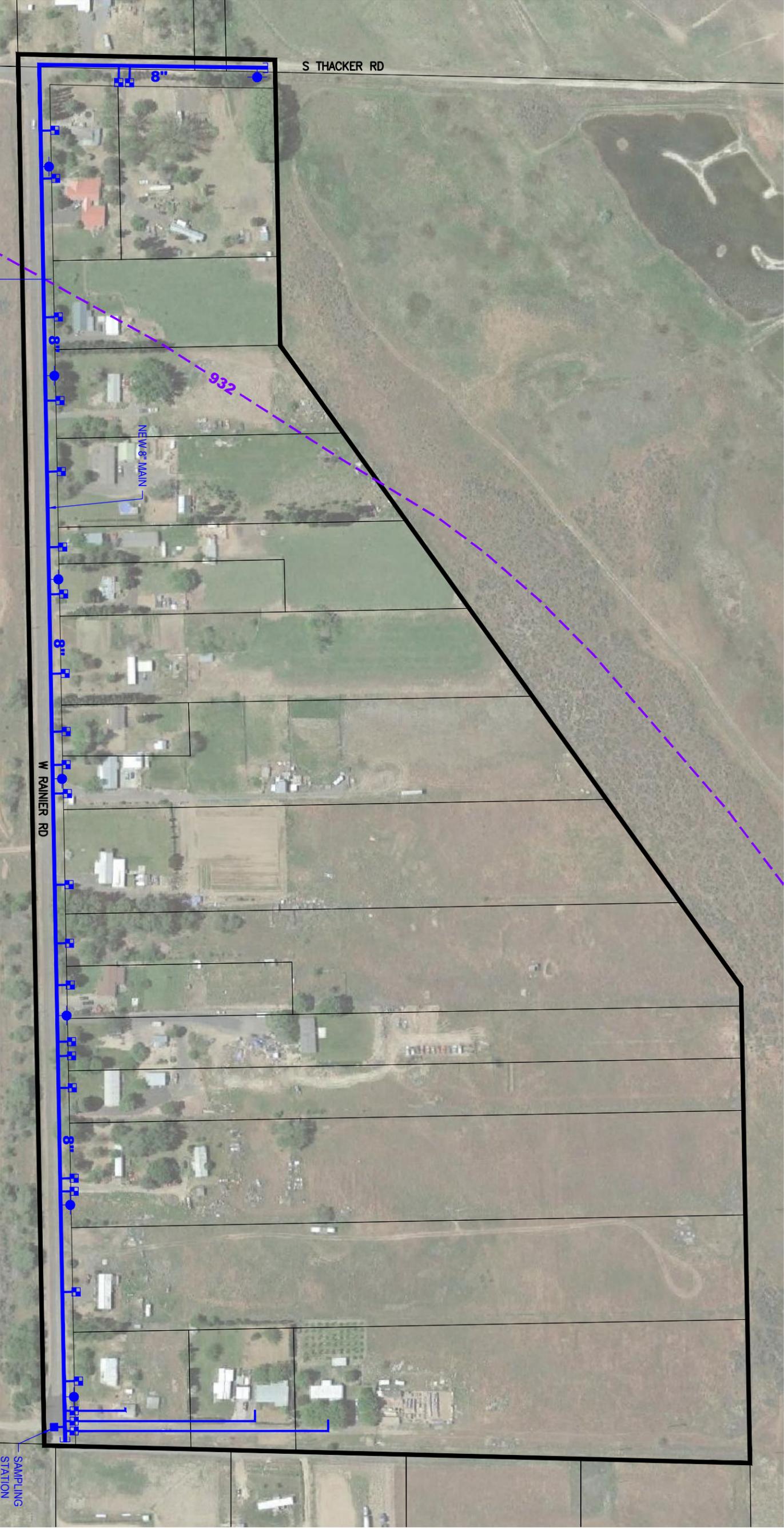
- RTWA BOUNDARY
- PARCEL LINE
- WATER LINE
- ⊗ WELL



VA
VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

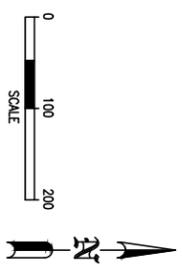
CITY OF OHELLO, WASHINGTON
 WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES
 RTWA EXISTING WATER SYSTEM AND
 WATER SYSTEM BOUNDARY

SCALE: AS SHOWN
DESIGNED: NVH/ASM
DRAWN: TJP
CHECKED: TJP
APPROVED: 172-08-03
PROJ. NO.: 172-08-03
DATE: 8/4/16



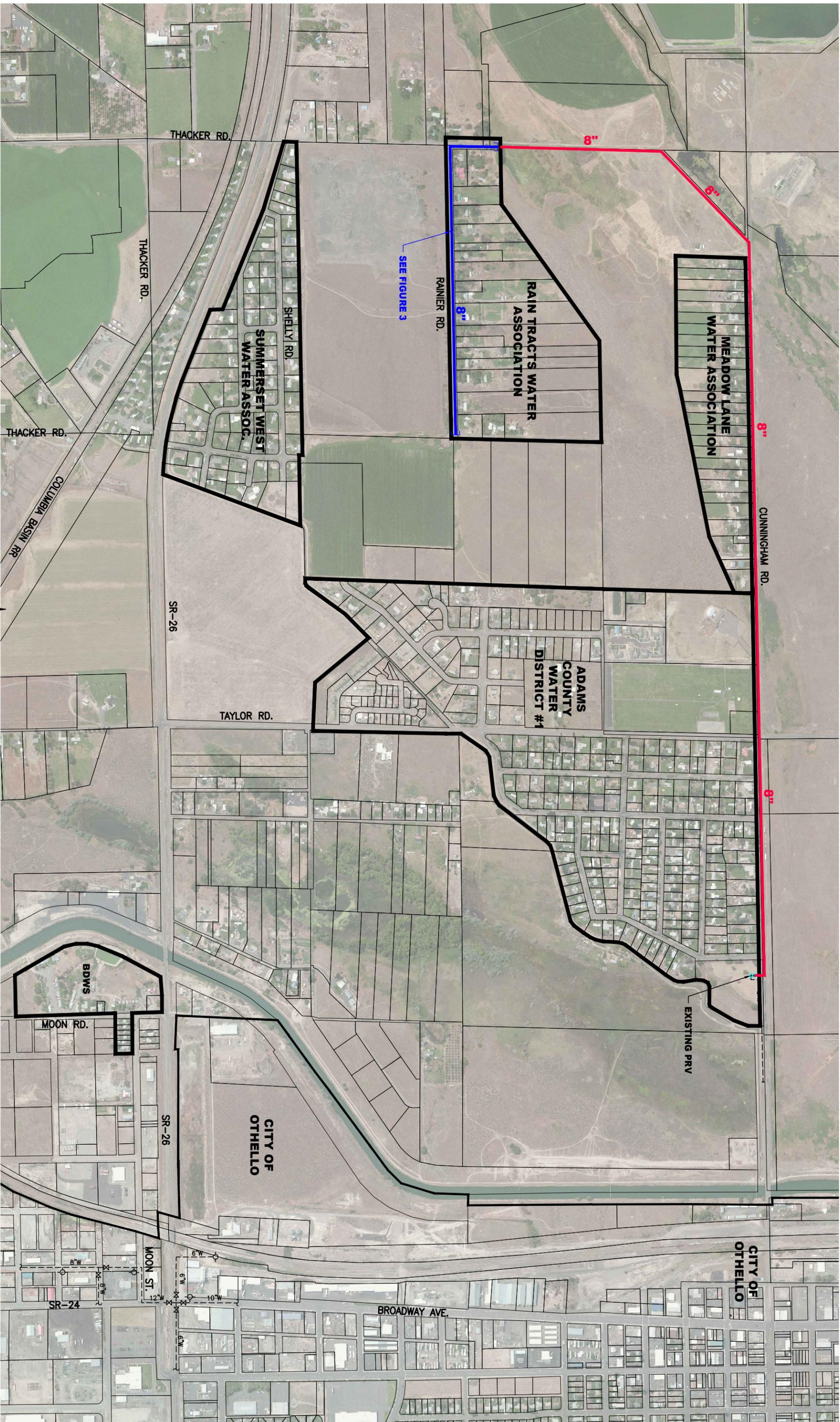
INDIVIDUAL PRVS ON SERVICES BELOW APPROX. ELEVATION 932'

- LEGEND**
- RTWA BOUNDARY
 - PARCEL LINE
 - 932' CONTOUR
 - WELL
 - SAMPLING STATION
 - PROPOSED WATER METER
 - PROPOSED FIRE HYDRANT
 - 8" PROPOSED WATER MAIN
 - 1" SERVICE PIPE



