# Slowing it Down in Eastern Idaho

## Idaho Falls VFD Analysis

**May 8, 2012**

**2013 PNWS-AWWA Conference**
**Spokane, Washington**


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# DAVID RICHARDS, P.E., CITY OF IDAHO FALLS WATER SUPERINTENDENT

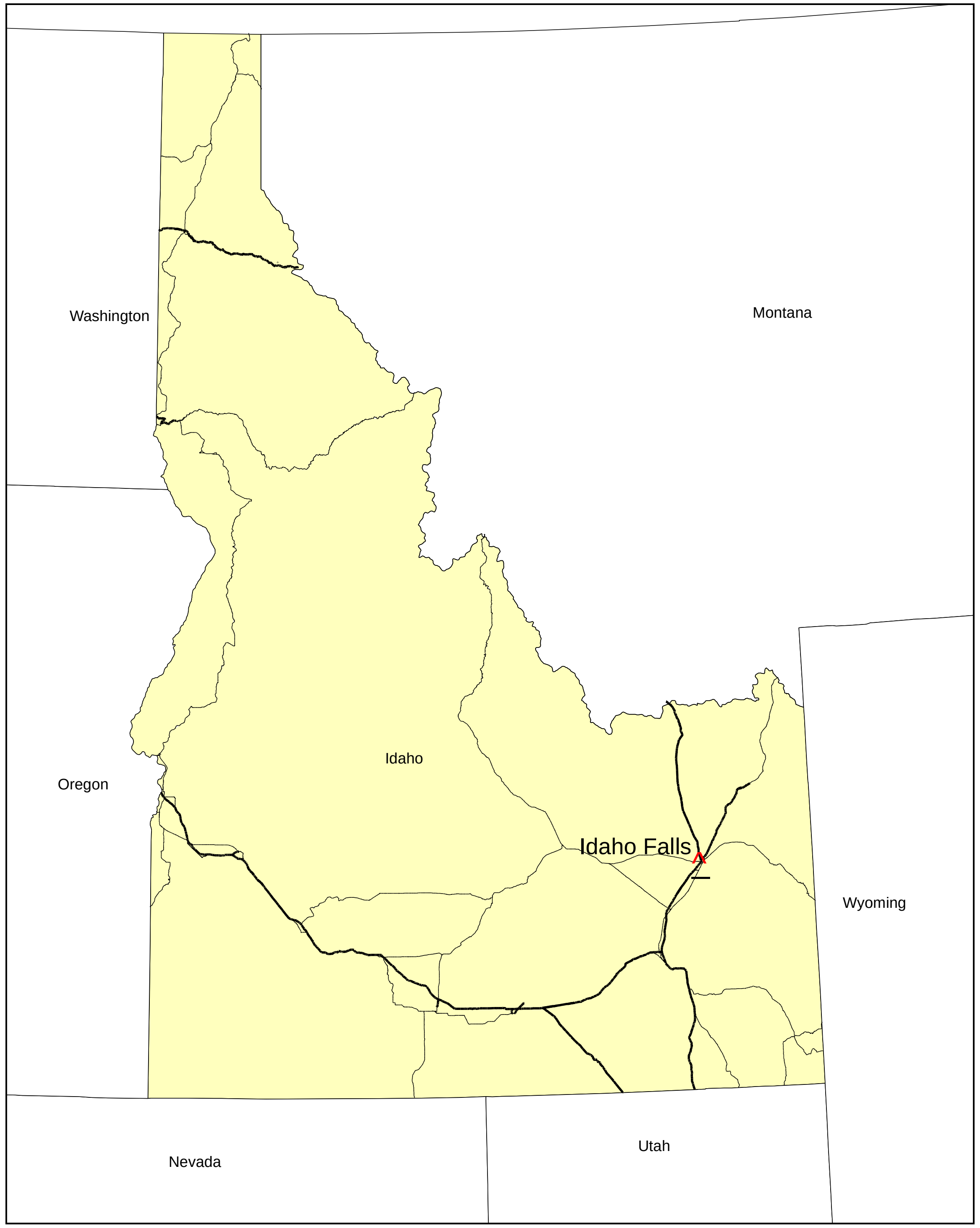
# INTRODUCTION

- City & Water System Overview
- System Issues & Reasons for the Project
- Project Approach
  - Facility Review
  - Planning & Modeling
  - Preliminary Selection and Concept Plans
- Next Steps

# CITY & WATER SYSTEM OVERVIEW

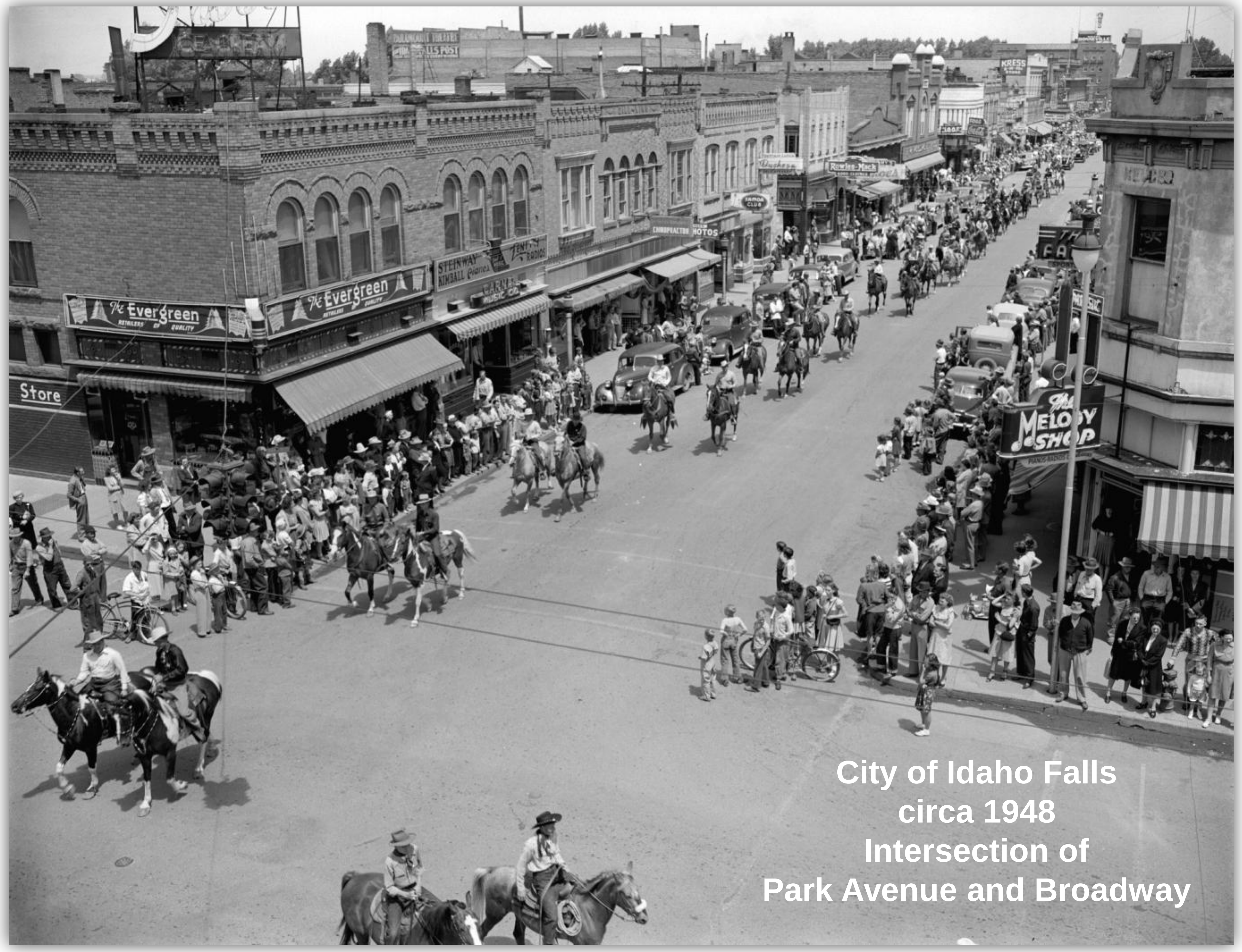
# IDAHO FALLS

- In Bonneville County in Southeastern Idaho
- 2 hours from Jackson Hole, WY
- 2 hours from West Yellowstone, MT
- 3 hours from Salt Lake City, UT
- 4 hours from Boise, ID
- Approximately 57,000 people
- Elevation ranges from 4,600 to 4,800 feet above MSL



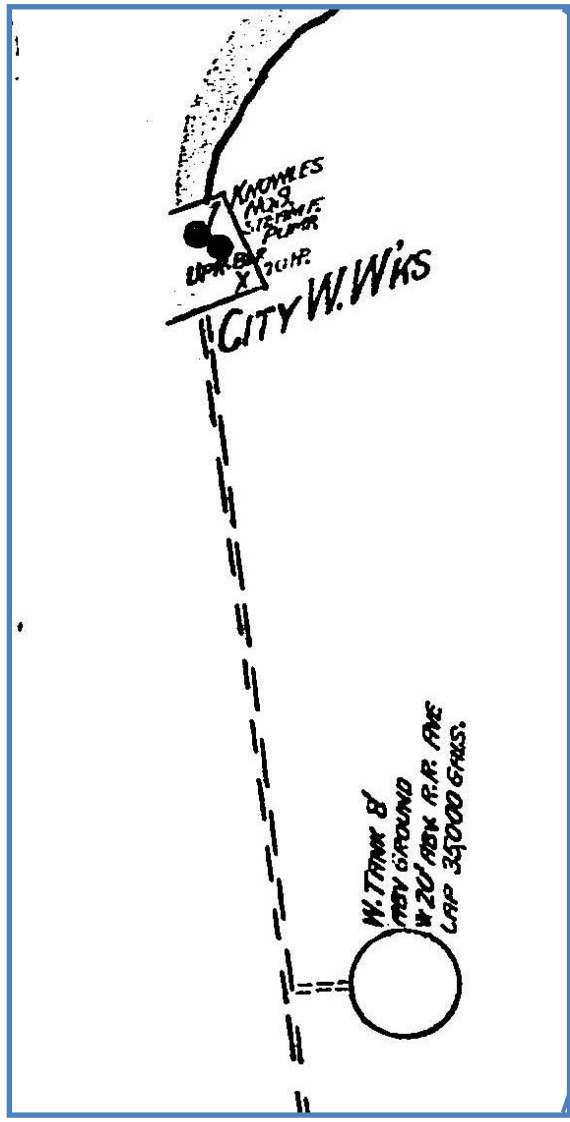
# IDAHO FALLS

- Originally settled in 1865 as Eagle Rock after construction of Taylor's Bridge on Snake River
- Eagle Rock later became Idaho Falls (July 22, 1891)
- With development, the nature of water use forever changed
- Fields developed into a thriving  municipality
- City needed then, as it does now, water to accommodate growth

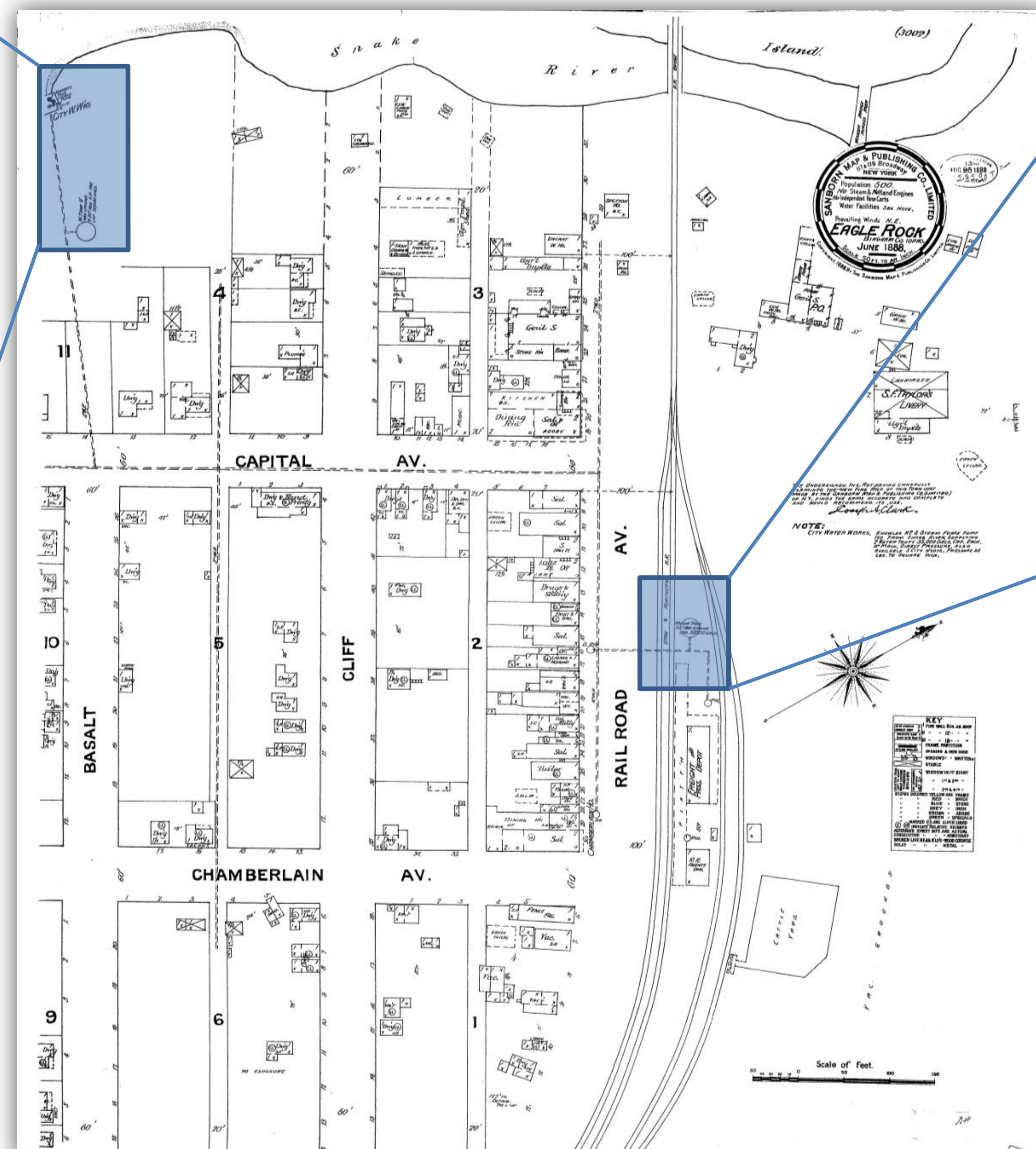



City of Idaho Falls
circa 1948
Intersection of
Park Avenue and Broadway

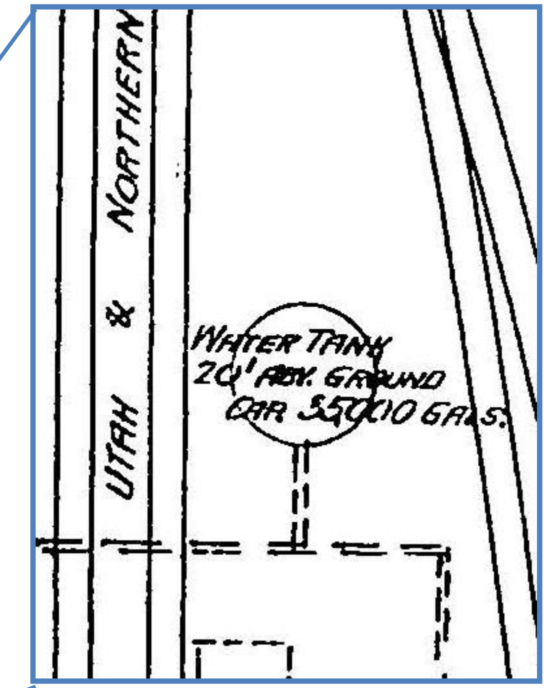
# WATER DEPARTMENT COMMENCEMENT




City of Eagle Rock pumped surface water from the Snake River




City of Eagle Rock – June1888
(Sanborn Map & Publishing Co. Ltd.)




