Union Consolidation Commissioner Workshop

June 13, 2017

Agenda

10:00 am	Review Water System Plan Chapters
10:15 am	Highland Park Storage Capacity Calculations
11:00 pm	Byron From BKI review of Union Consolidation Plan
12:00 pm	Working Lunch / Next steps direction

Water System Plan Chapters

1. System Description
2. Planning Data
3. System Analysis
4. Water Use Efficiency Program
5. Source Water Protection
6. Operation and Maintenance Program
7. Distribution Facilities Design & Construction Standards
8. Improvement Program
9. Financial Program
10. Miscellaneous Documents

WSP Preplan Meeting

- DOH, PUD, and Consultant Engineer
- Plan Scope
- Review of WACs
- Timeline

Water Design Manual 2009

Discussion with DOH Office of Drinking Water Staff

Storage Capacity Analysis

Step-by-Step Calculations for a Single Water System

Highland Park Capacity Analysis Calculations

Water usage based on actual service meter data from January 2006 through July 2015.
ERU = Equivalent Residential Unit = Average Day Demand of all residential connections over time

65 active connections in 2006
68 active connections in 2015

Based on the metered usage (2006 through 2015), Average Day Demand [ADD] was 199 gallons per day (gpd) per ERU.
Maximum Month Day Demand [MMDD] (month with highest usage) was 498 gpd/ERU.

Analysis Calculations

Peaking Factor = PF = 1.7 x (MMDD / ADD) =

1.7 X (498 gpd/ERU / 199 gpd/ERU = 4.25 PF

Maximum Day Demand (MDD) = PF x ADD =

4.25 X 199 gpd/ERU = 847 gpd/ERU

Storage Capacity

Equalizing Storage Requirements

$V_{ES} = (Q_{PH} – Q_S) \times 150$ min

V_{ES} = Equalizing storage component in gallons
Q_{PH} = Peak hourly demand in gpm = 1.47 x N + 33
Q_S = Total source of supply capacity, excluding emergency sources in gpm

N = 119 ERU at full build out

Q_{PH} = 1.47 gpm/ERU x N + 33 gpm = 1.47 gpm/ERU x 119 ERU + 33 gpm = 174.93 gpm + 33 gpm = **208 gpm**

Q_S = 100 gpm which is 50 gpm/well pump x 2 pumps

V_{ES} = (208 gpm – 100 gpm) x 150 min = 108 gpm x 150 min = **16,200 gal**

Provided Equalizing Storage = 6,800 gal

Storage Capacity

Standby Storage Requirements

$V_{SB} = (2 \times ADD \times N) - [T_m \times (Q_S - Q_L)]$ or $V_{SB} = 200$ gal/ERU x N

V_{SB} = Standby storage component in gallons
ADD = Average Daily Demand per ERU in gpd/ERU
N = Number of ERUs for the design year
Q_L = Capacity of the largest single sources serving the system in gpm
Q_S = Total source of supply capacity, excluding emergency sources in gpm
T_m = Maximum time remaining sources will be allowed to pump per day in minutes

ADD = 199 gpd/ERU based on years of metered data (2006 – 2015)

N = 119 ERU at full build out

Q_S = 100 gpm which is 50 gpm/well pump x 2 pumps

Q_L = 50 gpm for one pump T_m = 1,440 minutes = 24 hours/day

Storage Capacity

Standby Storage Requirements

V_{SB} = (2 x 199 gpd/ERU x 119 ERU) – [1,440 min x (100 gpm – 50 gpm)]

V_{SB} = (47,362 gal) – [1,440 min x 50 gpm] = 47,362 gal – 72,000 gal =

-24,638 gal

V_{SB} = 200 gal/ERU x 119 ERU = **23,800 gal**

Provided Standby Storage = 10,166 gal

ADD = 199 gpd/ERU based on years of metered data (2006 – 2015)

N = 119 ERU at full build out

Q_S = 100 gpm which is 50 gpm/well pump x 2 pumps

Q_L = 50 gpm for one pump T_m = 1,440 minutes = 24 hours/day

Chapters 2 and 3

Chapter 2 – Planning Data

Chapter 3 – System Analysis

Chapter 2 Basic Planning Data

Plan for 6 yr, 10 yr, and 20 yr time frames. Ten year allows us to get the state approval for a 10 Yr WSP.

This chapter reviews historical population and metered data to predict future water demands. Metered data was from 2006 through July 2015 except for Union Ridge which was not fully metered until mid-2011.