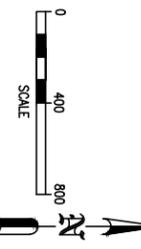
CITY OF OTHELLO, WASHINGTON
 WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES
 RTWA PROPOSED IMPROVEMENTS REQUIRED
 TO MEET CITY STANDARDS

SCALE: AS SHOWN
DESIGNED: NWH/JSM
DRAWN: TJP
CHECKED: TJP
APPROVED: 172-08-03
PROJ. NO.: 172-08-03
DATE: 8/16/16



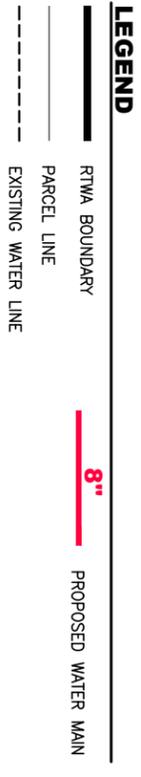
LEGEND

- RTWA BOUNDARY
- PARCEL LINE
- EXISTING WATER LINE
- 8" PROPOSED WATER MAIN

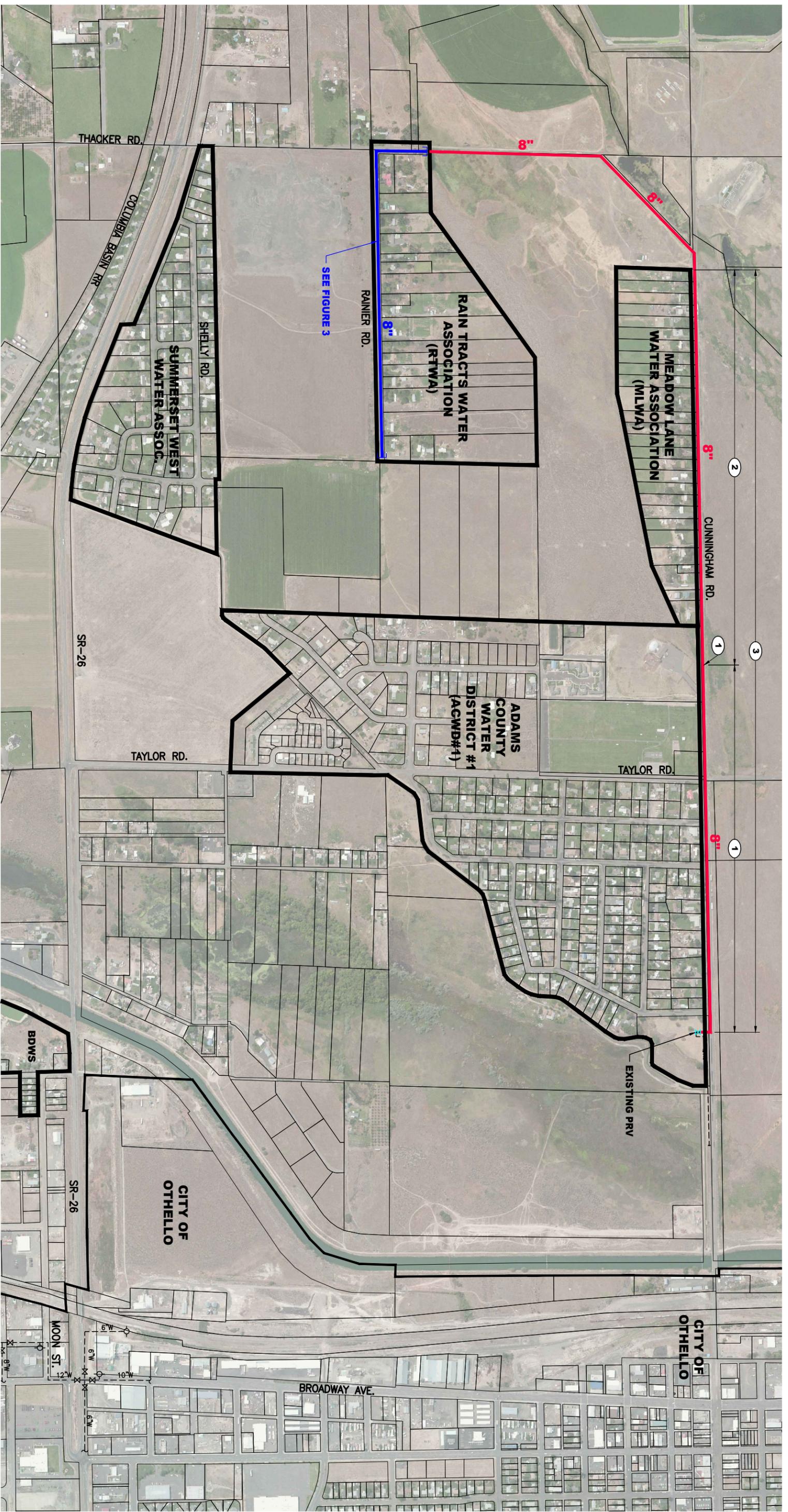


CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES
RTWA CONSOLIDATION IMPROVEMENTS

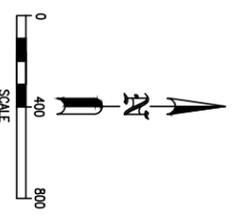
SCALE: AS SHOWN
 DESIGNED: NVH/ASM
 DRAWN: TYP
 CHECKED: TYP
 APPROVED: 172-08-03
 PROJ. NO.: 8/16/16
 DATE:



- NOTES**
- 1 IF ACWD#1 CONSOLIDATES THE T-MAIN WOULD CONNECT WEST OF TAYLOR RD. AND OVER ALL LENGTH OF T-MAIN WOULD BE REDUCED BY ~3,300 LF
 - 2 IF ACWD#1 AND MLWA CONSOLIDATES IN ADDITION TO 1, THIS PORTION OF THE T-MAIN COST WOULD BE SHARED WITH MLWA
 - 3 IF ONLY MLWA CONSOLIDATES THIS PORTION OF THE T-MAIN COST WOULD BE SHARED WITH MLWA



CITY OF OTHELLO, WASHINGTON
 WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES
 COST SHARING WITH MLWA AND ACWD#1



APPENDIX A

WFI



WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 2

Updated: 10/05/2015

Printed: 6/30/2016

WFI Printed For: On-Demand

Submission Reason: Owner Update

ONE FORM PER SYSTEM

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822

1. SYSTEM ID NO. 70910 M	2. SYSTEM NAME RAINIER TRACTS WATER ASSN	3. COUNTY ADAMS	4. GROUP A	5. TYPE Comm																									
6. PRIMARY CONTACT NAME & MAILING ADDRESS TAMMY S. RODRIGUEZ [SECRETARY] 2298 W RAINIER RD OTHELLO, WA 99344		7. OWNER NAME & MAILING ADDRESS RAINIER TRACTS WATER ASSN TAMMY S. RODRIGUEZ OPERATOR 2288 W. RAINIER RD OTHELLO, WA 99344		8. OWNER NUMBER: 004772																									
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP		STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP																											
9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION																											
Primary Contact Daytime Phone: (509) 488-9547		Owner Daytime Phone: (509) 331-2641																											
Primary Contact Mobile/Cell Phone: (509) 431-3401		Owner Mobile/Cell Phone:																											
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone: (xxx)-xxx-xxxx																											
Fax:	E-mail: xxxxxxxxxxxxxxxxxxxxxx	Fax:	E-mail: xxxxxxxxxxxxxxxxxxxxxx																										
WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.																													
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)																													
<input checked="" type="checkbox"/> Not applicable (Skip to #12) <input type="checkbox"/> Owned and Managed SMA NAME: _____ SMA Number: _____ <input type="checkbox"/> Managed Only <input type="checkbox"/> Owned Only																													
12. WATER SYSTEM CHARACTERISTICS (mark all that apply)																													
<input type="checkbox"/> Agricultural <input type="checkbox"/> Commercial / Business <input type="checkbox"/> Day Care <input type="checkbox"/> Food Service/Food Permit <input type="checkbox"/> 1,000 or more person event for 2 or more days per year <input type="checkbox"/> Hospital/Clinic <input type="checkbox"/> Industrial <input type="checkbox"/> Licensed Residential Facility <input type="checkbox"/> Lodging <input type="checkbox"/> Recreational / RV Park <input checked="" type="checkbox"/> Residential <input type="checkbox"/> School <input type="checkbox"/> Temporary Farm Worker <input type="checkbox"/> Other (church, fire station, etc.): _____																													
13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)																									
<input checked="" type="checkbox"/> Association <input type="checkbox"/> City / Town <input type="checkbox"/> County <input type="checkbox"/> Federal <input type="checkbox"/> Investor <input type="checkbox"/> Private <input type="checkbox"/> Special District <input type="checkbox"/> State				1,000																									
15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY				19 USE	20	21 TREATMENT			22 DEPTH	23	24 SOURCE LOCATION															
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE	
	IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE																												
S01	Well #1 - ABS607		X										X										197	45	SE NW	05	15N	29E	