- Water was stored in two 35,000-gallon water tanks
- 40 years later, City's first well was dug in 1927 and is still in use today
- Ample water source facilitated growth

# SELECTING SOURCE WATER

## SURFACE WATER vs. GROUNDWATER

**SURFACE WATER**

- Accessible Since Settlement
- High Cost of Treatment
- Less Consistent Supply
- More Susceptible to Freezing

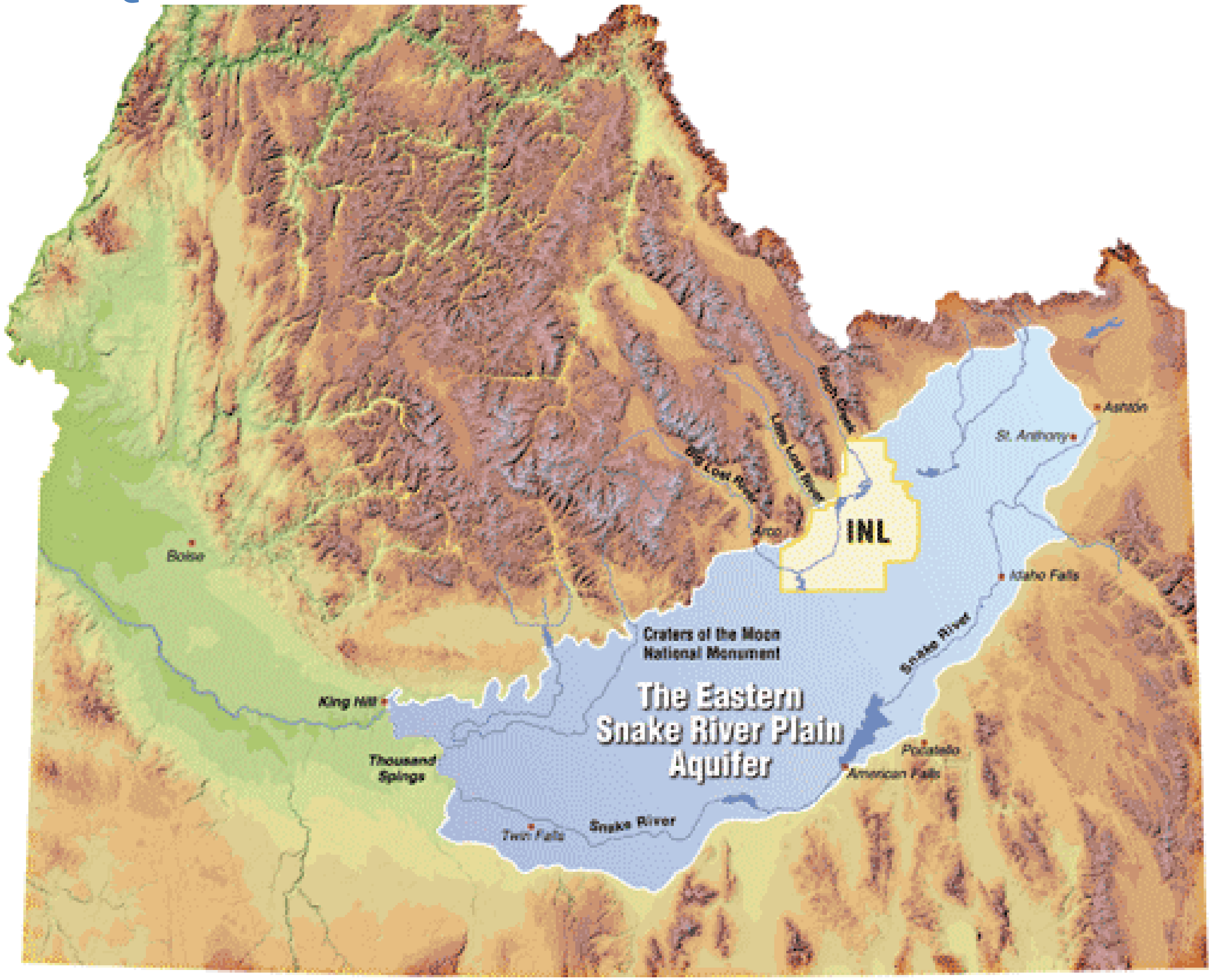
**GROUNDWATER**

- More Accessible Since 1950's
- Low Cost of Treatment
- More Consistent Supply
- Less Susceptible to Freezing

# THE CITY'S GROUNDWATER SOURCE

## EASTERN SNAKE RIVER PLAIN AQUIFER

- Supplies nearly all drinking water to Southeast Idaho
- Supplies irrigation for many agricultural needs
- Estimated volume of 200 billion cubic feet
- Aquifer occupies nearly the same size in surface area as Lake Erie
- Idaho Falls well drilled to nearly 2,000 feet in depth; still encountered water
- Abundant supply led to construction of many wells



# THE CITY'S WATER RIGHTS

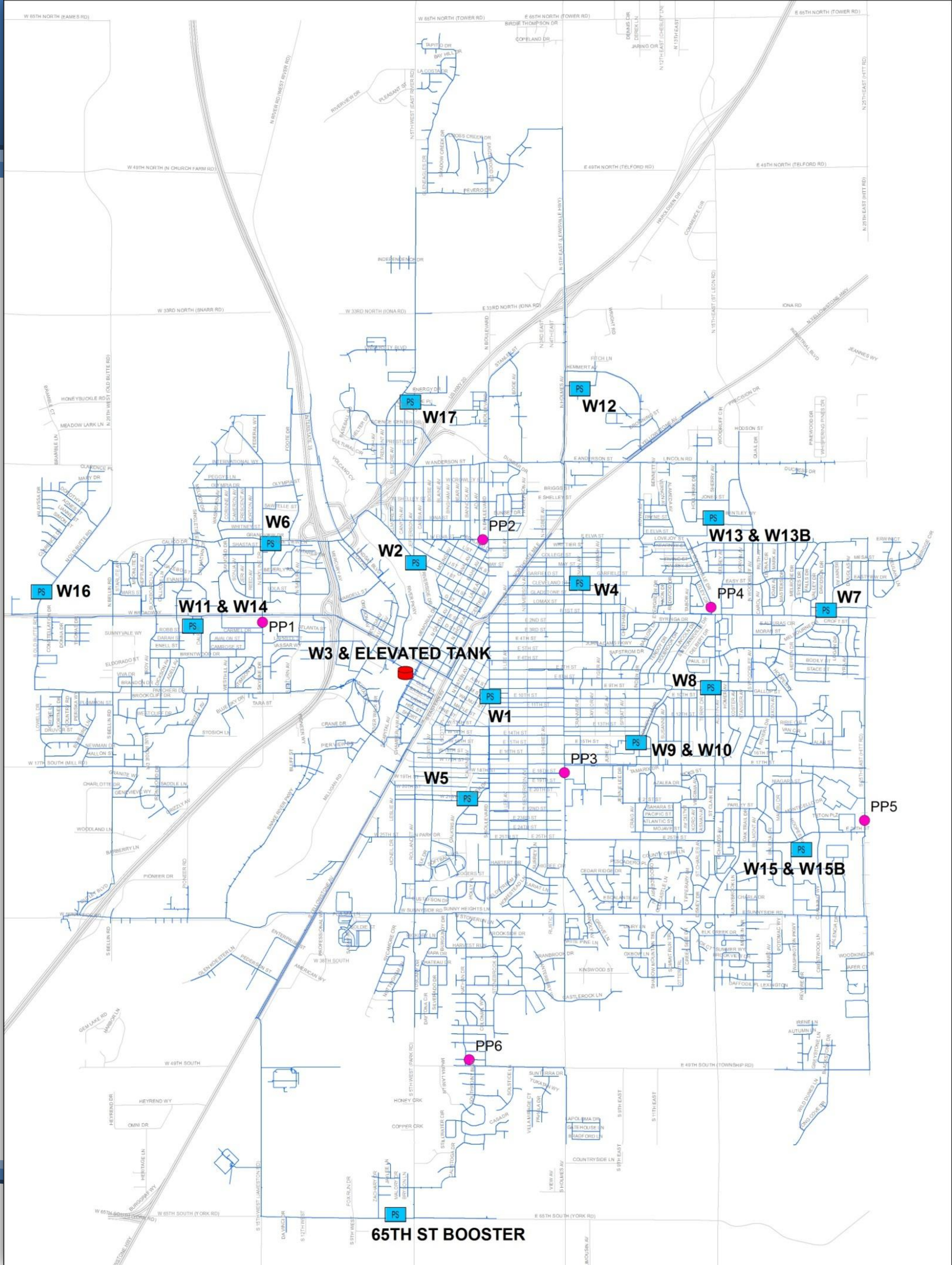
- All City's Groundwater Rights Issued Between 1927 & 1988
- Current Moratorium on Issuance of New Water Rights in Eastern Snake River Plain Aquifer
- Groundwater Rights Now Conjunctively Managed With Senior Surface Water Rights
- Cities Must Purchase Existing Groundwater Irrigation Rights & Transfer Them into City
- Groundwater Model Used to Determine Negative Impacts of Water Right Transfers

| Well No. | Year Built | Priority Date | Water Right No. | Current License Information | | | |
|---|---|---|---|---|---|---|---|
| | | | | License | Date | CFS | AF/Annum |
| 1 | 1926 | 2/25/1927 | 25-2095 | 25-2095 | 3/10/1939 | 5.20 | **3758.04** |
| 2 | 1930 | 4/8/1963 | 25-2142 | 25-2142 | 6/9/1970 | 50.20 | 20200.00 |
| 3 | 1937 | | | | | | |
| 4 | 1948 | | | | | | |
| 5 | 1950 | | | | | | |
| 6 | 1954 | | | | | | |
| 7 | 1957 | | | | | | |
| 8 | 1959 | ↓ | ↓ | ↓ | ↓ | ↓ | |
| 9 | 1962 | 11/22/1963 | 25-2143 | 25-2143 | 6/9/1970 | 17.10 | |
| 10 | 1962 | ↓ | 25-2143 | ↓ | ↓ | ↓ | |
| 11 | 1965 | 7/13/1967 | 35-7001 | 35-7001 | 4/3/1970 | 8.90 | ↓ |
| 12 | 1970 | 1/18/1972 | 25-7022<br>35-7207 | 25-7022 | 3/23/1978 | 7.35 | 4609.00 |
| 13 | 1974 | 8/22/1974 | 25-7058 | 25-7058 | 4/30/1981 | 6.14 | **4437.38** |
| 13-B | **In Approval Process** | | | **In Approval Process** | | | |
| 14 | 1978 | 2/7/1979 | 35-7841 | 35-7841 | 1/17/1990 | 7.35 | **5311.85** |
| 15 | 1983 | 12/23/1982<br>1/11/1985 | 25-7298<br>25-7398 | 25-7298<br>25-7398 | 1/28/1993<br>2/5/1993 | 4.90 | **3541.23** |
| 15-B | 2003 | 9/3/1997 | 25-7654 | 25-7654 | 11/6/1997 | 6.70 | **4842.09** |
| 16 | 1992 | 2/10/1988 | 35-8682 | 35-8682 | 8/31/1994 | 8.02 | **5796.05** |
| 17 | 1994 | 9/9/1988 | 25-7467 | **In Permitting** | | 8.02 | **5796.05** |
| | | | | | **Totals:** | 129.88 | 58291.69 |

**NOTE:** **Bold purple numbers indicate that no limit was noted on License. Values are derived from CFS values on License (CFS*1.98*365)**

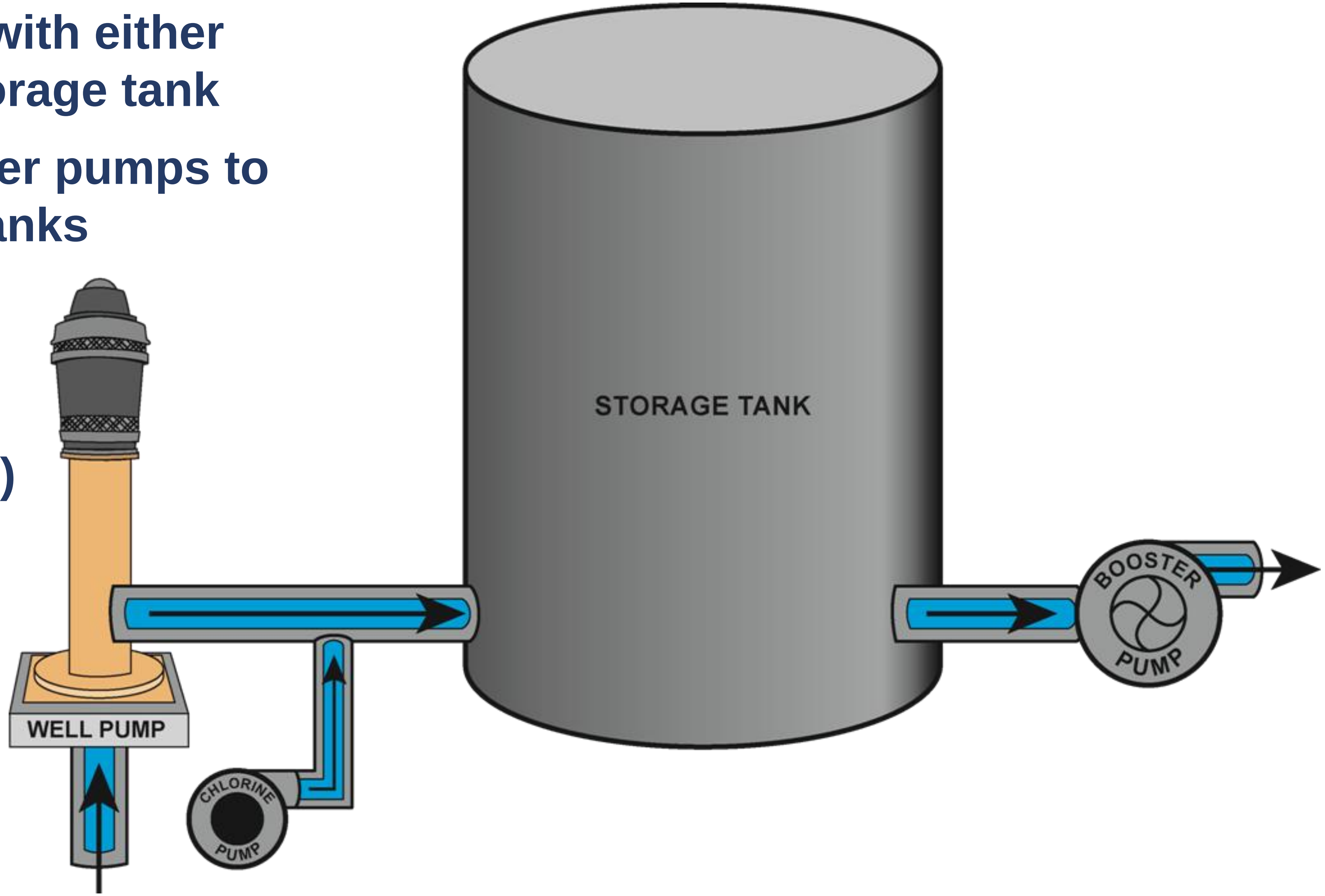
# WATER SYSTEM SETUP

- One pressure zone covers 23 square miles
- One 0.5 MG elevated tank
- 19 deep wells located on 15 sites
- Pump sizes range from 1,000 gpm to 5,600 gpm
- Total well pumping capacity is 90 mgd
- Central SCADA controls system from readings on 6 remote pressure points (4 more recently added that aren't yet used for control)