Chapter 2 Basic Planning Data

For the Union Regional Water System Plan the following were reviewed for all six systems and for the combined water system:

- total water production by system
- total water sales by system
- demands per connection
- demands by class within Alderbrook (residential, golf course, and resort)
- maximum day demand
- peak hour demand
- annual demand
- distribution system leakage
- ERUs served

Chapter 2 Basic Planning Data

Maximum Day Demand (MDD) is either based on daily meter read or estimated by multiplying 1.7 times the ratio of Maximum Month Day Demand (MMDD) to Average Day Demand (ADD).

MDD = 1.7 x (MMDD/ADD) in gpd/ERU

Peak Hour Demand (PHD) is based on the number of connections served or planned to be served and the Maximum Day Demand.

PHD = (MDD / 1440 minutes) x [(C x N) + F] + 18 in gpm

C = Coefficient from Water System Design Manual Table 5-1
N = number of ERUs served
F = Factor from Water System Design Manual Table 5-1

Chapter 2 Basic Planning Data

Distribution System Leakage (DSL) is the difference of Water Production and Total Water Sales minus usage for flushing and authorized hydrant usage such as fire suppression.

DSL = Production – Sales – Flushing – Authorized Hydrant Use in gallons

Chapter 2 Basic Planning Data

Based on the historical data, projected land use, and projected county growth rate, we strive to predict demands for the water system for the 6-year, 10-year, and 20-year planning timeframes.

Table 2-19 shows the predicted ERUs, ADD, MDD, PHD, and Annual Demand by year for the next twenty years. The ERUs include ERUs for leakage (DSL).

The end of the chapter discusses impacts of conservation and rates on demands as well as projected non-revenue water (flushing and fire suppression).

Chapter 3 System Analysis

Reviews system design standards, water quality analysis, facilities analysis, system capacity limits, and identifies needs and concerns.

WAC 246-290 Group A Public Water Systems – state regulations for Group A water systems that sets standards for capacity, water quality, and system reliability.

Water System Design Manual (DOH) 2009 – standards so Group A systems can comply with WAC 246-290.

Standard Specifications for Road, Bridge and Municipal Construction (WSDOT, APWA) Most Current Edition – standards for materials and workmanship for most public works projects including public water systems.

Mason County PUD No. 1 Design Standards – standards used by the PUD for construction of water systems.

Chapter 3 System Analysis

Water Quality Standards:

•WAC 246-290 (groundwater regulations only)

•Code of Federal Regulations (CFR) Title 40, Parts 141 and 143

Table 3-1 (pg. 3-3) reviews the various General Facilities Requirements from the DOH Design Manual: ADD, MDD, PHD, minimum pressure, maximum pressure, pipe sizing, valve spacing, and source reliability. The third column lists what the standard means for the Union Regional Water System.

A review of the water quality over the years. The Hood Canal Water System has a history of total coliform. There are no other water quality concerns.

Chapter 3 System Analysis

Facilities Analysis

- Sources
- Water Rights
- Treatment
- Storage

  Effective Storage = Equalizing Storage + Standby Storage or Fire Suppress Storage (whichever is greater)

- Distribution System
- Hydraulic Analysis (model)
- Capacity Analysis

Chapter 3 System Analysis

Capacity Analysis

- Source
- Instantaneous Water Rights (Q_i)
- Annual Water Rights (Q_a)
- Storage Capacity
  - Equalizing
  - Standby
  - Fire Suppression

Chapter 3 System Analysis

Based on the analyses of Chapter 3:

- Source capacity needs to be developed for 20-hour pumping before Year 2021 to meet MDD
- Lack of storage to meet existing demands (pg. 3-50,51) Storage capacity – "The most limiting factor is Storage, which limits the system to 1,717 ERU's. This is 116 ERU's fewer than the 1,833 ERU's represented by 2015 water use and connection data".
- Routine chlorination may need to be installed
- Miles of water main need to be replaced (approximately 28 miles exist and 58% is PVC, 35% is asbestos with 2.4% galvanized.)

Chapters 8 and 9

Chapter 8 – Improvement Program

Chapter 9 – Financial Program

Chapter 8 Improvement Program

Improvements Divided by:

- 10 Year
- 20 Year
- Non-Capital

Improvements are based on deficiencies, expected growth, and needed programs identified in previous chapters.

Chapter 8 Improvement Program

Nothing is designed.
Sizes are bare bones, basic – based on engineering calculations from DOH Design Manual and basic building codes.
Costs are estimates that include:

- •Engineering Reports and Designs (required)
- •DOH and County Reviews (required)
- •Permitting (required)
- •Construction (most have to go out to bid)

Years listed in Table 8-4 are estimates – for 10-Yr Plan have to provide year for each project.
Table 8-5 is 20-Yr Capital Improvement Plan