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO. 70910 M	2. SYSTEM NAME RAINIER TRACTS WATER ASSN	3. COUNTY ADAMS	4. GROUP A	5. TYPE Comm
------------------------------------	--	---------------------------	----------------------	------------------------

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		20	20
A. Full Time Single Family Residences (Occupied 180 days or more per year)	20		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		20	20

29. FULL-TIME RESIDENTIAL POPULATION
A. How many residents are served by this system 180 or more days per year? 61

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:

- Update - Change
 Update - No Change
 Inactivate
 Re-Activate
 Name Change
 New System
 Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.	
SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

APPENDIX B

City of Othello Hydraulic Model Information

Conceptual Future UGA Service Extension, ERUs and
Transmission Main Sizing

I. Steps taken to set up the City of Othello demand distribution map:

1. The City of Othello hydraulic model was created in Bentley WaterCAD V8i based on pipe sizes and lengths provided within the 2011 City of Othello Water System Plan and information provided by the City regarding water mains which have been either added or replaced after 2011. Elevations were based on Google Earth elevations at nodes.
2. Demands were assigned to nodes based on the City of Othello parcel map. Unweighted values were used to assign a demand value of 1 for each parcel.
3. The Parcel Count alternative was generated in WaterCad by inputting the demand distribution evaluated during step 3.
4. The high water user spreadsheet was provided by the City and shows a high user ERU of 6,562.
5. Several of the provided high user ERUs were adjusted based on City input. The high user adjusted ERU count was determined to be 5,759 for the 15 customers listed on the high user list for 2015.
6. High user ERUs were subtracted from the total ERU count for 2015 to produce the non-high user ERUs. Non-high user ERUs = total system ERUs (10,443) – high user ERUs (5,759) = 4,684
7. Adams County Water District #1 (ACWD1) demand was applied at the location of the meter vault node.
8. Using known locations for local businesses, Google Earth and school district resources medium demands were assigned to the Parcel Count (w/ medium users) alternative. This involved assigning higher demand than the parcel count method assigned during Step 3.
9. The model was run for the Parcel Count (w/ medium users) alternative which returned a total demand of 2,291.
10. The ERUs (w/o high user) alternative was generated by scaling the Parcel Count (w/ medium users) alternative using the known non-high user ERUs for 2015 and the calculated demand from Step 10 which resulted in a factor of 2.04 ($2.04 = 4684/2291$)
11. The ERUs (w/ high users) alternative was generated by applying point demands at individual nodes consistent with the high use spreadsheet to obtain the total 2015 ERU count of 10,443.
12. The ADD alternative was generated by scaling the ERUs (w/ high users) alternative using the provided average ADD of 3,290 gpm for the City system. The scaling factor used was $0.32 = 3290/10443$.
13. The MDD alternative was generated by scaling the ERUs (w/ high users) alternative using the provided average MDD of 4,700 gpm for the City system. The scaling factor used was $0.45 = 4700/10443$
14. PHD was calculated using Equation 5-1 of the DOH WSDM and the peaking factor calculated from the meter readings provided by the City of Othello. The calculated PHD was 7,640 gpm for the City system.
15. The PHD alternative was generated by scaling the ERUs (w/ high users) alternative using the calculated PHD of 7,640 from Step 15. The scaling factor used was $0.73 = 7640/10443$.
16. Production values were input into each of the Demand alternatives (ADD, MDD, PHD) at each node associated with a City well. Values were based on the most current well production values provided by the City.

17. Reservoir elevations were input into the model for the three existing standpipe reservoirs based on the 2011 City of Othello WSP Table 3-9 for values without McCain Foods online. Reservoirs serve one pressure zone. Reservoir elevation were input based upon the following conditions per the DOH WSDM:
 - ADD: Reservoir elevation are at the lower elevation of operation storage (OS). Initial elevation is 1,205 ft.
 - MDD: Reservoir elevation are at the lower elevation of fire suppression storage (FSS). Initial elevation is 1,174 ft. Because MDD was used to evaluate fire flow, the MDD Demand alternative does not include the highest producing well (Well 6).
 - PHD: Reservoir elevation are at the lower elevation of equalizing storage (ES). Initial elevation is 1,199 ft.
18. The Othello WSP Fire Flow alternative was created by applying a universal fire flow distribution of 1,000 gpm throughout the system per the Othello WSP. Nodes were then targeted to apply concentrated fire flow per the WSP.

II. Steps taken to size the City of Othello CFS distribution mains:

1. Transmission mains were extended from the City of Othello distribution system in order to consolidate the CFS candidates with the City system. Consolidation of the CFS candidates are discussed in each of the City of Othello Consolidation Feasibility Studies.
2. Available water system meter readings were analyzed for each CFS candidates to evaluate ERU, ADD, MDD and PHD demands. See City of Othello Consolidation Feasibility Studies for demands.
3. Individual water system demands were applied at the extended transmission mains at the connection node.
4. Distribution mains were sized to satisfy each demand scenario. See **Exhibit X**.
 - Pipe Material: PVC
 - Hazen Williams C: 150

III. Steps taken to size the City of Othello CFS UGA distribution mains:

1. The Urban Growth Area (UGA) was provided by the City and is shown on **Exhibit X**
 - Total UGA area: 5,688 acres
2. The total planned future ERU's were provided by the City for the UGA:
 - Total planned future ERUs: 1,252 ERUs
3. Transmission mains were extended from the CFS distribution (see above) mains within the City of Othello hydraulic model to serve the CFS UGA. Location of mains were based on input from the City, the full City of Othello UGA, and locations of transmission mains proposed in the Consolidation Feasibility Studies (CFS). The proposed CFS UGA is shown on **Exhibit X**.
 - UGA area served by T-mains: 3,012 acres
4. The planned future ERUs associated with the CFS UGA were calculated based on the total number of planned ERUs.
 - Planned future CFS ERUs: 663
5. A total count of existing connections not associated with the CFS candidates was performed based on the most recent aerial maps.

- Existing connections: 314 connections (non-CFS candidates)
6. Based on the proposed distribution system the UGA was split into the 4 areas as shown on **Exhibit X**. The City indicated that 111 acres within Area 2 is proposed Commercial and will contain a new school facility
 - Area 1: 584 acres (residential)
 - Area 2: 1,022 acres (residential and commercial)
 - Area 3: 874 acres (residential)
 - Area 4: 643 acres (residential)
 7. Existing CFS connections were combined with non-CFS connections. Existing Adams County Water District #1 (ACWD1) connections were not included in this total because ACWD1 demands were represented in the City of Othello Water System demands provided by the City.
 - Total existing connections: 671
 8. Total existing and planned ERUs were combined. Each connection was considered a City ERU.
 - Total planned ERUs: 1,334
 9. 50 ERUs were added to the total planned ERUs for the proposed school.
 - Total planned ERUs: 1,384
 10. The total planned ERUs (existing and future) were distributed within Areas 1 – 4 equally based on residential area.
 - Area 1: 259 ERUs
 - Area 2: 403 ERUs
 - Area 3: 387 ERUs
 - Area 4: 285 ERUs
 11. ADD was evaluated to be 453 gpd/ERU and is based on the most current City of Othello water demands.
 - CFS UGA ADD: 435 gpm
 12. MDD was evaluated based on the City of Othello's observed peaking factor for MDD.
 - Peaking Factor: 1.43 (MDD)
 - CFS UGA MDD: 623 gpm
 13. PHD was evaluated for the CFS UGA based on the City of Othello's observed peaking factor for PHD.
 - Peaking Factor: 1.62 (PHD)
 - CFS UGA PHD: 1,009 gpm
 14. FF was applied for residential and commercial fire flows.
 - Residential FF: 1,000 gpm
 - Commercial FF: 3,000 gpm (school)

15. ADD, MDD, PHD and FF were evaluated based on the CFS UGA land area

CFS UGA	Residential Area	Total Conn.	ERUs	ERUs adj	ADD	MDD	PHD	MDD+FF
Area 1	584	259	259	259	84	121	196	1121
Area 2	911	403	403	453	132	188	305	3188
Area 3	874	387	387	387	126	181	293	1126
Area 4	643	285	285	285	93	133	215	1215
Total	3012	1334	1334	1384	435	623	1009	