# WATER SYSTEM SETUP

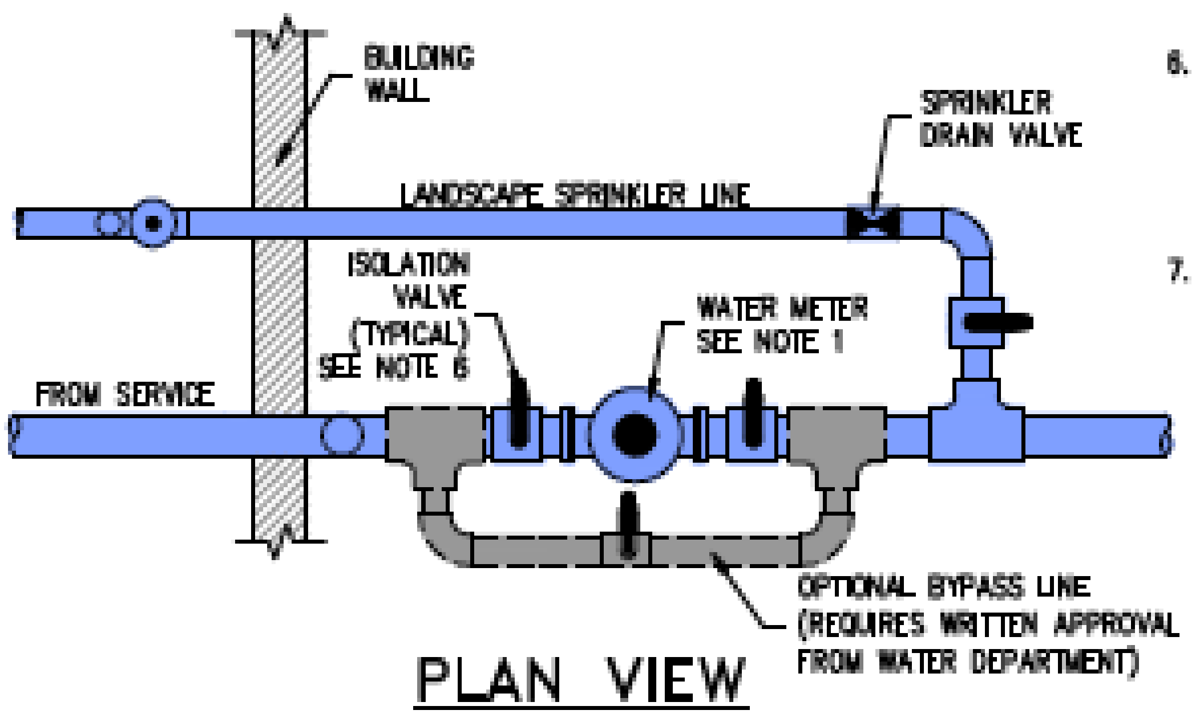
- Each well site is equipped with either chlorine contact tank or storage tank
- All but one well uses booster pumps to boost water from contact tanks into system
- Booster pumps are mostly constant speed pumps (Well 12 & 65th St are VFDs)



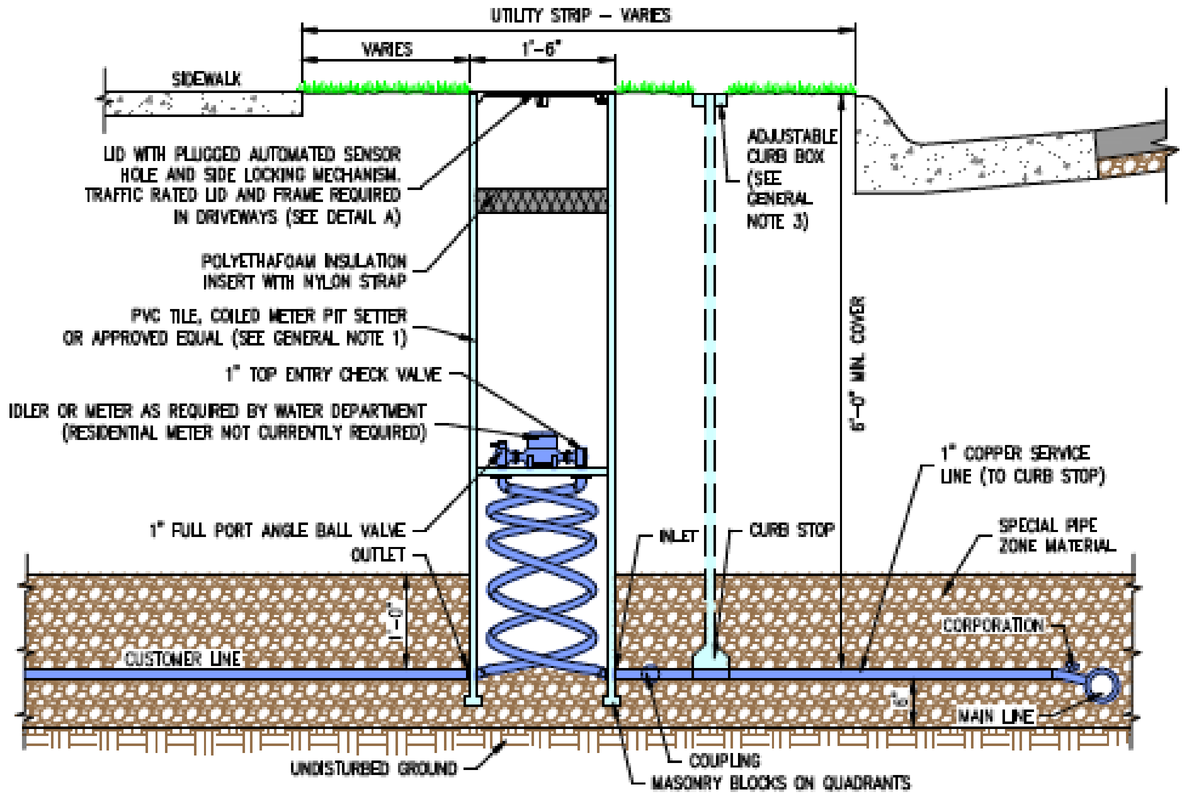
# WATER USE

- Approximately 24,000 service connections
- Around 200 commercial/industrial services are metered
- No other services are metered
- New construction is required to install provisions for a meter, but not install an actual meter

## COMMERCIAL INTERIOR METER SETTER




## RESIDENTIAL METER PIT



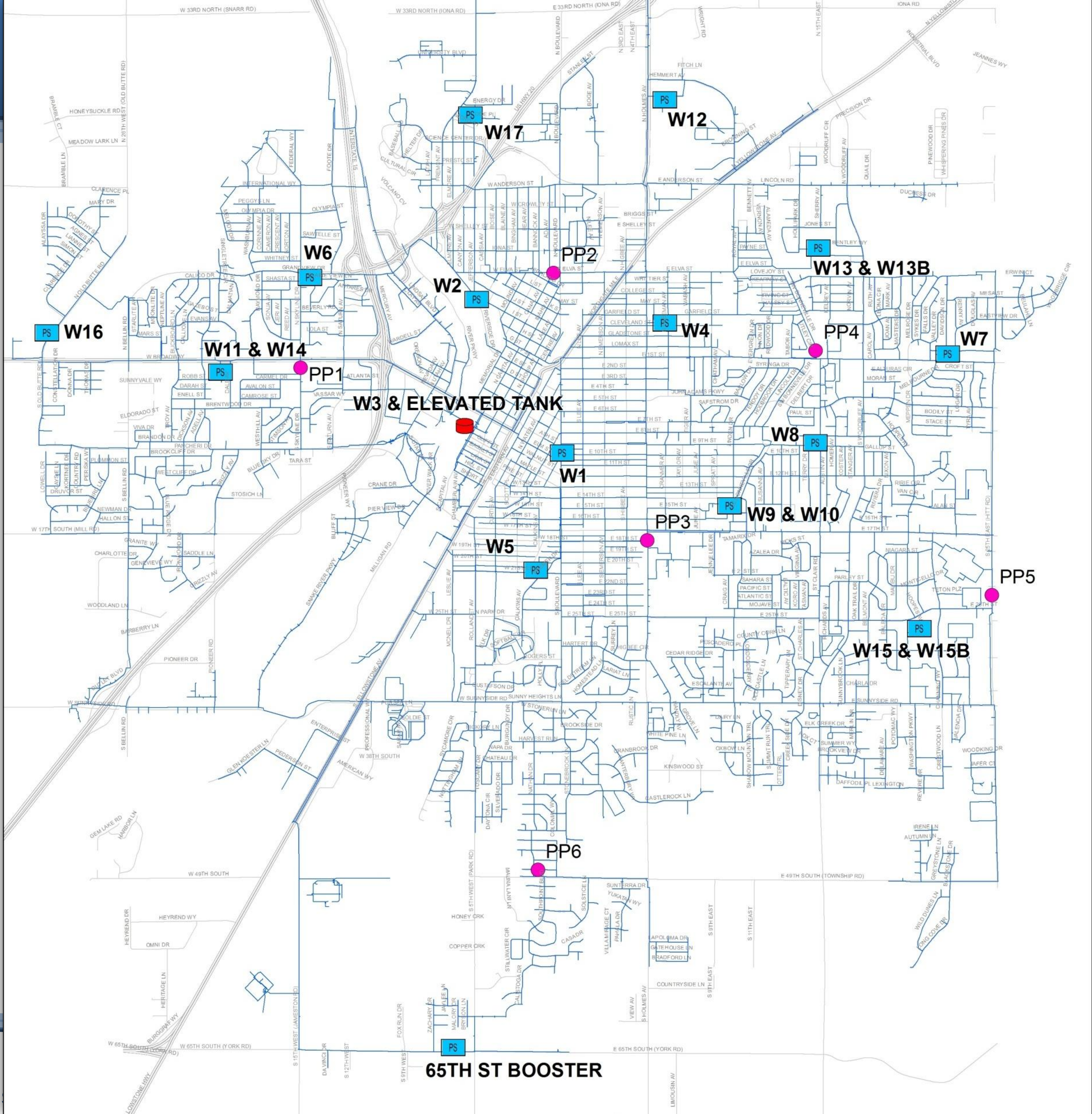

**Per Idaho State Regulations (IDAPA 58.01.08), the City of Idaho Falls Requires Installation of Either a Commercial Interior Meter Setter (Commercial Businesses Only) or a Meter Pit (Commercial or Residential)**

# WATER PRODUCTION

| Season (2008-2011) | Average Day Demand (mgd) |
|---|---|
| Low Demand (Nov-Apr) | 11 |
| Shoulder (May, Oct) | 21 |
| High Demand (June-Sept) | 44 |

| | |
|---|---|
| **Maximum Day Demand (2008-2011)** | **58 mgd** |
| **Peak Hour Demand (2008-2011)** | **79 mgd** |

- Booster pumps are controlled by remote pressure points
- Set points and order of operation varies by seasonal demand



# SYSTEM ISSUES & REASONS FOR THE PROJECT

# PROJECT DRIVERS

- Significant demand variability
- Limited reservoir hydraulic grade control
- Inefficient pumping scheme
- Lack of localized control
- All or nothing pumping
- Remote pressure transients
- Little understanding of the distribution of demand

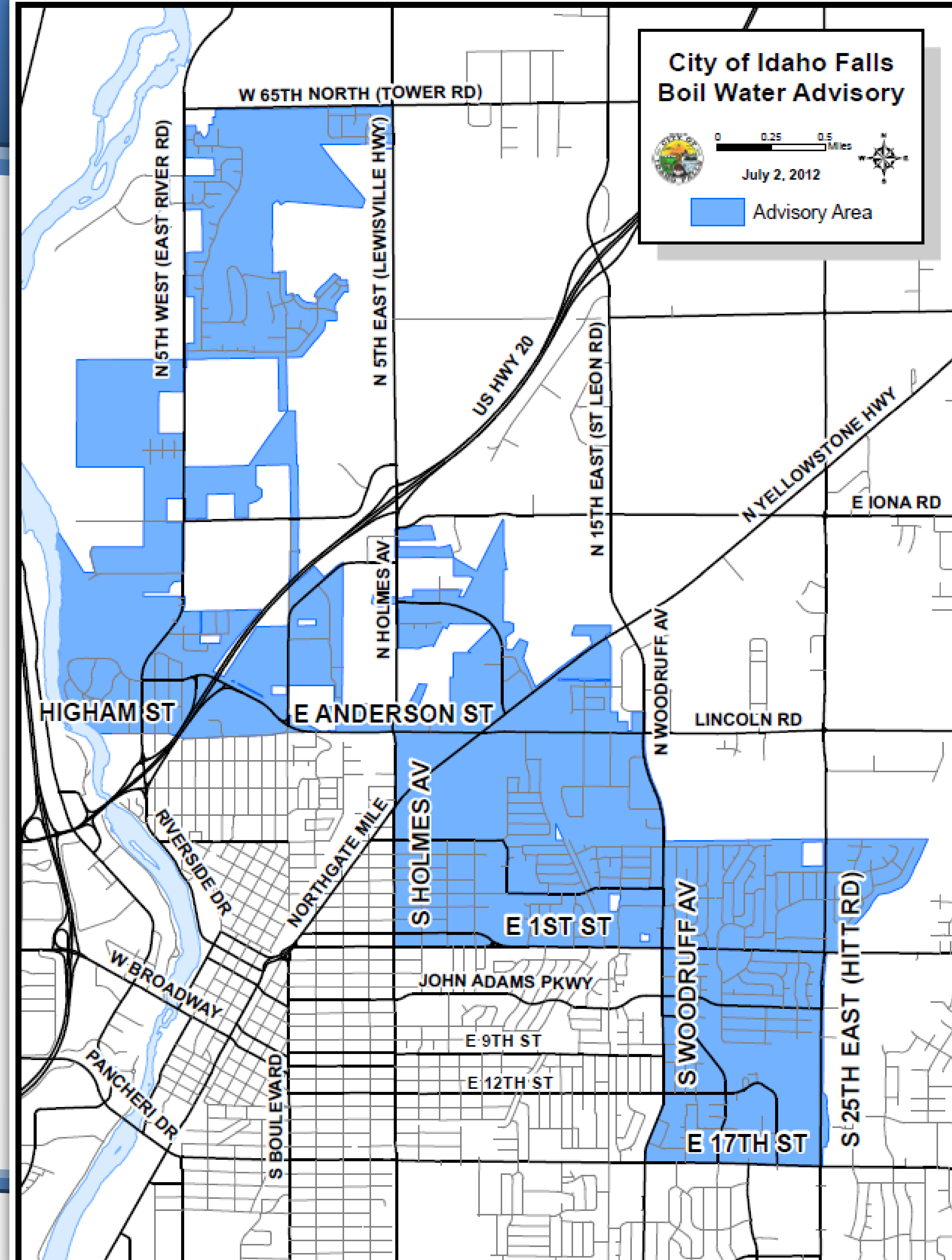
# CURRENT CONTROL STRATEGY


- System pressure drops at pressure point
- Central SCADA calls for booster pumps at well sites to turn on
- Booster pumps begin to drain chlorine contact tank, causing well to turn on
- Actuated butterfly valve restricts flow from booster pump to keep water level constant in chlorine contact tank
- System pressure rises at pressure point
- Central SCADA calls for booster pumps at well sites to turn off
- Wells refill contact tanks and shut down

# BOIL ADVISORY – 6/2/2012

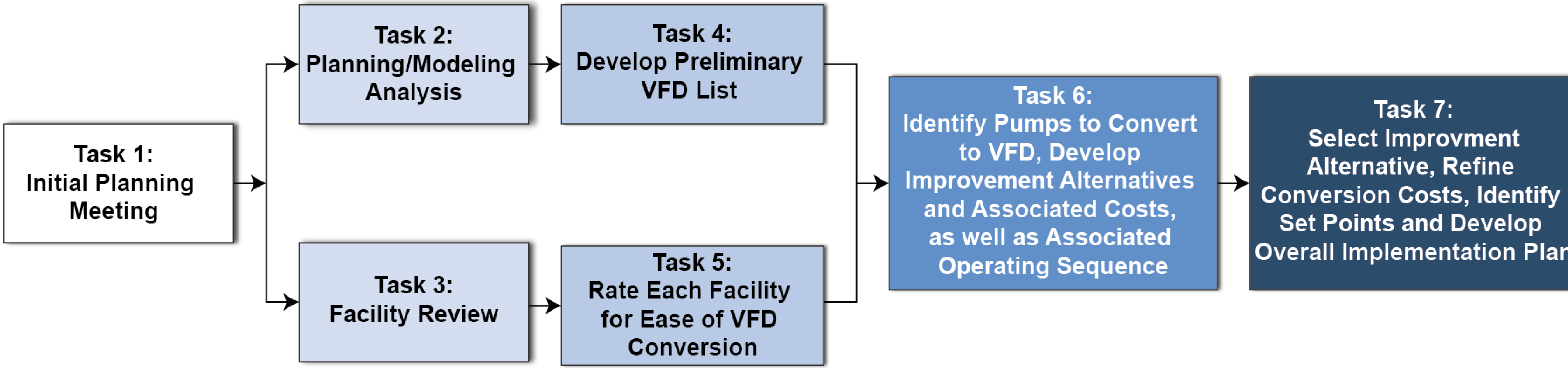
## PROBLEMS WITH CURRENT CONTROL STRATEGY

- SCADA radio communication lost, system pressure increased, command sent to turn off wells, but wells didn't turn off
- Communication restored; queued commands shut all wells down in automatic control
- Radio communication lost again
- Only wells in manual control remained on
- System pressure reduced to below 20 psi for approximately 25% of service area
- Public notification issued, BAC-T samples taken
- System controlled manually for entire week while SCADA system repaired
- Could have been avoided with local control at well sites



# PROJECT APPROACH

## PROJECT APPROACH FLOW CHART



# PROJECT CONSTRAINTS

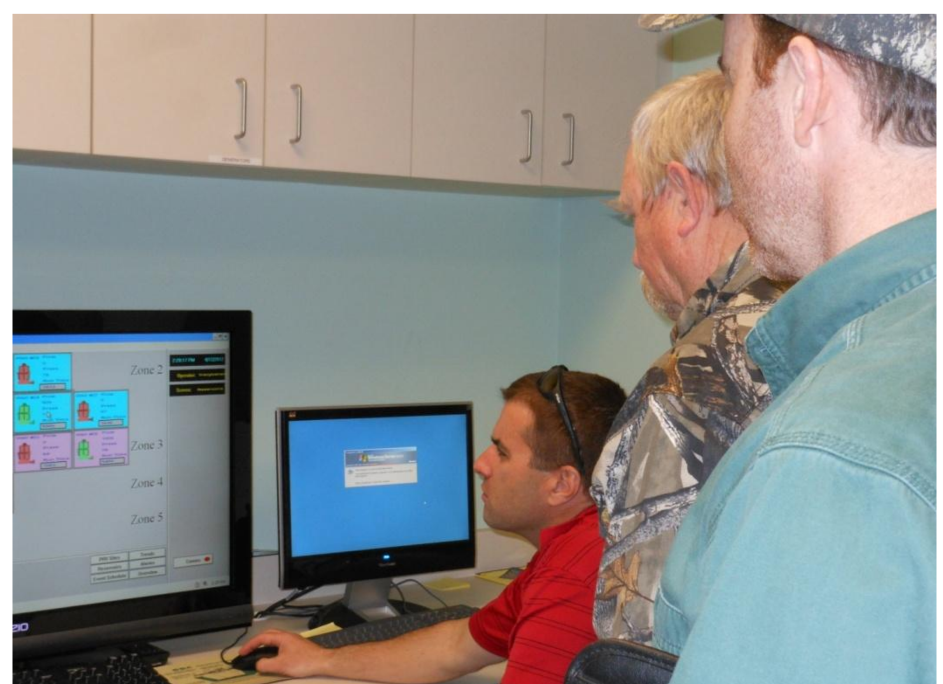
- ❑ **Limited budget**
  - **Limited pumps could be converted to VFD initially**
- ❑ **Large single pressure zone**
- ❑ **Remote pressure points**
- ❑ **Limited SCADA information on system operations and response**
- ❑ **Limited data on current energy use**
- ❑ **Negative O&M staff perception of VFDs**

# EXISTING VFD EXPERIENCE

- City previously had system that used liquid resistance technology to vary pump speed
- Many issues with maintenance and operation
- Currently have 2 operating VFDs in System
- Only 1 on well/booster facility (Well 12)

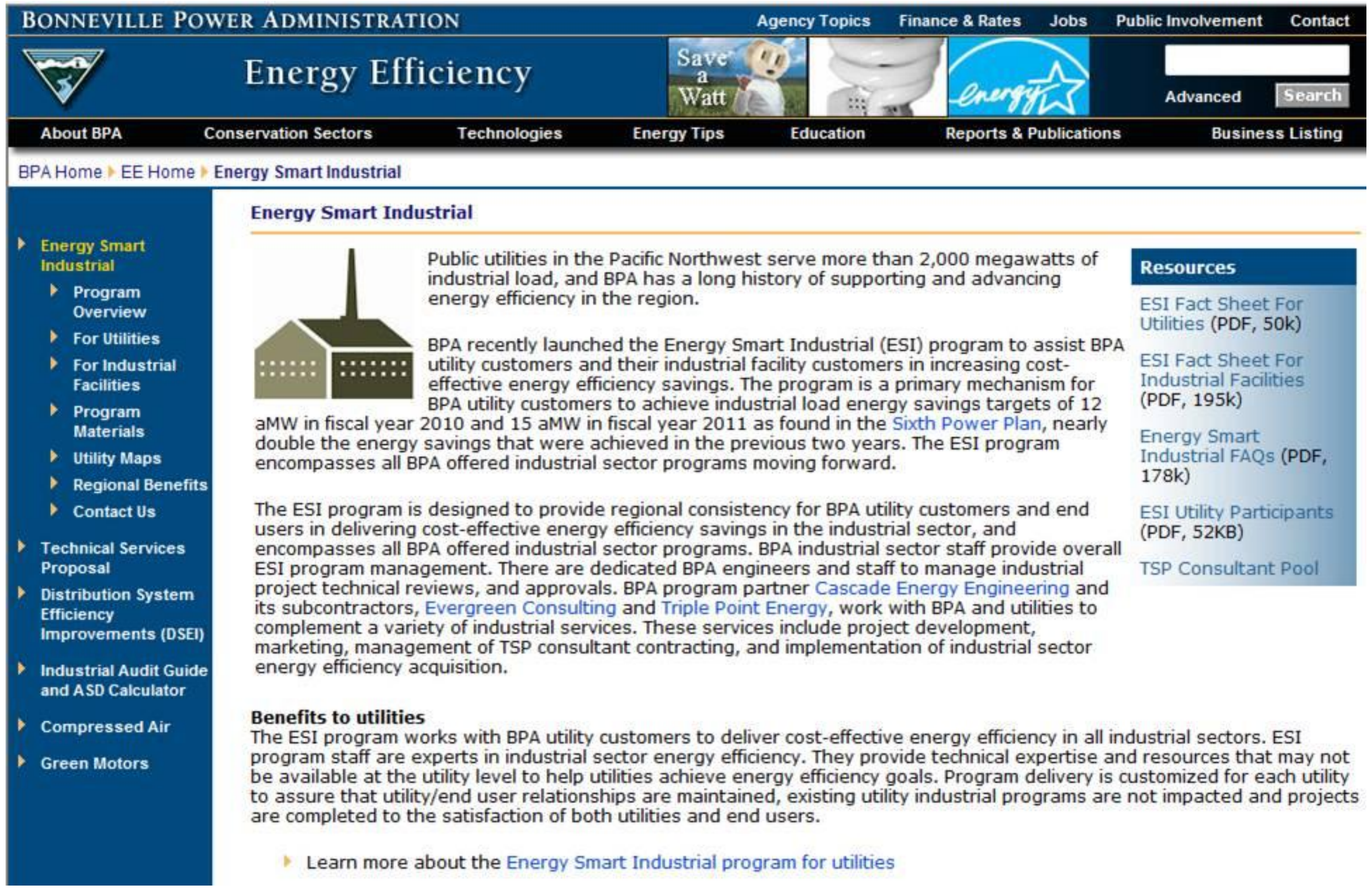
# SITE VISIT - MERIDIAN, ID

- City of Meridian
  - Similar System
  - VFD Driven Well Pumps
- Primary purpose
  - Reduce Operator Concern about VFD technology and use

# ENERGY CONSUMPTION INCENTIVES

- Bonneville Power Administration (BPA) works with Idaho Falls Power
- BPA offers energy efficiency dollars to public utilities each year
- In 2012 the City received $95,000 from BPA for upgrades at the WWTP
- The same program may be used for efficiency upgrades to water pumping
- Eliminating the butterfly valve operation will provide energy savings
- Must document energy improvements through before and after data
- Incentive dollars vary by year—likely monitoring in 2014 and implementation in 2015



# FACILITY REVIEW

# OPERATOR SURVEY

- Survey given to operators for general feedback on facility condition and operational set points
- Used feedback along with site assessments to rate facilities

# FACILITY REVIEW

- Visited each facility and reviewed the following:
  - Available space
  - Structure Condition
  - Pump and motor compatibility with VFD
  - Discharge piping
  - HVAC
  - Building electrical (outside motor control)

# FACILITY REVIEW – AVAILABLE SPACE

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# FACILITY REVIEW – STRUCTURE CONDITION

# FACILITY REVIEW – PUMP AND MOTOR

# FACILITY REVIEW – PUMP AND MOTOR

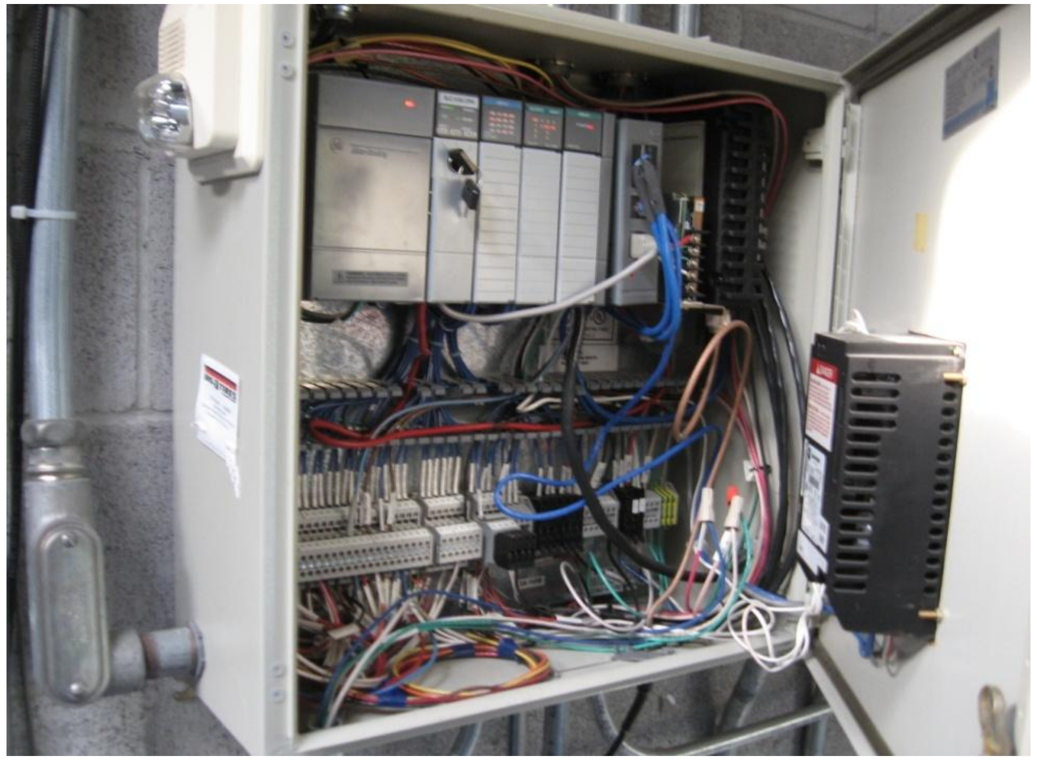
# FACILITY REVIEW – DISCHARGE PIPING

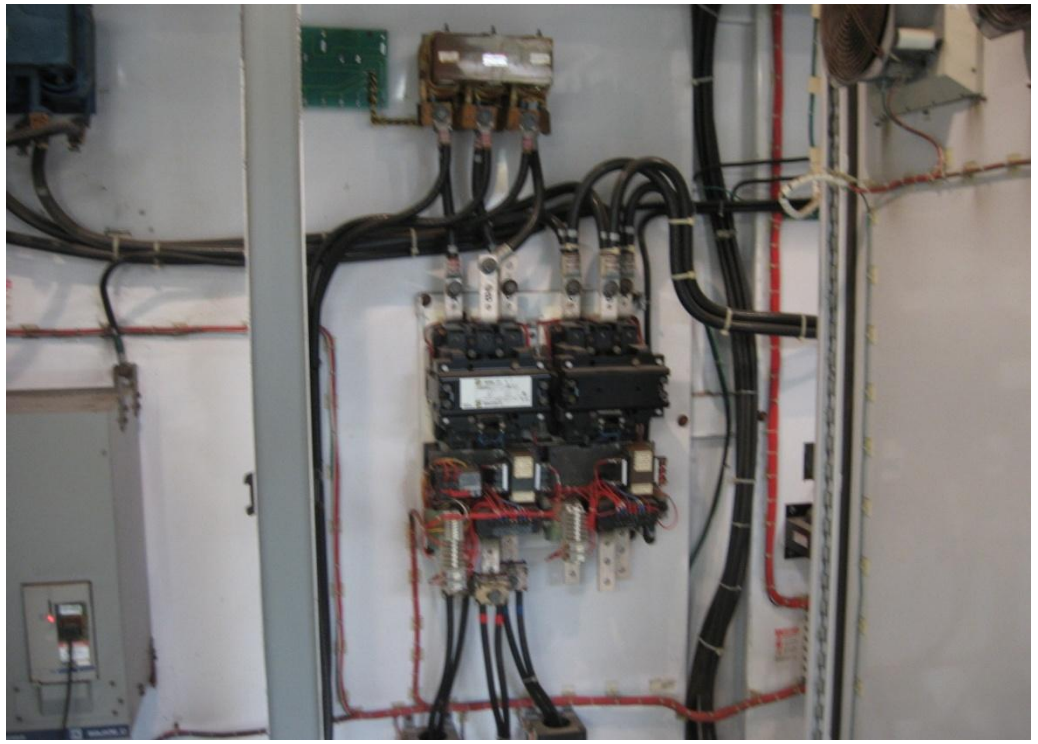
# FACILITY REVIEW – DISCHARGE PIPING

# FACILITY REVIEW – HVAC

# FACILITY REVIEW – ELECTRICAL SYSTEM

| Booster System | Electrical Upgrades | |
|---|---|---|
| | Most Recent | Planned |
| 1 | 2002 | 2022 |
| 2 | 2001 | 2021 |
| 3 | 1995 | 2015 |
| 4 | 1996 | 2016 |
| 5 | 1997 | 2017 |
| 6 | 2012 | 2032 |
| 7 | | |
| 8 | 2000 | 2020 |
| 9 | 1994 | 2014 |
| 10 | 1994 | 2014 |
| 11 | 2011 | 2031 |
| 13 | 2005 | 2025 |
| 14 | 2011 | 2031 |
| 15 | 1982 | 2002 |
| 16 | 1991 | 2011 |
| 17 | 1994 | 2014 |