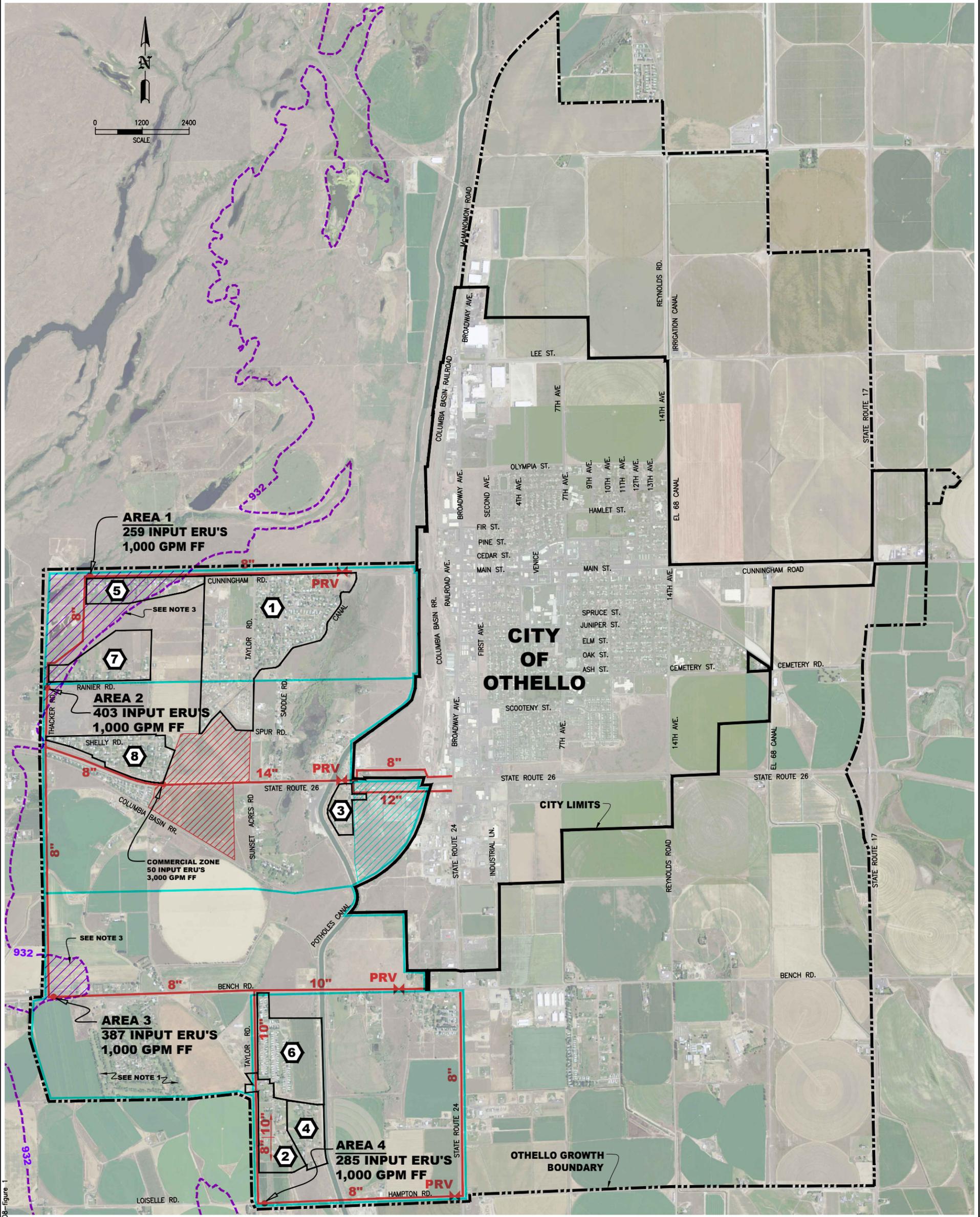
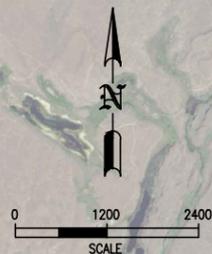
16. Demands for each of the ADD, MDD and PHD scenarios were applied to the City of Othello UGA distribution model at the eastern most node within each of the 4 areas.

17. Distribution mains were sized to satisfy each of the demand scenarios. See **Exhibit X**.

- Pipe Material: PVC
- Hazen Williams C: 150

IV. Steps taken in order to establish pressure zones in the UGA

1. Once the City of Othello CFS UGA distribution mains were sized the “No Demand” scenario was run in the hydraulic model. High pressures associated with the elevation drop were observed to the south and west of the City.
2. 80 psi was determined to be highest desirable pressure in the UGA during the “No Demand” scenario (Reservoir levels = 1,209 ft)
3. The 80 psi elevation contour was found to be 1,024.2 ft. ($1209 - [80 \times 2.31]$)
4. PRVs were placed along Bench Rd and Hampton Rd at elevation = 1,024.2 ft and along State Route 26 at the intersection of the proposed 12-inch and 8-inch transmission mains (elevation = 1,005 ft).
5. The three proposed PRVs and existing ACWD#1 PRV were set to have a discharge pressure of 40 psi.
6. After the PRVs were input into the model, the “No Demand” scenario was run and pressures exceeding 80 psi were observed.
7. The 80 psi elevation contour for the new pressure zone was found to be 981.8 ft. ($1024.2 - [40 \times 2.31]$). Services below this elevation require service PRVs to keep service pressures from exceeding 80 psi.
8. Demand scenarios were run to check that the addition of the PRVs in the hydraulic model did not affect supply. Main sizes were adjusted as necessary.



LEGEND

	CITY LIMITS
	OTHELLO GROWTH BOUNDARY
	WATER DISTRICT BOUNDARY
	AREA BOUNDARY
	PROPOSED WATER MAIN
	PRESSURE REDUCING VALVE
	COMMERCIAL ZONE
	LIGHT INDUSTRIAL ZONE
	932 CONTOUR

- NOTES**
- GOLF COURSE IRRIGATION TO BE PROVIDED BY IRRIGATION DISTRICT.
 - PRV TO BE SET AT 40 PSI.
 - SERVICE PRV'S REQUIRED AT ELEVATION LOWER THAN 932

- | | |
|---|---|
| 1 ADAMS COUNTY WATER DISTRICT #1 - SYSTEM ID: 22525 X
• 341 CONNECTIONS
• OTHELLO WATER SYSTEM INTERTIE - UNKNOWN CAPACITY | 5 MEADOW LANE WATER ASSOCIATION - SYSTEM ID: 53190 T
• 25 CONNECTIONS
• WELL #1 - 70 GPM |
| 2 BASIN VIEW WATER ASSOCIATION - SYSTEM ID: 04530 N
• 22 CONNECTIONS
• OTHELLO MANOR WATER SYSTEM INTERTIE - 300 GPM
• WELL #1 - 35 GPM | 6 OTHELLO MANOR WATER SYSTEM - SYSTEM ID: 64845 3
• 152 CONNECTIONS
• WELL #1 - 300 GPM |
| 3 BIRD DOG FAMILY LTD PARTNERSHIP II - SYSTEM ID: 52172 8
• 58 CONNECTIONS
• WELL #1 - 33 GPM | 7 RAINIER TRACTS WATER ASSOCIATION - SYSTEM ID: 70910 M
• 20 CONNECTIONS
• WELL #1 - 45 GPM |
| 4 HIGHLAND ESTATES WATER SYSTEM - SYSTEM ID: 32736 0
• 16 CONNECTIONS
• WELL #1 - 56 GPM | 8 SUMMERSET WEST WATER ASSOCIATION - SYSTEM ID: 85080 M
• 72 CONNECTIONS
• WELL #1 - 200 GPM |

SCALE: AS SHOWN
 DESIGNED: NVH
 DRAWN: TVP
 CHECKED:
 APPROVED:
 PROJ. NO.: 172-08
 DATE: 7/8/16



APPENDIX C

Long-term water supply study excerpts

TECHNICAL MEMO

TO: City of Othello, WA
FROM: Jesse Cowger, PE
DATE: August 24, 2016
RE: Water Supply Plan Summary
ATTACH: Water Supply Planning Recommendations – Aspect Consulting – Dec 10, 2014
Well Assessment – Aspect Consulting – Feb 12, 2016
Groundwater Supply Improvements – Aspect Consulting – Jun 21, 2016

Background

The City of Othello relies on wells drilled into the lower Wanapum Basalt aquifer as its sole source of drinking water. Over time the groundwater level in the lower Wanapum Basalt has declined and resulted in progressively lower pumping rates from existing wells. The Washington State Department of Ecology (Ecology) has identified and documented the regional decline of aquifer levels through a series of reports regarding the Columbia Basin Groundwater Management Area (GWMA). Othello recognized the looming threat to its water supply posed by declining aquifer levels and sought assistance from Varela & Associates and Aspect Consulting. The City tasked Varela and Aspect with developing a Water Supply Plan to secure the City's water supply for the future.