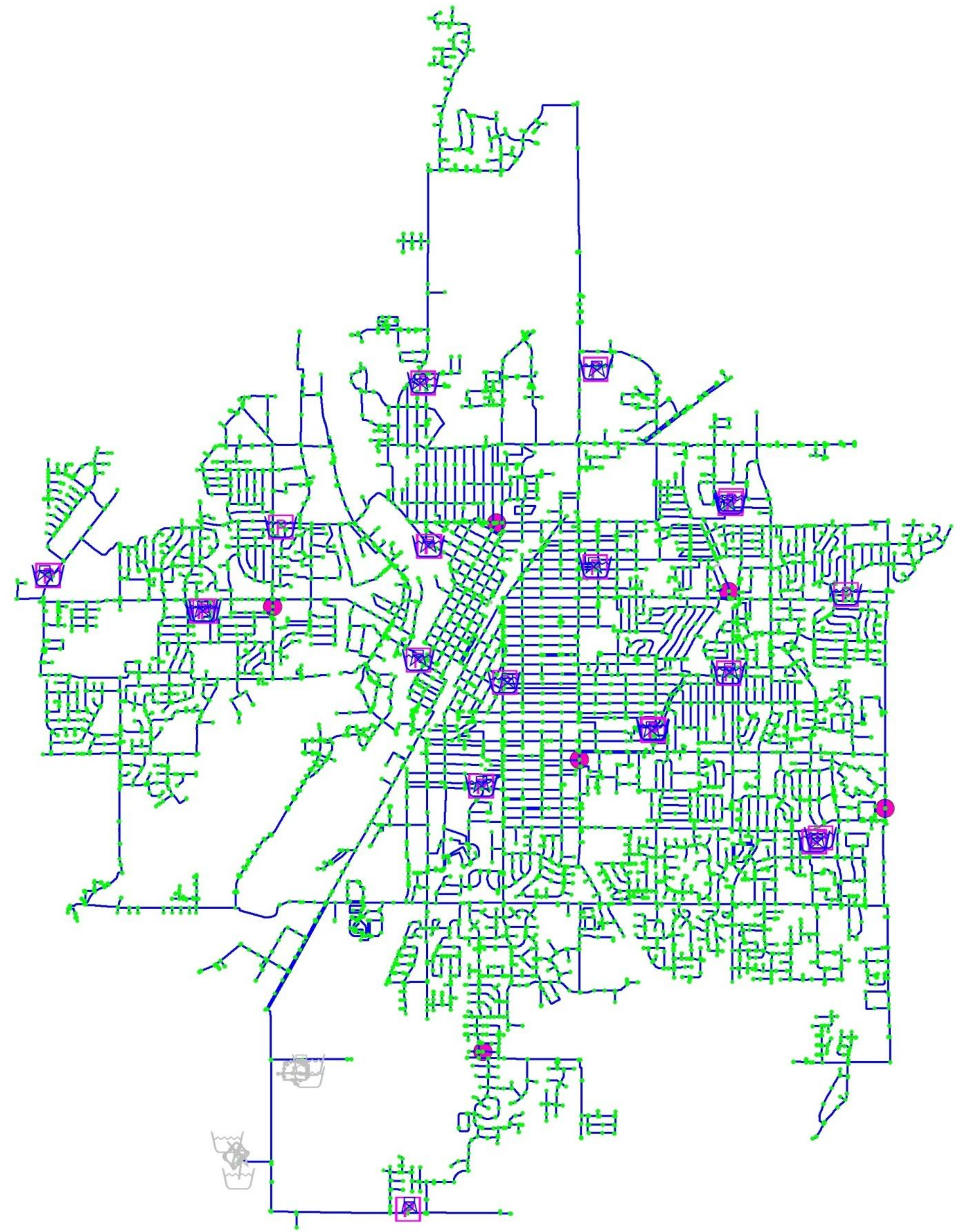
# FACILITY RANKING

| Booster System | Structure Expansion Required | Structure Quality (rennovation requirements) | Pump Upgrade Required | Piping Upgrade Required | HVAC Upgrades Required | Motor Rebuild Required | Electrical Upgrades Required (System Outside of Motor Control) | Total Facility Score |
|---|---|---|---|---|---|---|---|---|
| 13 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 11 |
| 14 | 1 | 2 | 2 | 1 | 3 | 2 | 1 | 12 |
| 15 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 12 |
| 16 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 13 |
| 17 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 13 |
| 11 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 13 |
| 2 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 14 |
| 9 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 14 |
| 10 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 14 |
| 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 18 |
| 6 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 18 |
| 8 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 18 |
| 4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 19 |
| 5 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 19 |
| 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 20 |

# PLANNING & MODELING

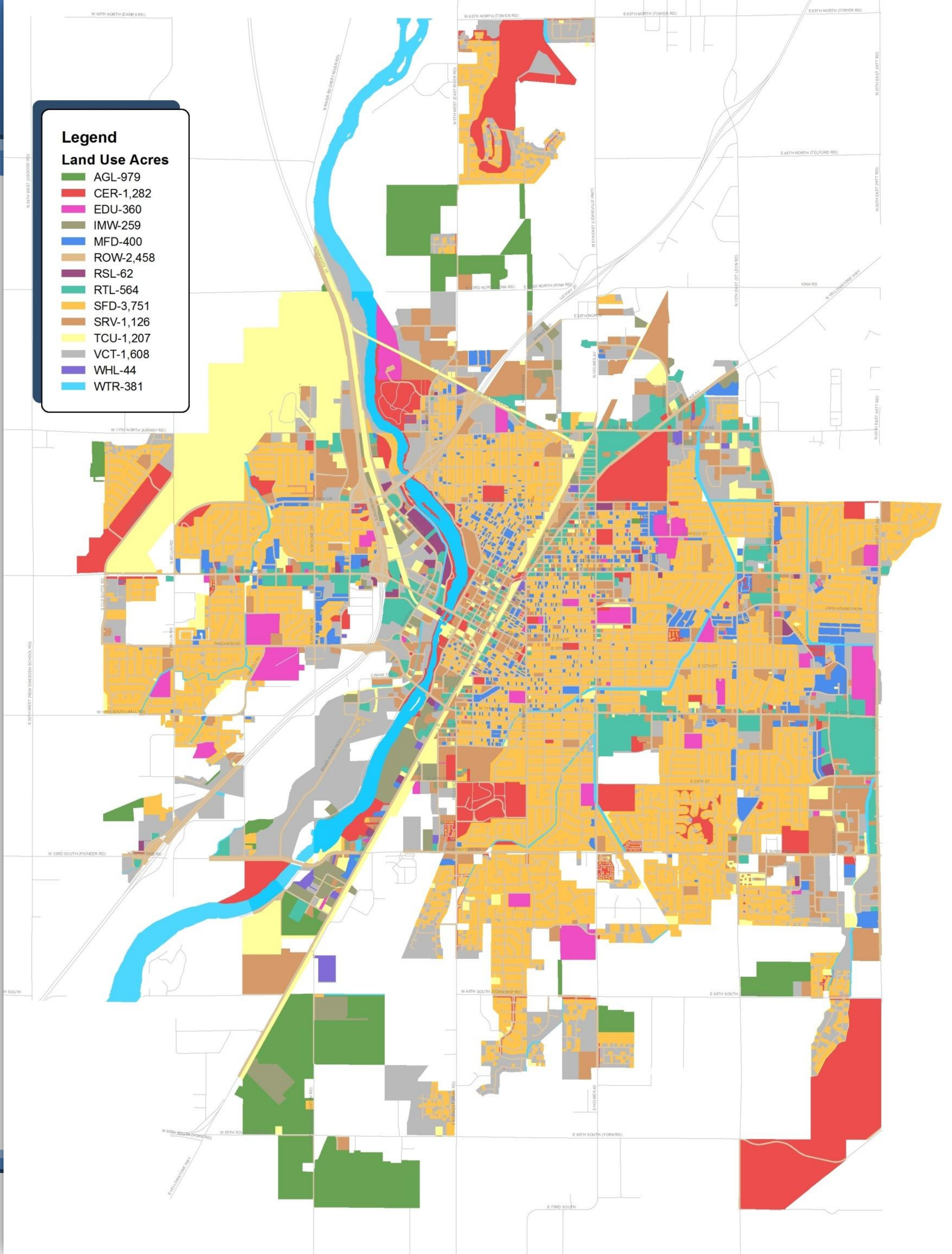
# THE MODEL

- Created from GIS
- Challenging Demand Allocation
- Scenarios for different demand requirements



# DEMAND DEVELOPMENT

- Water production known
- Non-revenue water estimated
- Land use acreage determined
- Billing records used for number of connections per land use type
- Textbook per capita indoor demands by land use assumed
- Outdoor water use estimated by landscaped acreage
- Per acre demand allocated by land use type

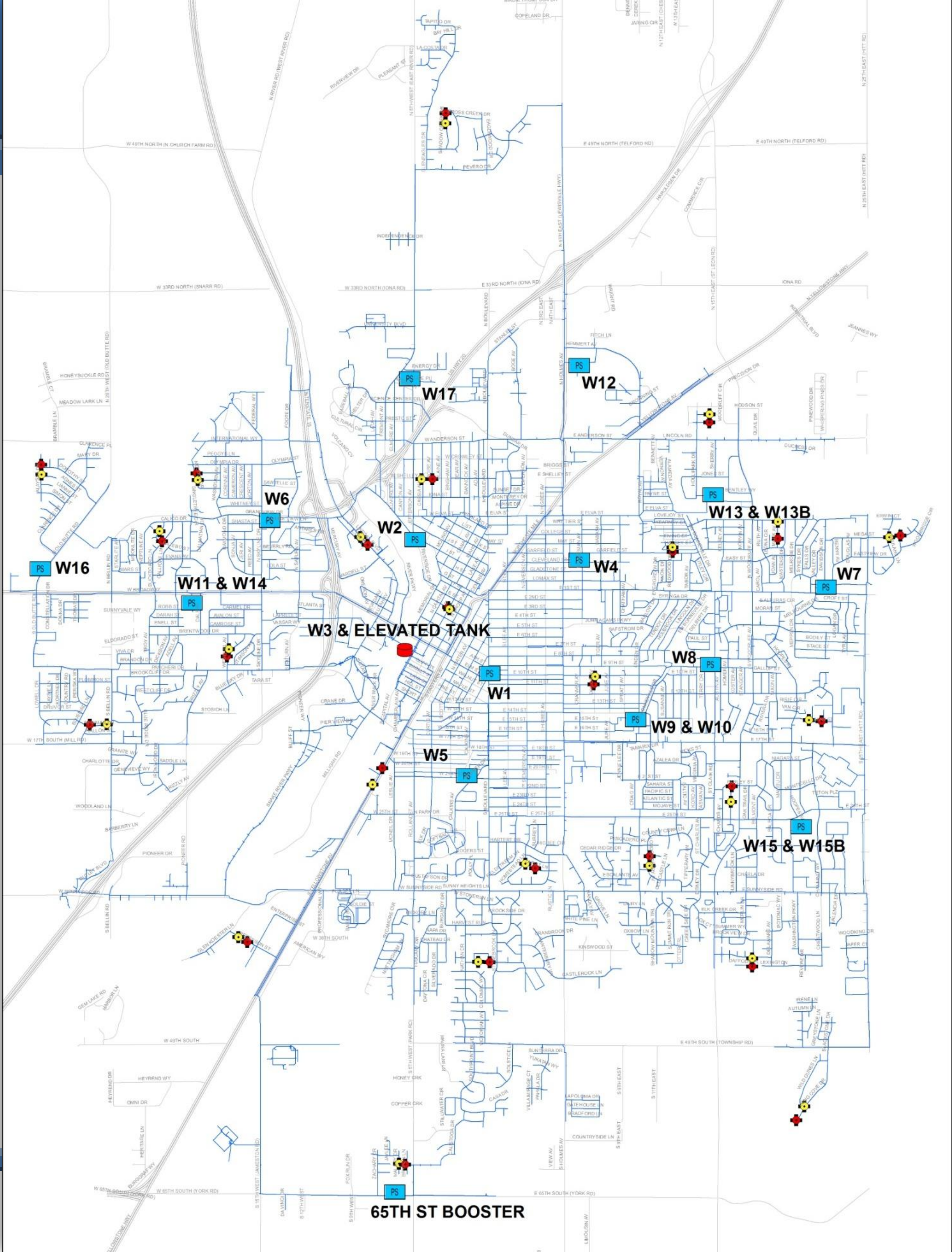


# DEMAND DEVELOPMENT

| Land Use | Total Acres | Coefficient | Irrigated Acres | Outdoor Use | | Indoor Use | | Indoor and Outdoor Use | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | (MG/day) | (acre-ft/ day) | (MG/day) | (acre-ft/ day) | (MG/day) | (acre-ft/ day) |
| **SFD** | **3751.00** | **0.65** | **2438.15** | **9.457** | **29.025** | **4.480** | **13.751** | **13.938** | **42.775** |
| **MFD/RSL** | **462.00** | **0.40** | **184.80** | **0.717** | **2.200** | **0.913** | **2.803** | **1.630** | **5.003** |
| **RTL/SRV/WHL/IMW/TCU (excluding churches & airport)** | **2320** | **0.15** | **348.00** | **1.350** | **4.143** | **3.460** | **10.619** | **4.810** | **14.762** |
| *Metered* | *N/A* | *N/A* | *N/A* | *N/A* | *N/A* | *0.840* | *2.578* | | *N/A* |
| *Non-Metered* | *N/A* | *N/A* | *N/A* | *N/A* | *N/A* | *2.620* | *8.041* | | *N/A* |
| **INL** | **1240.00** | **N/A** | **291.06** | **1.129** | **3.465** | **0.281** | **0.863** | **1.410** | **4.327** |
| *Airport* | *678.72* | *0.05* | *33.94* | *0.132* | *0.404* | *0.003* | *0.010* | *0.135* | *0.414* |
| *Elementary Schools* | *317.90* | *0.57* | *181.20* | *0.703* | *2.157* | *0.081* | *0.248* | *0.784* | *2.405* |
| *Jr. High School* | | | | | | *0.044* | *0.135* | *0.044* | *0.135* |
| *High School* | | | | | | *0.045* | *0.137* | *0.045* | *0.137* |
| *College* | | | | | | *0.032* | *0.098* | *0.032* | *0.098* |
| *Church* | *187.70* | *0.36* | *67.57* | *0.262* | *0.804* | *0.077* | *0.235* | *0.339* | *1.040* |
| *Other* | *55.68* | *0.15* | *8.35* | *0.032* | *0.099* | *N/A* | *N/A* | *0.032* | *0.099* |
| **PRK** | **1282.00** | **0.90** | **1153.80** | **4.475** | **13.735** | **0.000** | **0.000** | **4.475** | **13.735** |
| **ROW** | **2458.00** | **0.10** | **245.80** | **0.953** | **2.926** | **0.000** | **0.000** | **0.953** | **2.926** |
| **Total Indoor & Irrigation Use** | | | | | | | | **27.217** | **83.529** |
| **Outdoor Construction** | | | | | | | | **1.408** | **4.321** |
| **Non-Revenue Water** | | | | | | | | **3.169** | **9.726** |
| **Total Irrigation Season Daily Use** | | | | | | | | **31.794** | **97.576** |