Othello received a Pre-Construction Grant from the Washington State Drinking Water State Revolving Fund (DWSRF) to partially fund the Water Supply Plan. The City utilized a combination of local funds and the grant from DWSRF to fund the Water Supply Plan.

Project Description and Scope

In addition to declining aquifer levels, interference between City and private wells exacerbates declining pumping rates in City wells. The City's Well 6 has fluoride (F) concentrations above the MCL and Well 7's capacity has declined possibly due to biofouling. The City also relies heavily on well pumping capacity to meet peak demands due to a lack of equalizing storage volume in reservoirs. Due to these factors, this Water Supply Plan scope includes the following:

- Systematic evaluation of existing wells
- Options for addressing fluoride level above MCL in Well 6
- Options for meeting present and future water demands

Systematic Evaluation of Existing Wells

Refer to attached Aspect Consulting memo dated February 12, 2016 for the full detailed analysis of City wells. The following summarizes the findings and recommendations related to the existing condition of the City's wells:

- The City is doing a good job of managing the effects of seasonal drawdown and well interference by selectively pumping certain wells to maximize yield.
- All City wells except Well 7 show stable well efficiency over time. Well 7 was constructed with a stainless steel screen (all other wells except Well 6 are completed primarily with open borehole in the water bearing zones. Rehabilitation of Well 7 might increase the existing pumping rate of 600 gpm to 900 gpm.
- The City operates a telemetry system collecting and recording water level and flow data from each of the active wells. Much of the historical telemetry data was reportedly corrupted and lost. Maintaining reliable, accurate water level and flow data is critical to managing and optimizing the City's pumping and limiting drawdown in the wells. We recommend that the City routinely archive telemetry data in a secure location to ensure data are available for future use.
- Wells 2, 6, and 8 may be subject to cascading water when pumping causes water levels to draw down below the elevation of uncased water bearing zones. Cascading water may entrain air and negatively affect pump performance. We recommend that the pump performance curves be compared to actual pump yields at operating total head to assess whether cascading water and air entrainment could be affecting pump performance.
- Water rights are not a constraint for the City in managing the well field. Withdrawals from recently constructed Well 9 are limited to 2,000 gpm, 3,000 ac-ft/year, as this well is only authorized under one City water right. We recommend that if and when future water changes are required that Well 9 be added to the right being changed.
- There is record in the files reviewed that proofs of appropriation or requests to extend the development schedules for City water rights were filed with Ecology. If this is the case, we recommend completing proofs of appropriation for five of the City's water rights that are ready for certification, while filing extensions to the development schedules for the remaining rights.

Options for Addressing Fluoride in Well 6

Well 6 has fluoride levels that generally exceed the MCL of 4.0 mg/L. The City attempted to modify the well in the past to decrease the fluoride concentration, but had little success. Due to the fluoride levels exceeding the MCL Othello currently designates Well 6 as an emergency well and only operates it if all other sources of supply cannot meet system demand. Well 6 is the City's largest producing source at 2,500 gpm. The City sees the following Options for future utilization of Well 6:

Option 1: Continue to Utilize Well 6 as an Emergency Source (Do Nothing)

The City can continue to utilize Well 6 on an emergency basis and rely on blending in the distribution system to dilute the fluoride level. The primary benefit of this alternative is no investment is required. This alternative has the disadvantage of lack of flexibility in when the City can utilize Well 6. It would also make it more likely the customers closest to Well 6 would consume water with fluoride levels that exceed the MCL. DOH may not allow the City to operate the well in the fashion indefinitely.

Option 2: Dedicate Well 6 to Supplying Industrial Users

More than half of the water pumped from Othello's wells goes to industrial users. The largest of these industrial users is Simplot, which utilizes roughly 70% of total industrial water supplied by Othello. If a significant portion of Othello's industrial users could utilize water from Well 6 without affecting their industrial processes, then devoting Well 6 to industrial use would effectively reduce the demand on Othello's other wells. The following considerations pertain to feasibility of implementing this option:

- DOH may have water quality requirements for the water used in the industrial processes that would preclude use of water with fluoride concentrations above 4.0 mg/L.
- Water produced from Well 6 has some aesthetic taste and odor issues that may make the water unappealing for some industrial customers.
- Dedicate use of Well 6 would require construction of a dedicated distribution system for industrial supply and would require industrial users to internally separate their potable uses from their industrial uses. This carries with it an increased risk of cross connection between the two systems.
- Well 6 does not currently have a VFD to allow modulation of pumping rate to match demand; however, the City has budgeted for purchase an installation of a VFD for Well 6.
- If the VFD does not provide sufficient range of flow for industrial users, then a dedicated reservoir would also be needed.
- Dedicating a single source to industrial use has potential for reliability issues if the single source breaks down. Installation of a one-way intertie with the City's potable water distribution system could potentially mitigate reliability concerns.

Additional discussions with the City's industrial users are needed to determine whether barriers exist that preclude implementation of this option. The City will investigate this option further and potentially combine discussions with industrial users while investigating the feasibility of industrial wastewater treatment and reuse.

Option 3: Construct Treatment System to Remove Fluoride from Well 6 Water

A Treatment system could remove fluoride from the water produced by Well 6. The following types of treatment methods could likely remove fluoride from Well 6 raw water to levels below the MCL:

- Granular Activated Alumina
- Reverse Osmosis (RO)
- Electrodialysis and Electrodialysis Reversal
- Bone Char

Additional investigation of the raw water properties and constituents is needed to determine which of the preceding treatment methods would make the most sense for Well 6 if implemented. A treatment system would require additional operator expertise and certification and would also have ongoing chemical and membrane/media expenses (depending on the treatment method).

Option 4: Blend Well 6 with other City Well(s)

Well 6 has the highest fluoride concentration of all Othello's wells. Most City wells have average fluoride concentrations around 2.0 mg/L; although some of the wells have occasional spikes up to 3.0 mg/L. Several factors affect the feasibility of blending Well 6 with another City well:

- Capacity: Well 6 is Othello's largest producing source with a current pumping rate of approximately 2,000 gpm. To reliably achieve a blended water fluoride concentration below the MCL the City may need to reduce the pumping rate of Well 6 to allow sufficient dilution of fluoride.
- Proximity of other wells to Well 6:
 - A dedicated main with no service connections is required to blend Well 6 with another well. The well closest to Well 6 is Well 2 which is approximately half a mile away. However, Well 2 has limited reliability; City Staff reports the well runs out of water after roughly 15 minutes of operation. The City has designated Well 2 "Emergency Only".
 - Due to Well 2's lack of capacity (historic pumping rate of approximately 300 gpm) compared to Well 6 and its lack of reliability for extended pumping, blending with Well 2 appears unfeasible.
 - Most City wells (other than Well 2) are 1-2 miles away from Well 6
- Reliability: in order to maintain blended fluoride concentration below the MCL operation of Well 6 becomes contingent upon the operability of the well(s) blended with it. If the blending well becomes inoperable due to mechanical failure, interference issues, capacity decline, or other issues then the City cannot operate Well 6 without supplying the system undiluted water with fluoride concentration likely exceeding the MCL.
- Monitoring: fluoride concentrations in City wells vary throughout the year so DOH would likely require routine monitoring (possibly daily) to demonstrate blended fluoride concentration meets regulatory requirements. The frequency and corresponding expense associated with monitoring blended water quality may affect the feasibility of this Option.

The cost associated with blending Well 6 with other City wells would be considerable due to the high capacity of Well 6 and its proximity to other wells. Blending also has the disadvantage of reduce reliability because Well 6 becomes dependent on the operation of other wells to achieve the desired blended fluoride concentration below the MCL.

Option 5: Use Well 6 as an Aquifer Storage and Recover (ASR) Injection Well

Othello has begun investigating the feasibility of developing a supplemental source of supply to augment its groundwater sources. The supplemental supply would likely include treatment of surface water and may utilize ASR (refer to later section of this memo for details pertaining to the City’s plans for a future supplemental source of supply). If the City utilizes Well 6 as the injection well for ASR it may dilute the fluoride concentration in the vicinity of the well. If the City also continues to utilize Well 6 as a recovery well the fluoride concentration may drop below the MCL.