# MODEL CALIBRATION

- Fire Flow Testing in August 2012
- Calibration challenges
  - Lack of demand information
  - Status of butterfly valves
  - Collecting accurate pump/well status from SCADA
  - Status of system valves
  - Unmetered construction water



# VFD FUNCTIONALITY IN MODEL

DB Editor

New Close Close All Exit VSP Control

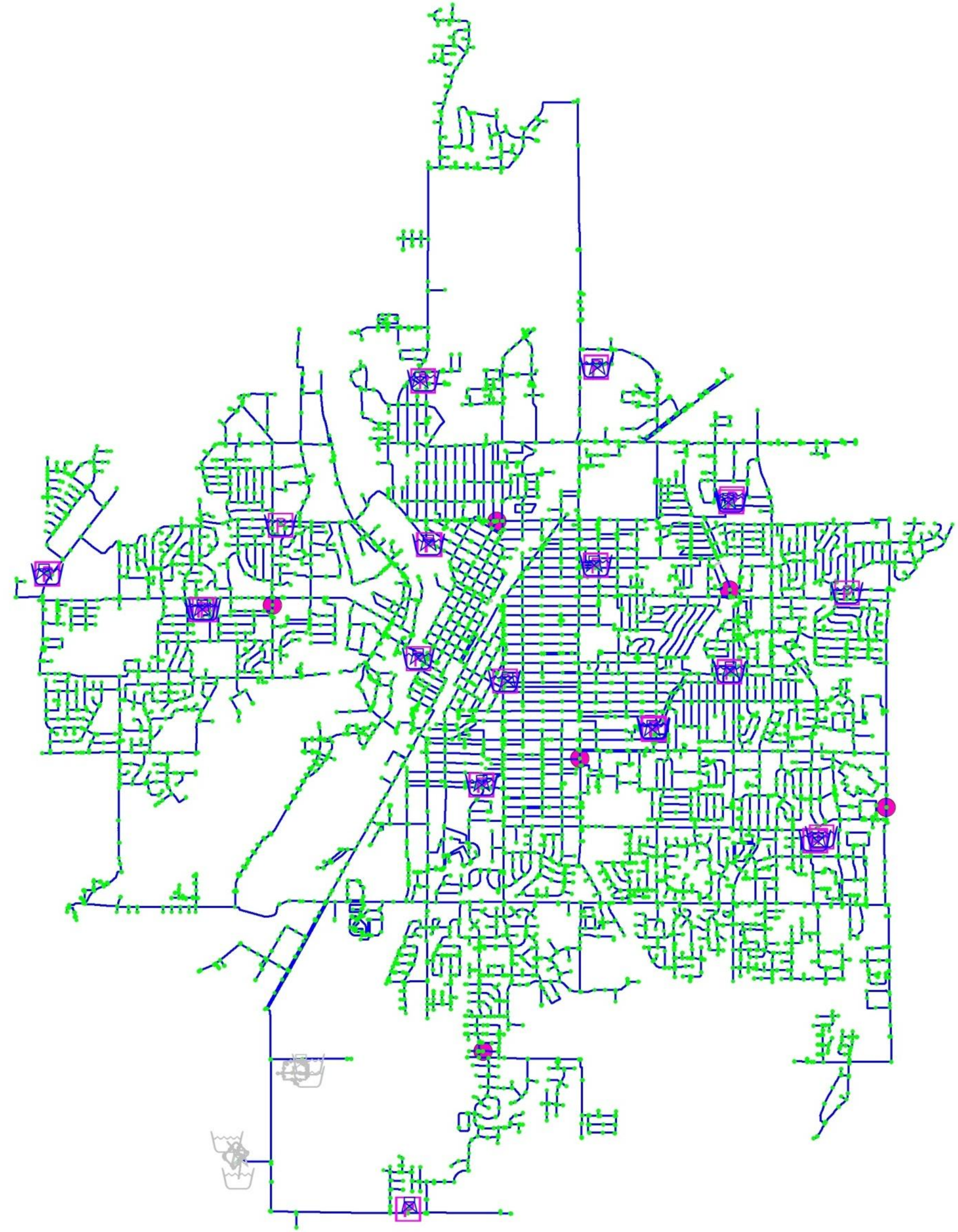
VSP Control

| * CALIBRATION3 * | ID (Char) | Control Type (Int) | Control Setting (Double) | Control Element (Char) |
|---|---|---|---|---|
| 1 | W10_BP | 0: Non-VSP | 67.00 | PP3 |
| 2 | W10_WP | 0: Non-VSP | 0.00 | |
| 3 | W11_BP | 0: Non-VSP | 65.00 | PP1 |
| 4 | W11_WP | 0: Non-VSP | 0.00 | |
| 5 | W12_BP | 0: Non-VSP | 68.00 | PP4 |
| 6 | W12_WP | 0: Non-VSP | 0.00 | |
| 7 | W13B_WP | 0: Non-VSP | 0.00 | |
| 8 | W13_BP1 | 2: Junction Pressure | 67.00 | PP4 |
| 9 | W13_BP2 | 0: Non-VSP | 63.00 | PP4 |
| 10 | W13_BP3 | 0: Non-VSP | 0.00 | |
| 11 | W13_WP | 0: Non-VSP | 0.00 | |
| 12 | W14_BP | 0: Non-VSP | 58.00 | PP1 |
| 13 | W14_WP | 0: Non-VSP | 0.00 | |
| 14 | W15B_WP | 0: Non-VSP | 0.00 | |
| 15 | W15_BP1 | 2: Junction Pressure | 69.00 | PP3 |
| 16 | W15_BP2 | 0: Non-VSP | 58.00 | PP5 |
| 17 | W15_BP3 | 0: Non-VSP | 54.00 | PP3 |
| 18 | W15_WP | 0: Non-VSP | 0.00 | |
| 19 | W16_BP1 | 2: Junction Pressure | 68.00 | PP1 |
| 20 | W16_BP2 | 0: Non-VSP | 62.00 | PP1 |
| 21 | W16_WP | 0: Non-VSP | 0.00 | |

- **Required Information:**
  - **Pump Control Types**
    - **Non-VSP**
    - **Discharge Pressure**
    - **Junction Pressure**
    - **Pump Flow**
  - **Setting**
  - **Control Element**
  - **Maximum Speed**

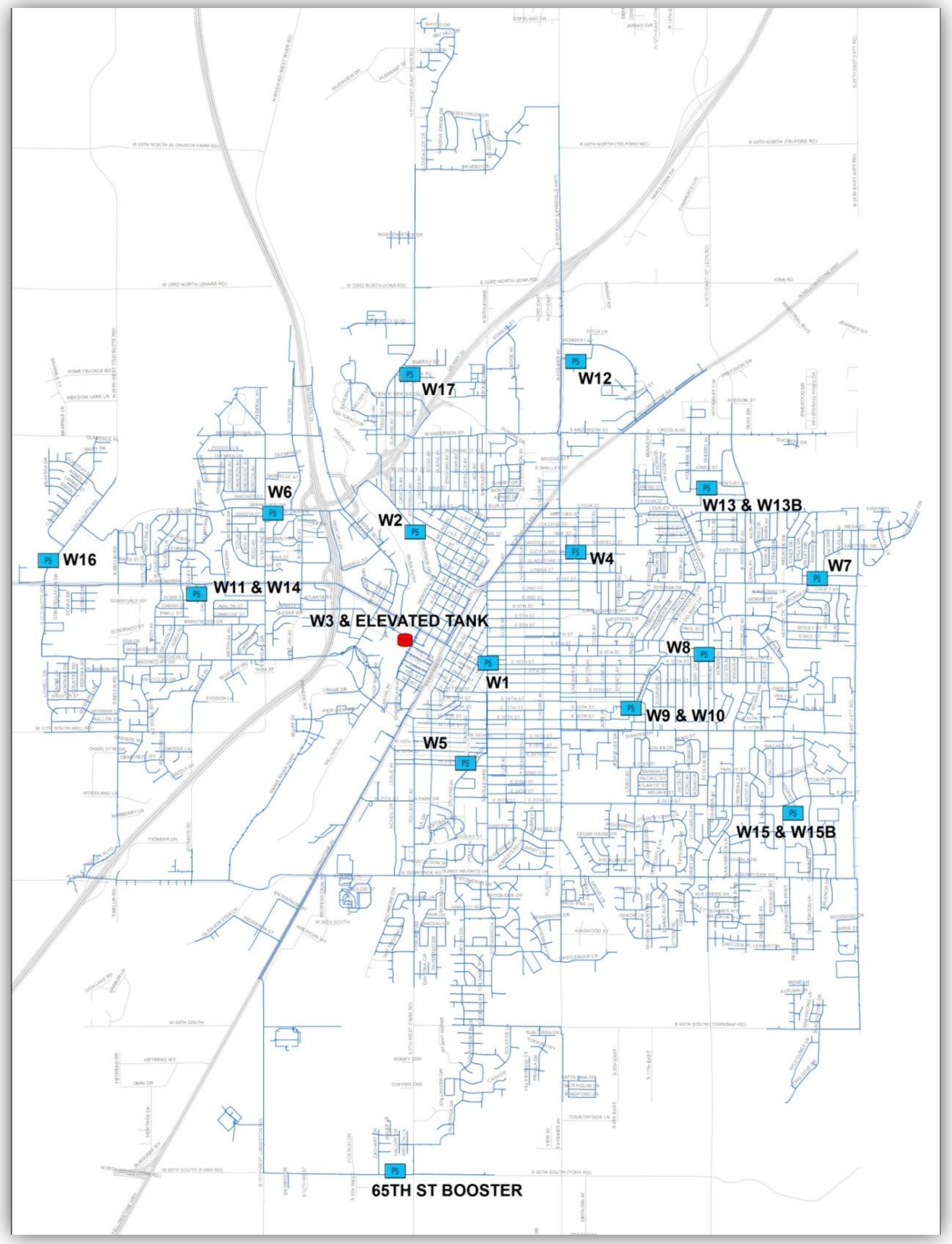
# MODEL CONSIDERATIONS

1. Booster pump capacity
2. Historical pump usage
3. Geographic location in system
4. Multiple pumps at same site
5. Ability to meet range of winter, shoulder season and summer demands
6. Elevated tank status
7. Well and booster pump capacity relationship



# VFD Preferences

- On periphery of system
- Minimize influence of elevated tank
- Controlled by local pressure, not a remote pressure point or tank level
- Implement multiple VFDs simultaneously (3 proposed) to enable consistent system operations
- Convert single pump to VFD in each booster location (e.g. 1 VFD and 2-3 constant speed)

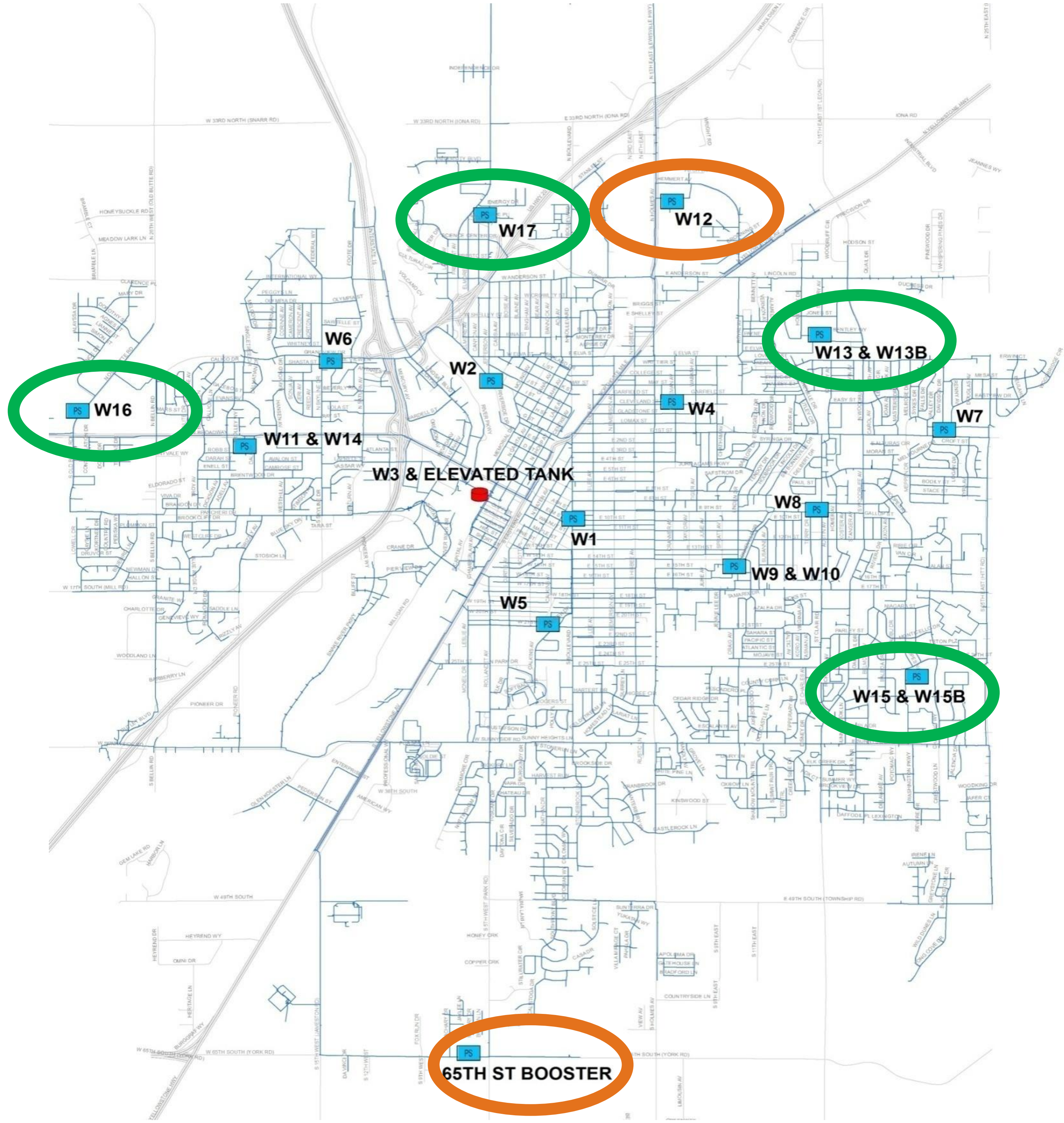


# PLANNING & MODELING SUMMARY

## Wells 12, 13, 15, 16 & 17 meet the requirements

- Separated from elevated tank
- Reasonable booster pump sizes to work with
- Periphery of system
- Good system coverage
- Facilities are regularly used

## Target 2 – 3 locations to convert at same time



# PRELIMINARY SELECTION AND CONCEPTS

# FACILITY RANKING AND MODEL PRIORITIES

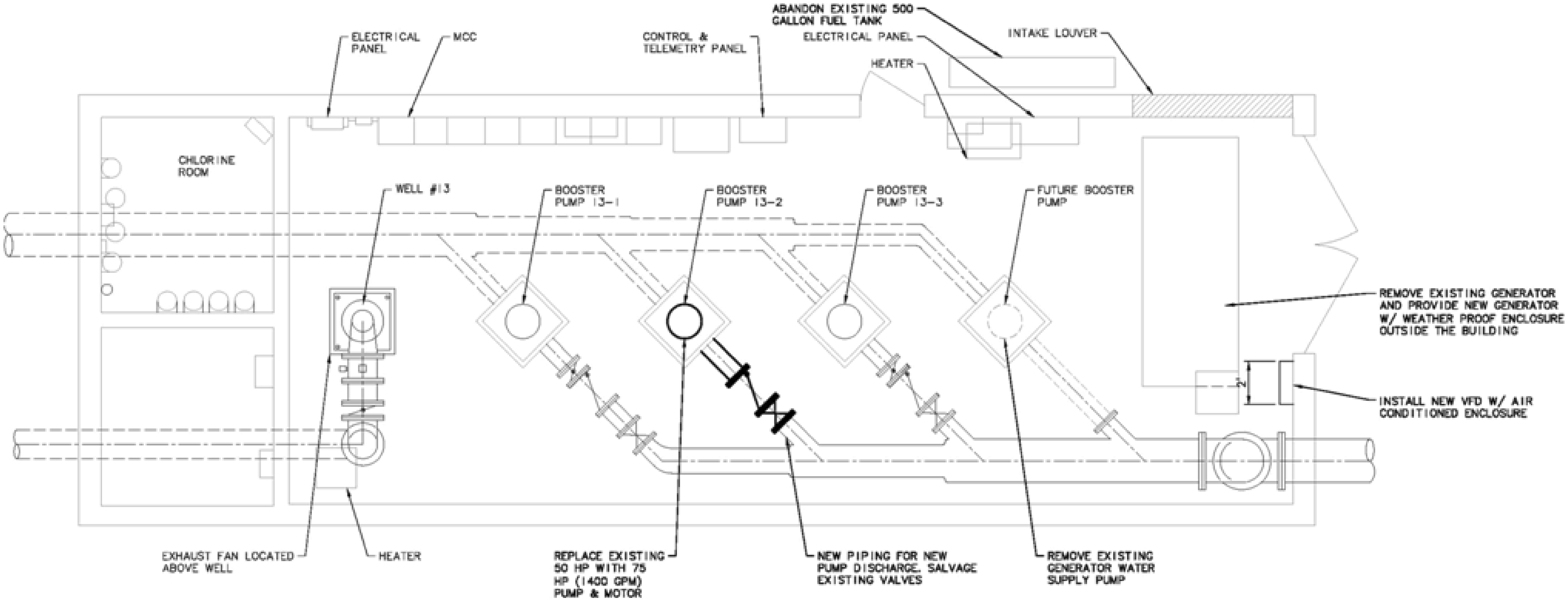
| Booster System | Structure Expansion Required | Structure Quality (rennovation requirements) | Pump Upgrade Required | Piping Upgrade Required | HVAC Upgrades Required | Motor Rebuild Required | Electrical Upgrades Required (System Outside of Motor Control) | Total Facility Score |
|---|---|---|---|---|---|---|---|---|
| 13 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 11 |
| 14 | 1 | 2 | 2 | 1 | 3 | 2 | 1 | 12 |
| 15 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 12 |
| 16 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 13 |
| 17 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 13 |
| 11 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 13 |
| 2 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 14 |
| 9 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 14 |
| 10 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 14 |
| 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 18 |
| 6 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 18 |
| 8 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 18 |
| 4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 19 |
| 5 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 19 |
| 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 20 |

# IMPROVEMENT CONCEPT OPTIONS

- Convert existing smallest pump to VFD or replace smallest pump with VFD pump of equal capacity
- Replace smallest pump with VFD pump of larger capacity
- Add VFD pump to facility

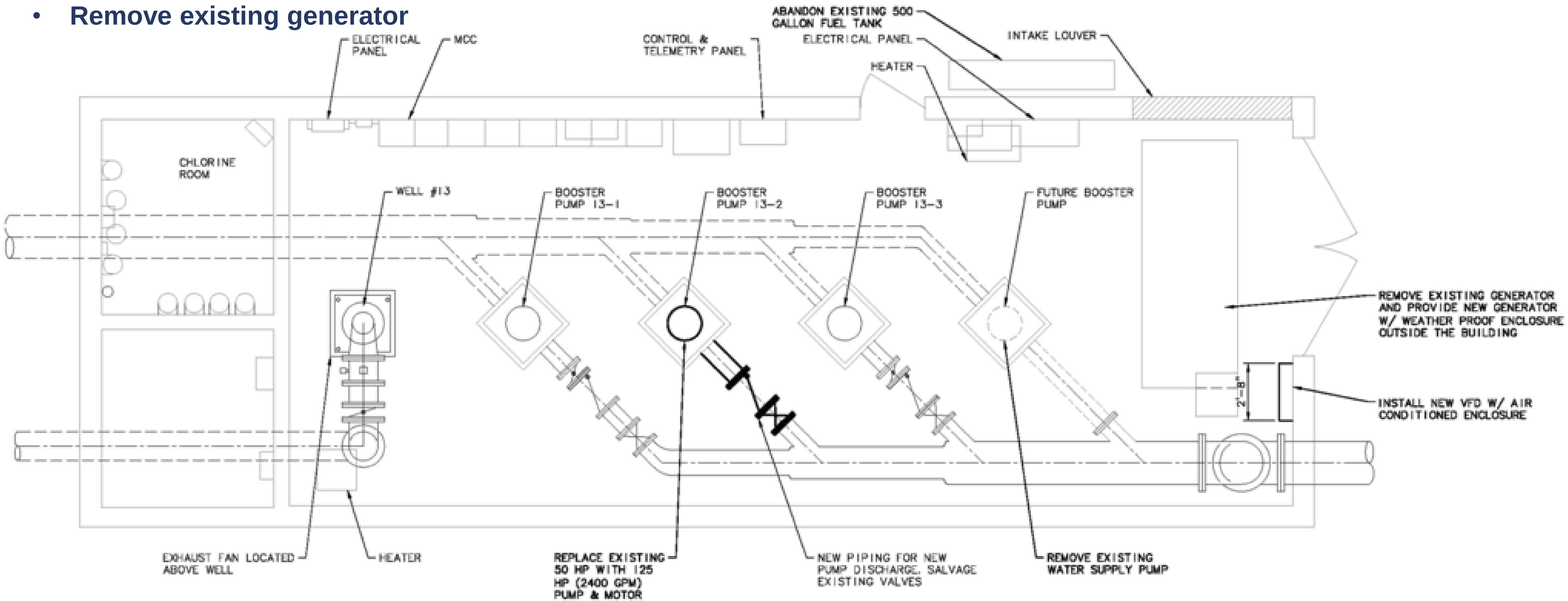
# WELL 13 – OPTION 1

- Replace smallest existing pump
  - 50 hp to 75 hp
  - New valves at pump discharge
  - Remove existing generator



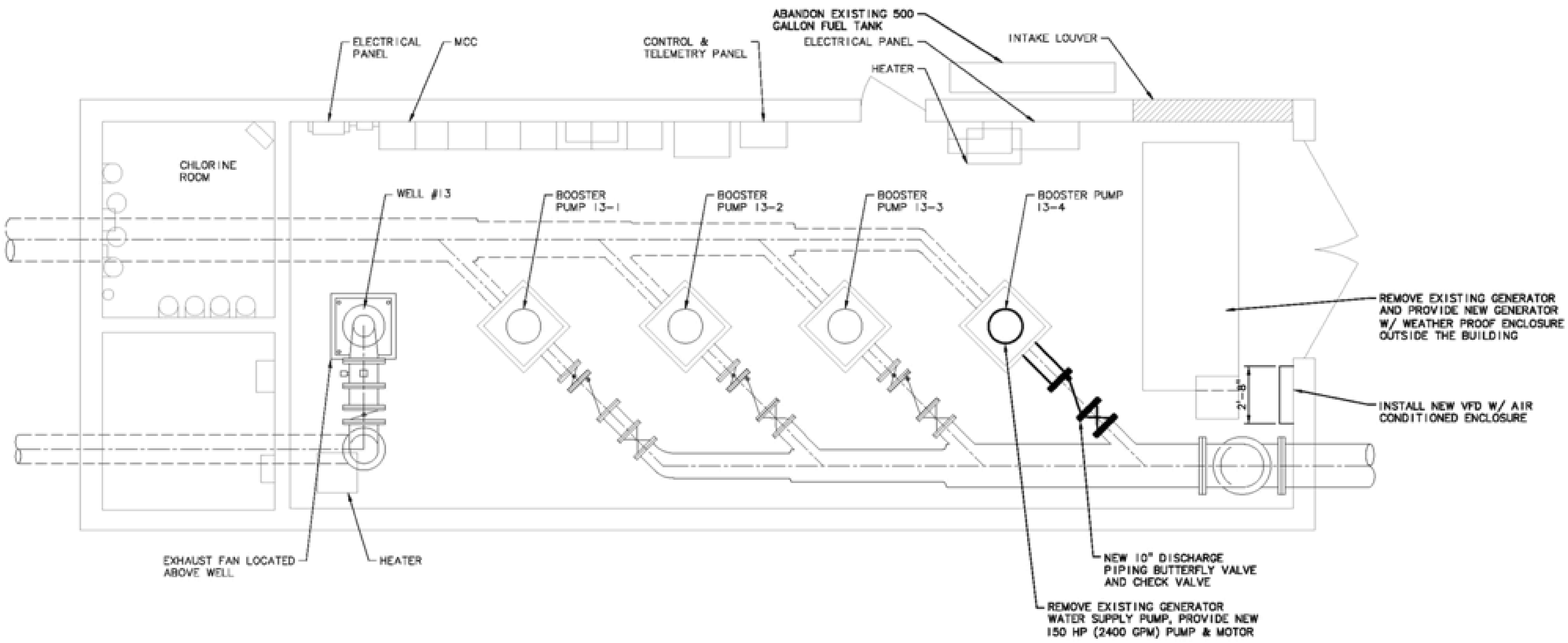
# WELL 13 – OPTION 2

- Replace smallest existing pump
  - Increase capacity from 1,400 gpm to 2,400 gpm
  - New valves at pump discharge
  - Remove existing generator



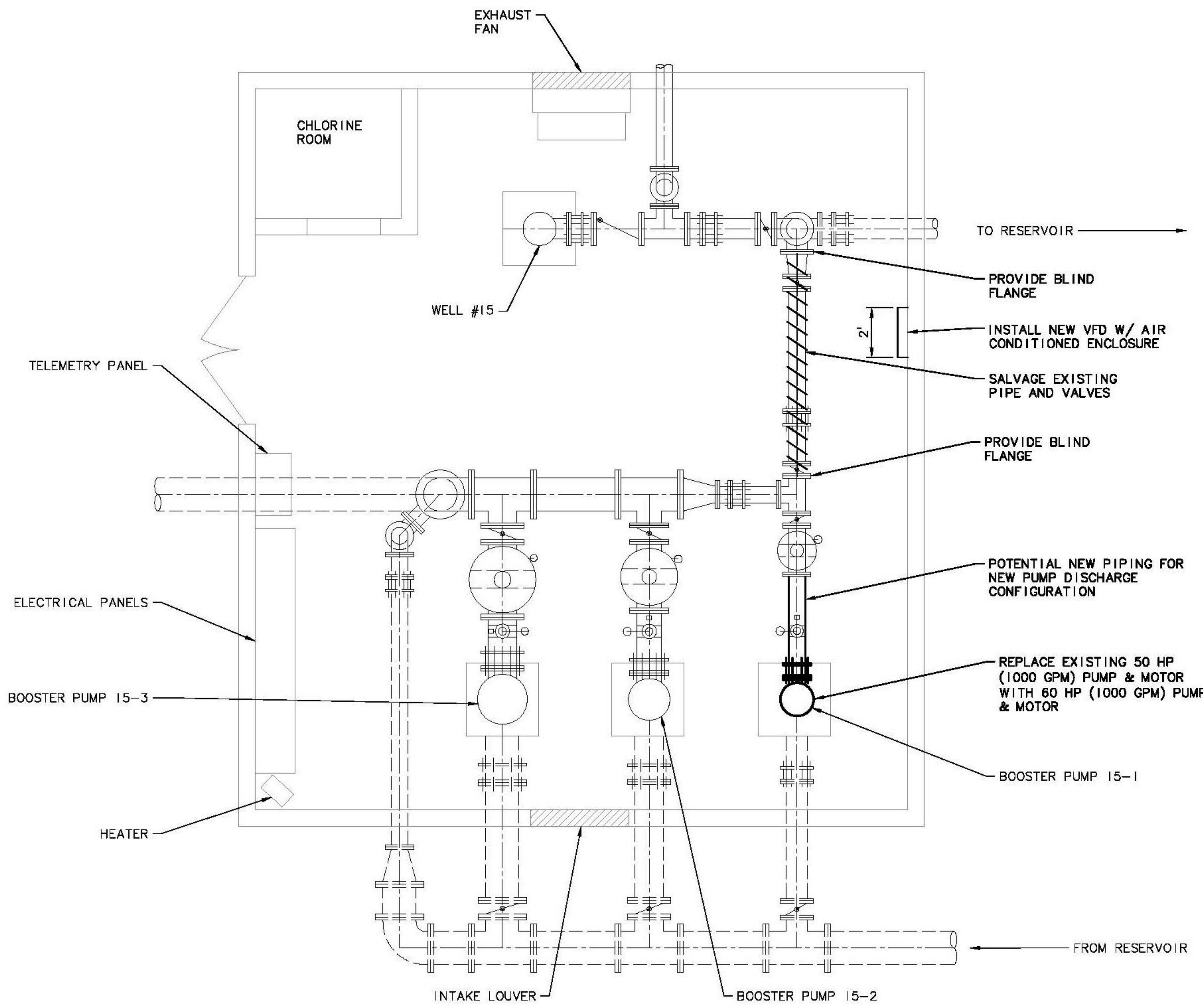
# WELL 13 – OPTION 3

- Add fourth pump to system
  - Capacity of 2,400 gpm
  - Remove existing generator