Well 6 is located near the western edge of Othello’s system. Initial observations by the City’s hydrogeology consultant indicate a well more centrally located betwixt Othello’s other wells would be more ideal from an ASR standpoint. However, further analysis is needed to assess the options, combinations, advantages, and disadvantages associated with selecting the injection well(s) for an ASR system.

Utilizing Well 6 for ASR may have operational complexities that affect the well’s availability for meeting system demand (e.g. when utilizing Well 6 as an injection well it cannot provide supply to the system). Some of the restrictions on availability could likely be overcome through operational coordination with the City’s other wells and the new supplemental source (surface water or industrial). Presumably the City would not inject water during periods of high demand when the City might need Well 6 to meet peak demands.

Discussion of Options for Addressing Fluoride in Well 6

The following table summarizes advantages and disadvantages associated with the options for addressing fluoride in Well 6:

Option	Advantages	Disadvantages
1) Do Nothing	<ul style="list-style-type: none"> • Low cost 	<ul style="list-style-type: none"> • Well 6 remains emergency source • Customers closest to Well 6 likely exposed to higher levels of fluoride when Well 6 operates
2) Dedicate Well 6 to Industrial Users	<ul style="list-style-type: none"> • Potentially puts capacity of Well 6 to use for existing industrial customers • Would likely reduce fluoride levels consumed by non-industrial customers 	<ul style="list-style-type: none"> • Acceptability to regulators unknown • Would require dedicated distribution system and potentially storage facilities (significant cost to implement)
3) Treatment System to Remove Fluoride	<ul style="list-style-type: none"> • Reliable way to reduce fluoride from water produced by Well 6 	<ul style="list-style-type: none"> • Likely significant first cost • Increased operational complexity • Ongoing chemical/media/membrane maintenance
4) Blend with other City Well(s)	<ul style="list-style-type: none"> • Could achieve blended fluoride levels that meet the MCL. 	<ul style="list-style-type: none"> • Significant first cost associated with mains dedicated to blending • May required blending with multiple sources or reducing pumping rate of Well 6 • Reduces system reliability due to required functionality of blending wells to operate Well 6 • Increased monitoring to demonstrate blended water quality meets regulatory requirements

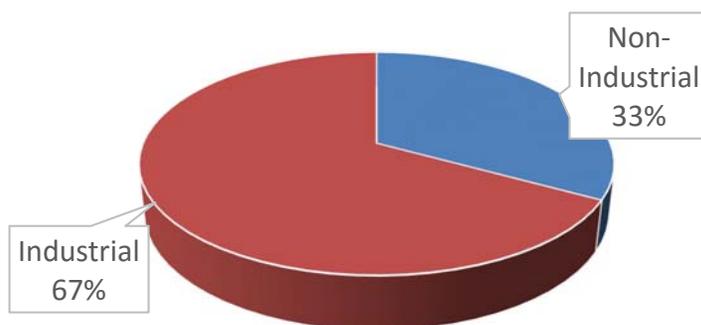
Option	Advantages	Disadvantages
5) Use Well 6 as ASR Injection Well	<ul style="list-style-type: none"> • May reduce concentration of fluoride in Well 6 to below MCL. • Would not require reducing the pumping rate of Well 6 • If ASR implemented, may slow the decline of the Wanapum aquifer • Supplemental source of supply would reduce the City's reliance on existing sole source aquifer 	<ul style="list-style-type: none"> • Requires construction of supplemental source of supply (high first cost and ongoing operation and maintenance cost) • Non-central location of Well 6 in relation to Othello's other wells may not be ideal from an ASR standpoint • Greater operational complexity

As shown in the preceding table, each option has advantages and disadvantages. Additional investigation and cost estimates are needed to determine which option best serves the City's long-term interests. The results of the City's ASR feasibility study will affect the City's decision as will input from DOH on potentially devoting Well 6 to industrial use. Othello has begun the process of updating its Water System Plan and will further analyze the alternatives discussed herein when formulating the City's capital improvements plan.

Meeting Present and Future Water Demand

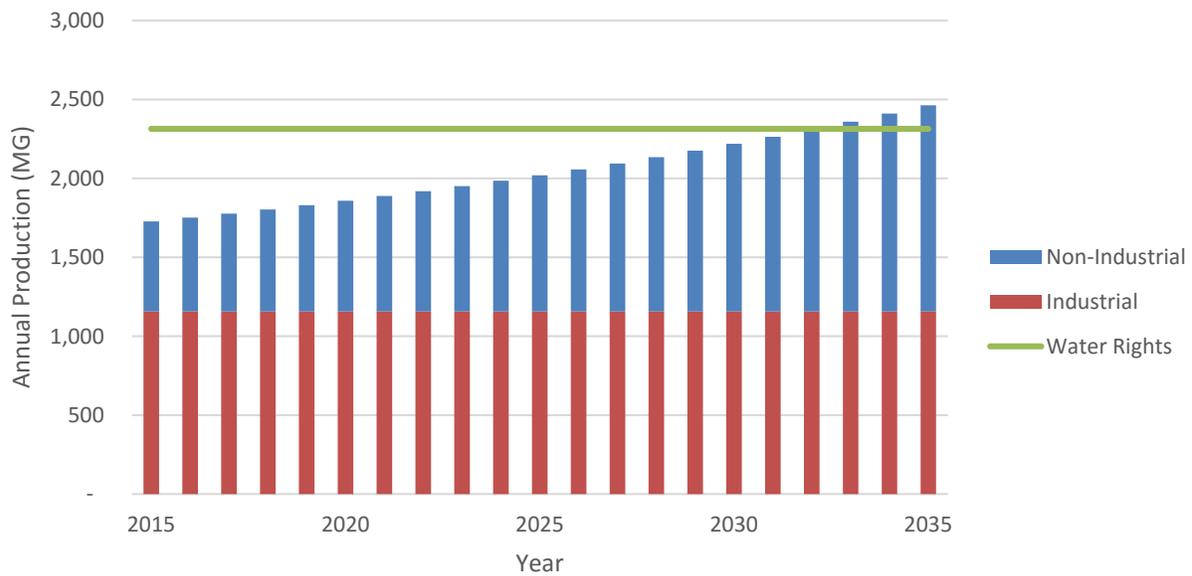
On March 28, 2016 Othello adopted its updated Comprehensive Plan (Comp Plan). The Comp Plan lays out an ambitious vision for growth in Othello which includes population growing from 7,780 in 2015 to 17,825 in 2035. The population growth projected in the Comp Plan equates to an annual rate of 4.23%. In many cases a water systems water demand will increase roughly proportionally to its population growth. However, Othello supplies several large industrial users which make up almost 2/3 of the City's annual demand. For this reason, projections for future demand can be broken into industrial and non-industrial segments.

Ratio of Industrial and Non-Industrial Water Use



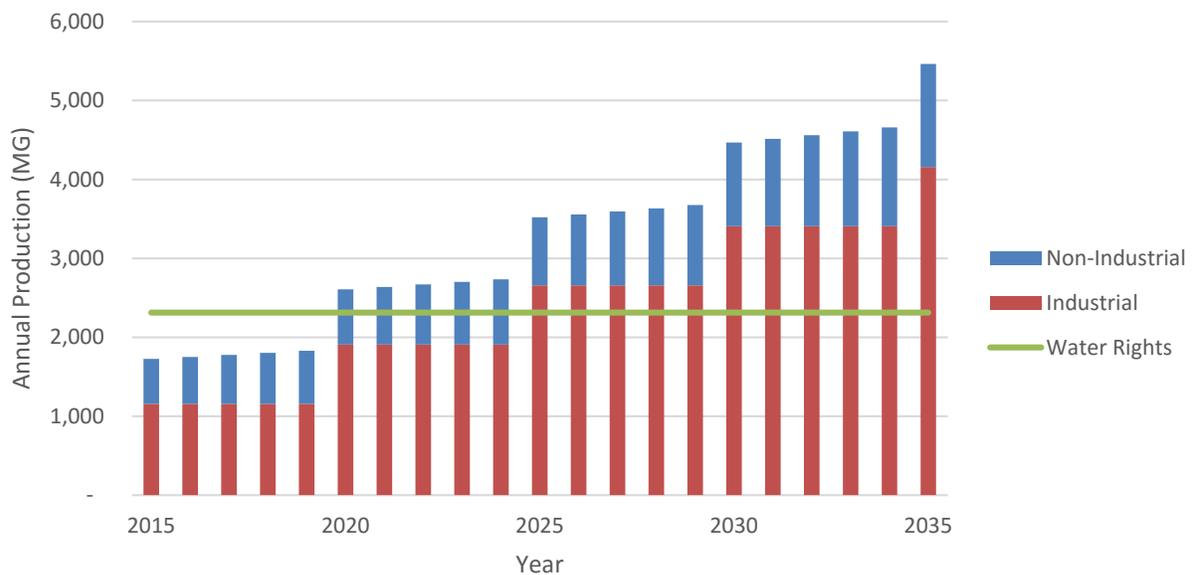
If non industrial water use increases proportionally with projected population growth and industrial demand remains static, the following demand curve results:

Projected Water Demand: No New Industrial Customers



Were Othello to attract additional industrial users to the City, water demand would experience incremental jumps as new industrial users come online. The City’s largest industrial customer (Simplot) utilizes approximately 750 MG annually. If a new industrial user similar to Simplot located in Othello roughly every five years the following demand curve would result:

Projected Water Demand: New Industrial Customer Every Five Years



As shown in the preceding graphs, the time frame in which Othello has adequate water rights to meet system demand depends a great deal on whether the City attracts additional industrial users. If no new industrial users locate in the City then Othello’s water rights could supply projected demand for the next 17-18 years. The City appears to have insufficient water rights to support addition of a new industrial user similar in size to Simplot at any point in the future. The City’s

Comp Plan envisions growth of all sectors in Othello (residential, commercial, industrial, etc.); hence, the City plans the following steps to meet projected water demand and prevent availability of water supply from constraining growth in Othello:

Near Term: Continue to Maintain, Develop, and Rely on Groundwater

In the near term Othello must continue to rely on its groundwater sources and develop additional well(s) to keep up with regional declines in aquifer levels and corresponding declines in exiting well pumping rates. Refer to attached Aspect Consulting memo dated June 21, 2016 for the full detailed recommendations for improving Othello's groundwater supply. The following summarizes the findings and recommendations contained therein:

- Rehabilitate Well 7: it appears the efficiency of Well 7 has decreased over time. Rehabilitation of this well could recover 300 gpm of pumping capacity.
- Install new Wanapum Aquifer Well
- Explore Grande Ronde Aquifer

The City's existing wells tap the Wanapum basalt aquifer which has declined over time and decreased available drawdown and pumping rates of the City's wells. Rehabilitating Well 7 and developing a new Wanapum well will help the City maintain its existing supply capacity at least for the near term. Exploring the Grande Ronde basalt aquifer, which is deeper than the Wanapum basalt, will help the City determine the degree to which Othello may be able to rely on groundwater into the future. If the Grande Ronde has reasonable quality and quantity of water available it may extend the period of time Othello can continue to rely on groundwater supply.

Mid to Long-Term: Develop Supplemental Source of Supply

The available data and analyses to date document a regional decline in ground water levels in the Columbia Basin. The estimates vary on current rate of decline, but it appears Othello may not be able to continue to rely on groundwater indefinitely as its sole source of water supply. In recognition of the possibly finite nature of groundwater supply Othello plans to develop a supplemental source of supply. The City has identified the following possible components of a future supplemental source of supply:

- Surface water from bureau of reclamation irrigation canals treated to drinking water standards for potable use; this source could also be treated to the groundwater anti-degradation standard for injection and storage in the basalt aquifer for later recover via City wells.
- Industrial wastewater treated to anti-degradation standard for groundwater injection and storage in the basalt aquifer for later recovery via City wells. Currently industrial wastewater cannot be utilized for direct potable reuse; future changes in regulation may open doors for direct potable reuse of industrial wastewater.

The City has begun a study to investigate the feasibility of establishing a new source of supply which may employ aquifer storage and recovery (ASR) as a means to store treated water in the basalt aquifer. ASR may prove a useful tool for Othello due to several factors:

- Surface water from Bureau of Reclamation canals is not available for use during the winter. Treating water from the canals and storing it in the aquifer could allow Othello to treat and store the volume of water most useful to the City's situation.
- If the City pursued treatment and reuse of industrial wastewater the treated effluent would need to spend time in an environmental buffer such as a basalt aquifer before it could be utilized for drinking water.
- If the City utilizes Well 6 as the injection well for ASR it may dilute the fluoride concentration in the vicinity of the well (refer to previous discussion of options for Well 6). If the City also continues to utilize Well 6 as a recovery well the fluoride concentration may drop below the MCL.

Capacity of a supplemental source will depend on several factors including availability of raw water, construction and operation cost for treatment, and the City's desired ratio of groundwater Vs. supplement supply. Assuming availability of raw water is not the limiting factor, treatment could be designed for incremental expansion based on the City's needs over time.

The timing for implementation of a supplemental source of supply depends on many factors such as:

- Availability of raw water from Bureau of Reclamation canals, industrial users, or other sources not yet identified.
- Contaminants in raw water and treatment requirements to make raw water suitable for potable consumption or storage via ASR
- Permitting with Department of Ecology for reservoir permit and water rights implications
- Availability of funding
- Rate of aquifer decline and effect on Othello's ability to supply system demand
- Viability of Grande Ronde aquifer; if Grande Ronde is viable source of supply it may extend the timeframe Othello chooses to rely on groundwater

The results of Othello's ASR feasibility study will provide the City with some of the information needed to lay out a more specific timeline for implementation.

Appendix X

Cumulative effect of consolidation on the City of Othello water system components

1.1 Estimated Impact to City System

1.1.1 Estimated System Demands

The impact of consolidating all 8 small water systems into the City of Othello water system is evaluated below by system component including supply, distribution and storage. The evaluation will be based on the current City of Othello water system demands as shown on the following table.

Table 1: Current City of Othello Water System Demands

Year	ERUs ⁽¹⁾	ADD (gpm)	MDD (gpm)	PHD (gpm)	Annual (MG)	Annual (acre/ft)
2013		3,340	4,570	7,410	1,757	5,390
2014		3,420	5,070	8,250	1,796	5,510
2015		3,100	4,460	7,250	1,628	5,000
Average	10,490	3,300	4,700 ⁽²⁾	7,600 ⁽³⁾	1,700	5,300

⁽¹⁾ Calculated based on ADD using 453 gpd/ERU

⁽²⁾ Resulting ADD:MDD peaking factor 1.43

⁽³⁾ Resulting MDD:PHD peaking factor 1.62

Estimated current and future ERUs for the 8 individual systems are shown in the following table.

Table 2: Cumulative Estimated Current and Future Individual Water System ERUs

System	Current ERUs ⁽¹⁾	Future ERUs ⁽²⁾
Adams County Water District No.1	0	36
Basin View Water Assoc.	15	21
Bird Dog Family Partnership II	30	64
Highland Estates Water System	13	13
Meadow Lane Water System	10	11
Othello Manor Water System	104	194
Rainier Tracts Water Assoc.	12	12
Summerset West Water Assoc.	53	55
Total	237	406

⁽¹⁾ From individual water system reports (used highest ERU count for data period)

⁽²⁾ From individual system reports

⁽³⁾ ACWD#1 is currently connected and current ERUs are included in Table 1. The Future ERUs are the net increase in ERUs considering substantial reduction in DSL (See ACWD#1 report for more comprehensive explanation)

Estimated current and future water use for the 8 individual water systems are shown in the following table.

Table 3: Estimated Cumulative Water System Demands (8 systems)

Description	ERUs (1)	ADD			MDD (3)			PHD (4) (gpm)	Annual (5)	
		gpd/ERU (2)	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)		(MG)	(ac-ft/yr)
Current	237	453	107,400	75	951	225,500	157	381	39.2	120.3
Future	406	453	183,900	128	951	386,100	268	583	67.1	206.0

(1) From Table 2

(2) Based on current City of Othello water use for the period 2013 – 2015

(3) $MDD = ADD(2.1)$; The ADD(2.1) factor was derived from comparing the average ADD to MMAD ratio from all the systems where this data was available and applying the $MDD = MMAD(1.3)$ calculation per the WSDOH WSDM

(4) $PHD = (MDD/1440)(CN+F)+18$, where C =(varies), N = ERUs and F = (varies); WSDOH WSDM Equation 5-1

(5) $ADD \times 365 \text{ days/year}$

1.1.2 Supply

Criteria

The WSDOH WSDM provides the following criteria for public water supply:

- Supply must meet MDD
- Supply should meet MDD and replenish Fire Suppression Storage within 72 hours while supplying MDD

Current Capacity

The City’s water is supplied via eight groundwater wells. The current supply capacity of the City’s wells is shown on the following table.

Table 4: Current City Supply

Well No.	DOH ID No.	Current Capacity (gpm)
2	01	-
3	02	800
4	06	430
5	07	900
6	05	2,500
7	08	630
8	09	395
9	10	1,500
Total Supply Capacity		7,155

Evaluation

The impact of consolidating the 8 water systems into the City of Othello water supply is evaluated in the following table.

Table 5: Supply Capacity Evaluation

Description	Scenario	MDD (gpm)	Replenish FSS ⁽¹⁾ (gpm)	Total (gpm)	Current Supply Capacity ⁽²⁾ (gpm)	Excess / (Deficiency) (gpm)
City of Othello	Current ⁽³⁾	4,700				
8 Water Systems	Current ⁽⁴⁾	157				
Total		4,857	347	5,204	7,155	1,951
City of Othello	Current ⁽³⁾	4,700				
8 Water Systems	Future ⁽⁴⁾	268				
Total		4,968	347	5,315	7,155	1,840

⁽¹⁾ Per City of Othello 2011 WSP Fire Suppression Storage = 6,250 gpm for 4 hours (1,500,000 gallons), Replenish FFS = 1,500,000/72 hrs/60 min

⁽²⁾ From Table 4

⁽³⁾ From Table 1

⁽⁴⁾ From Table 3

Conclusion

The City has adequate supply capacity to serve all 8 water systems with no improvements required.

See Appendix F for discussion related to long-term effects on City supply.

1.1.3 Distribution

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during FF/MDD.

Hydraulic Analysis Model

As described in Section 3.2.2 of each individual report.

Evaluation

The hydraulic model of the City of Othello's water system was run after adding the 8 water system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the 8 water system demands and the demands estimated for the future UGA area. No deficiencies within the existing City of Othello water system were found.

Conclusion

The City has adequate distribution system capacity to serve the 8 water systems and the future UGA with no improvements required.

1.1.4 Storage

Criteria

The WSDOH WSDM provides the following criteria for public water storage:

Operational Storage (OS): Storage volume devoted to supplying the water system when sources of supply are in the “off” status (volume between pump “on” and pump “off”)

Equalizing Storage (ES): Storage volume required to meet peak system demands which exceed source capacity (min. system pressure 30 psi)

- $ES = (PHD - Q_s)(150 \text{ min.})$

Where:

- PHD = peak hour demand in gpm
- Q_s = sum of all source capacities in gpm

Standby Storage (SB): Storage volume to provide system reliability in cases where sources fail or during periods of unusually high demands (min. system pressure 20 psi) (Equation 9-3)

- $SB = (2 \text{ days})[(ADD)(ERUs) - t_M(Q_s - Q_L)]$

Where:

- ADD = gpd/ERU
- $t_M = 1,440$ minutes
- Q_s = Sum of all source capacity in gpm
- Q_L = Largest source capacity in gpm

Alternatively, the WSDM recommends the standby storage volume be no less than 200 gal/ERU

Fire Suppression Storage (FSS): Storage volume required to provide the maximum fire flow rate and duration (min. system pressure 20 psi)

- $FSS = (FF)(\text{duration})$

Where:

- FF = 6,250 gpm (largest fire flow demand)
- Duration = 4 hours (longest fire flow duration)

Dead Storage (DS): Storage volume below the minimum required system pressure (unusable storage)

Current Capacity

The City of Othello has three reservoirs with a total nominal storage capacity of approximately 6,000,000 gallons. The useable volume available to the system varies from 1.3 MG to 2.8 MG depending on the residual system pressure for the storage component being analyzed, i.e. 20 psi for FF and SB; 30 psi for ES. The remaining volume is referred to as “dead storage”.

Evaluation

Operational Storage

Extending service to serve the 8 water systems will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs ⁽¹⁾ (gpm)	Duration (min.)	ES (gal.)
Othello	7,600 ⁽²⁾	7,155	150	66,750
8 water systems	583 ⁽³⁾	7,155	150	0
Combined	8,183	7,155	150	154,200

⁽¹⁾ From Table 4

⁽²⁾ From Table 1

⁽³⁾ From Table 3

Standby Storage

Description	Duration (days)	ADD (gpd/ERU)	ERUs	t _M	Qs (gpm)	Q _L (gpm)	SB (Eq.9-3) (gal.)	SB (200 gpd/ERU) (gal.)
Othello	2	453	10,490	1440	7155	2500	<0	2,098,000
8 water systems	2	453	406	1440	7155	2500	<0	81,200
Combined	2	453	10,896	1440	7155	2500	<0	2,179,200

Fire Suppression Storage

Description	Largest FF Demand (gpm)	Longest FF Duration (hrs)	FF Volume (gal.)
Othello	6,250	4	1,500,000
8 water systems	1,000	2	120,000

Dead Storage

All service elevations in the 8 water systems are at or below existing City of Othello service elevations so extending City of Othello water service to the 8 water systems will not increase dead storage.

Storage Comparison

The City of Othello storage volumes with and without the 8 water systems is shown in the following table:

Table 6: Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/8 systems	
	Elevation (amsl)	Volume (gal.)	Elevation (amsl)	Volume (gal.)
Overflow ⁽¹⁾	1209.0		1209.0	
OS		239,825		239,825
Bottom of OS ⁽¹⁾	1205.0		1205.0	
ES		65,950		154,200
Bottom of ES ⁽²⁾	1203.9		1202.4	
SB		2,098,000		2,179,200
Bottom of SB ⁽³⁾	1168.9		1166.1	
FSS		1,500,000		1,500,000
Bottom of FSS ⁽⁴⁾	1178.9		1177.4	
Base Elevation	1119.6		1119.6	

- (1) From 2011 Water System Plan
 (2) Minimum elevation required to maintain 30 psi service pressure = 1195
 (3) Minimum elevation required to maintain 20 psi service pressure = 1167
 (4) Minimum elevation required to maintain 20 psi service pressure = 1170
 (5) SB and FSS are nested per 2011 Water System Plan

Conclusion

The City has adequate OS, ES and FSS storage capacity to extend water service to the 8 water systems with no improvements required.

Serving the 8 water systems will require additional SB storage capacity. The additional storage capacity is estimated to be deficient by approximately 54,000 gallons above the elevation 1167. This results in 195 gal/ERU SB storage instead of the 200 gal/ERU minimum recommendation in the WSDM.

It is noted the City has 8 operational wells and when SB is calculated per WSDM Equation 9-3 SB is zero. It would be a highly unusual circumstance with multiple source failures or extended power outage affecting all wells before the SB would be used.

1.1.5 Water Rights

Criteria

The criteria used to evaluate the adequacy of the City’s water rights are as follows:

- | | | |
|--|---|---------------------------------------|
| Maximum instantaneous flow
(based on total source capacity) | < | Maximum instantaneous withdrawal (Qi) |
| Maximum annual water use
(based on current water use data) | < | Maximum annual withdrawal (Qa) |

Current Water Right

The City’s water rights were consolidated into a unified water allocation. This unified allocation is as follows:

$$Q_i = 9,550 \text{ gpm}$$

$$Q_a = 7,100 \text{ acre-ft/yr}$$

Evaluation

The impact on the City's water rights of consolidating the BDWS into the City of Othello water system is evaluated in the following table.

Table 7: Water Rights Evaluation

Description	Q _i	Q _a
	Instantaneous water use (gpm)	Annual water use (acre-ft/yr)
City of Othello	7,155	5,300 ⁽¹⁾
8 water systems	0 ⁽²⁾	206 ⁽³⁾
Total	7,155	5,506
Water Right	9,550	7,100
Excess/(deficiency) ⁽⁴⁾	2,395	1,594

⁽¹⁾ From Table 1

⁽²⁾ The 8 water systems will not increase instantaneous withdrawal (no new sources of supply added to system)

⁽³⁾ From Table 3

⁽⁴⁾ Potential additional water rights obtained by transferring the individual system water rights to the City of Othello are not shown.

Conclusion

The City of Othello has adequate water rights to provide service to the 8 water systems.

1.1.6 Summary of Impacts of Consolidation on City Water System

The following table summarizes the impacts to the City of Othello's water system components:

Table 8: Summary of Impacts to City of Othello Water System Components

Component	Deficiencies Identified	Impacts to City System
Supply	none	none
Distribution	none	none
Storage	SB is deficient by ~48,000 gal.	SB is reduced from the DOH recommended 200 gal/ERU to 195 gal/ERU
Water Rights	none	None ⁽¹⁾

⁽¹⁾ The City will benefit from a net increase in water rights by transferring the individual system water rights to the City as part of the consolidation.