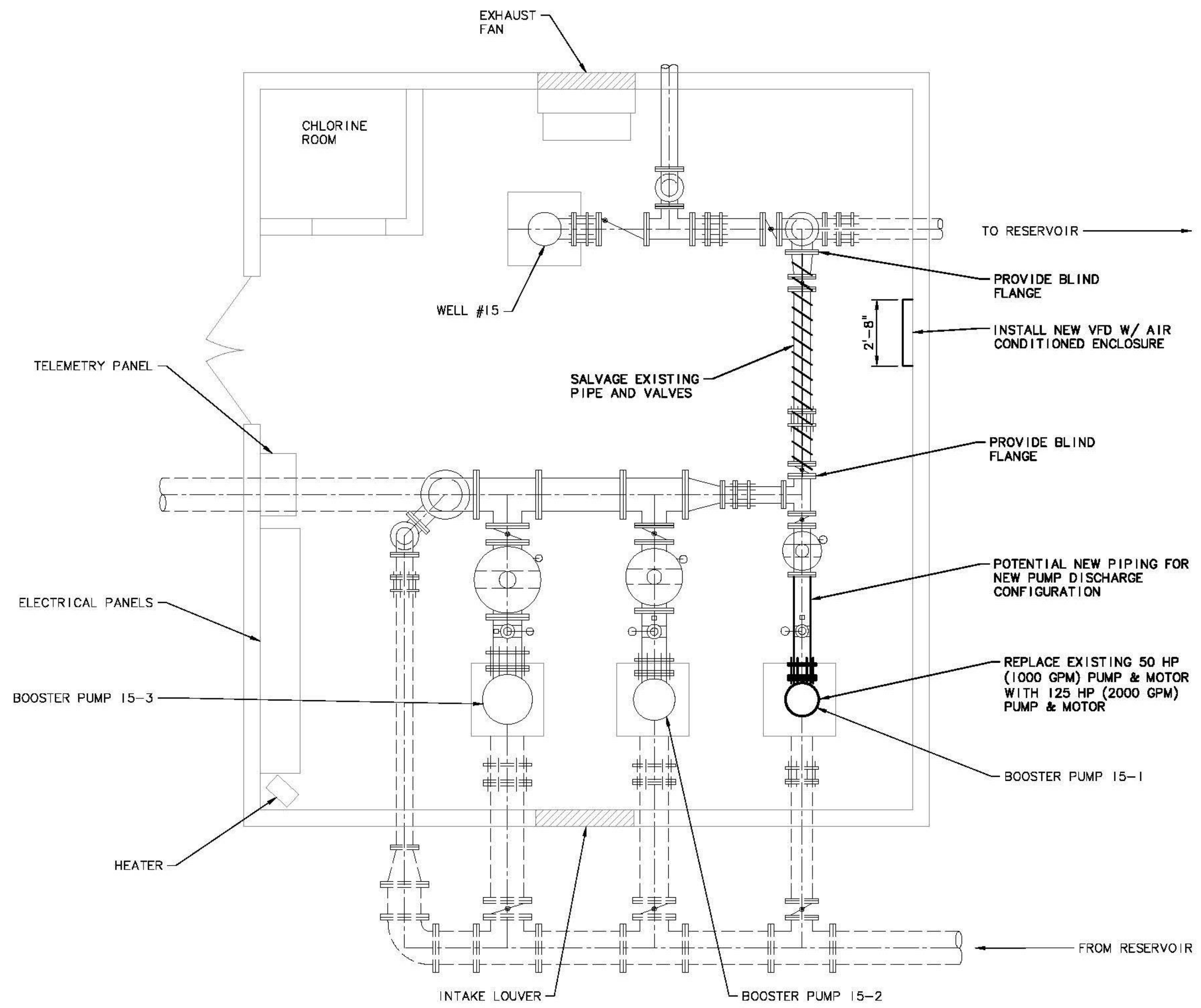
– **Replace smallest pump**
  - **Capacity of 1,000 gpm**

– **Remove direct connection from well to discharge piping into the system.**
  - **Provide space to VFD without building modifications**



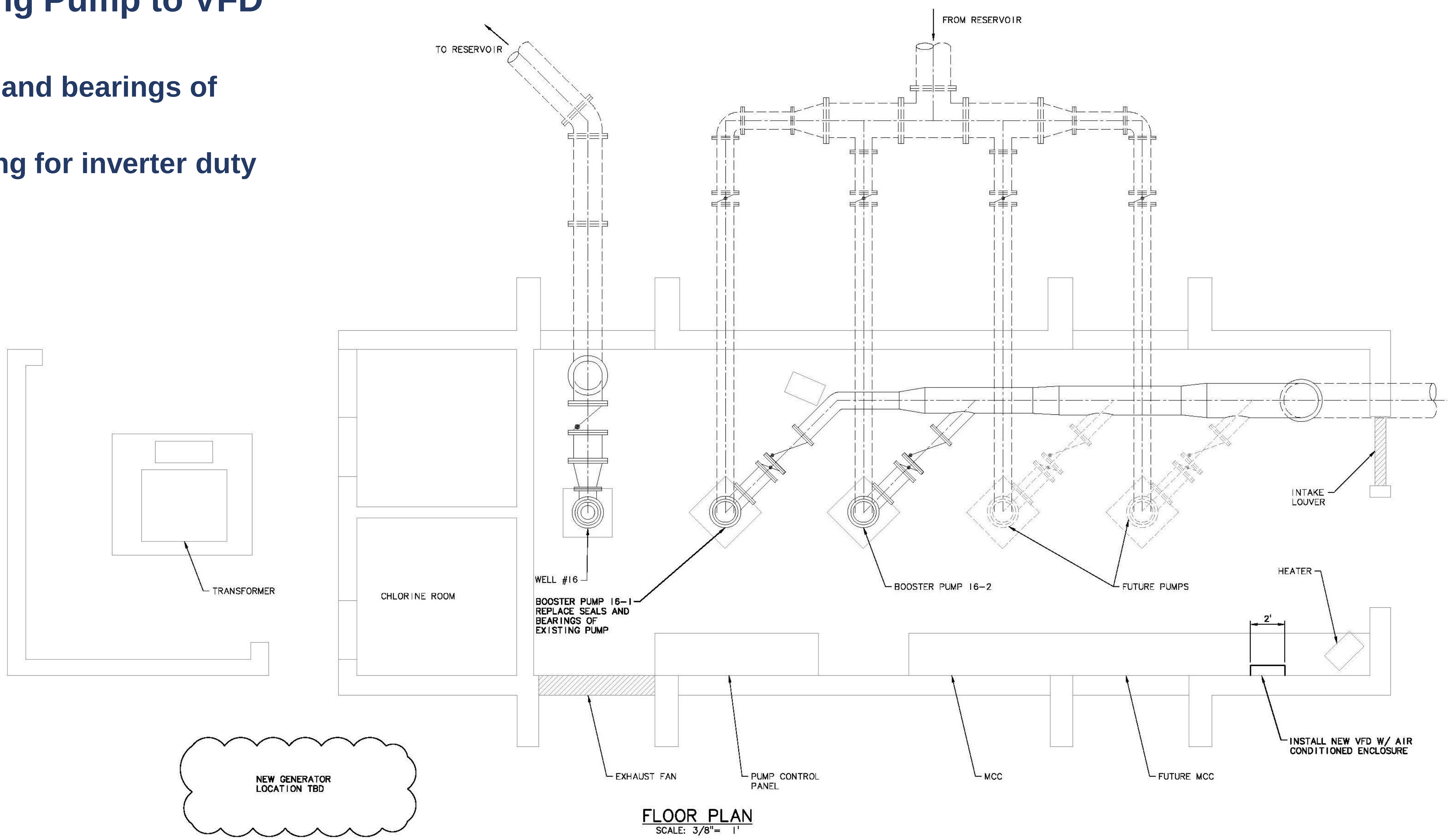
# WELL 15 – OPTION 2

- Replace smallest pump
  - Increase capacity from 1,000 gpm to 2,000 gpm
- Remove direct connection from well to discharge piping into the system.
  - Provide space to VFD without building modifications



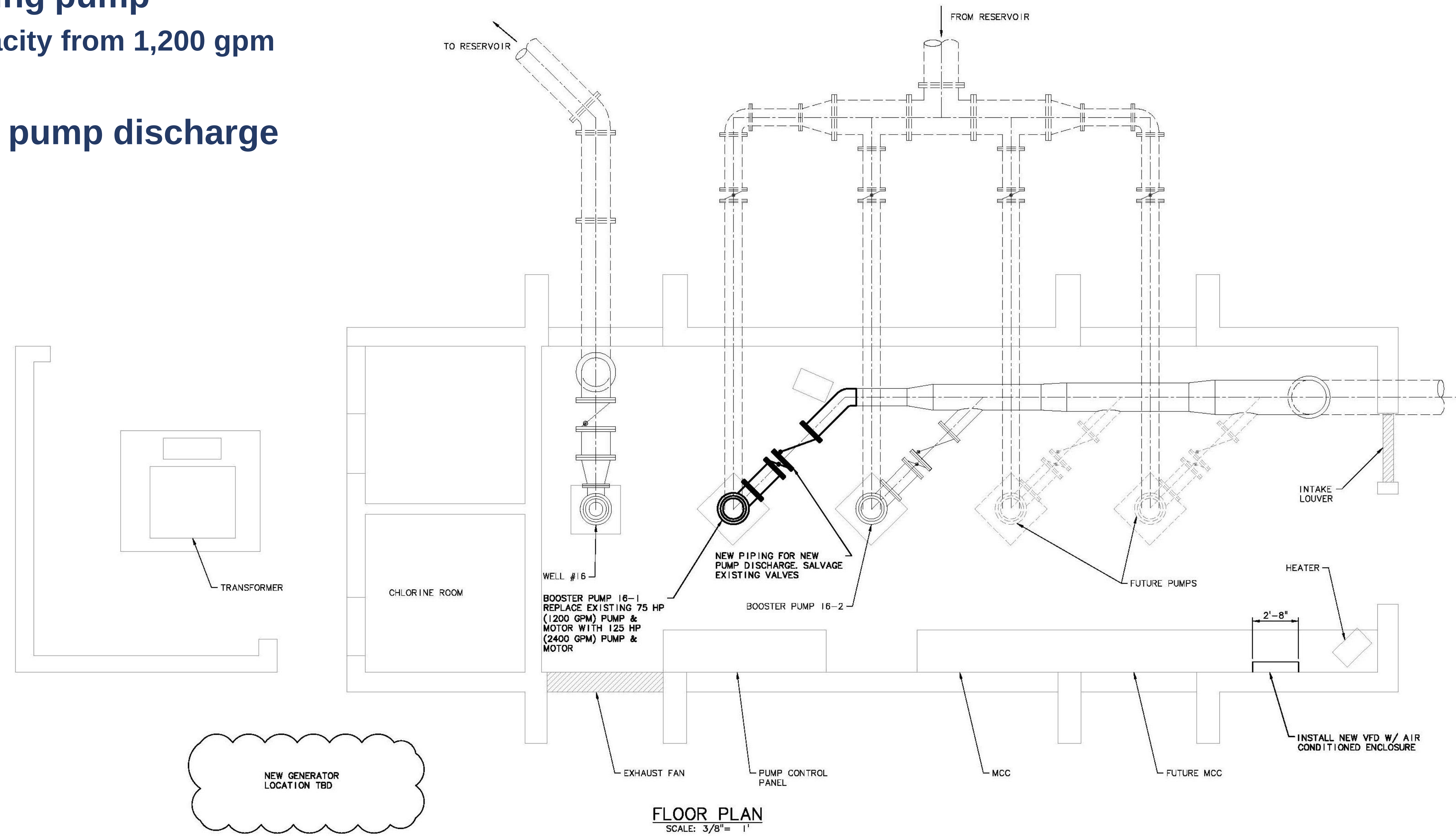
# WELL 16 – OPTION 1

- Convert existing Pump to VFD operation
  - Replace seals and bearings of existing pump
  - Motor rewinding for inverter duty rating



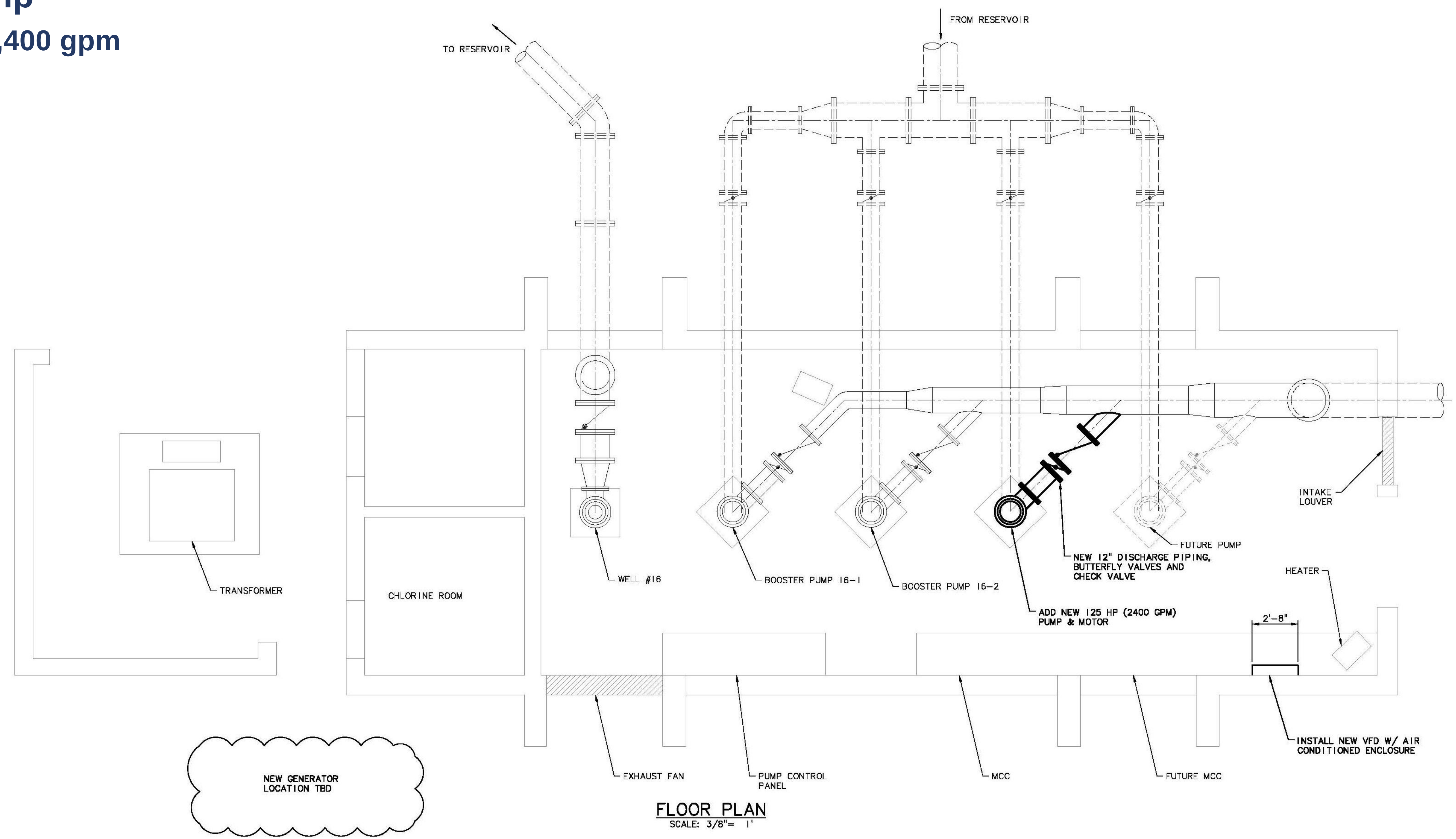
# WELL 16 – OPTION 2

- Replace existing pump
  - Increase capacity from 1,200 gpm to 3,400 gpm
- New valves at pump discharge



# WELL 16 – OPTION 3

- Add third pump
  - Capacity of 2,400 gpm



# IMPROVEMENT CONCEPT COSTS

- **Well 13: $180k – $200k**
- **Well 15:  $170k - $190k**
- **Well 16: $ 96k - $170k**
  - **Low cost option uses existing pump**
- **Cost for emergency generator is not included**
- **Leverage electrical upgrade budget for VFD implementation**

# EMERGENCY POWER

- IDAPA 58.01.08.003.15.f requires standby power if standby storage of 8 hours of ADD is not provided
- City needs approximately 4 MGD of additional flow provided with standby power

# EMERGENCY POWER

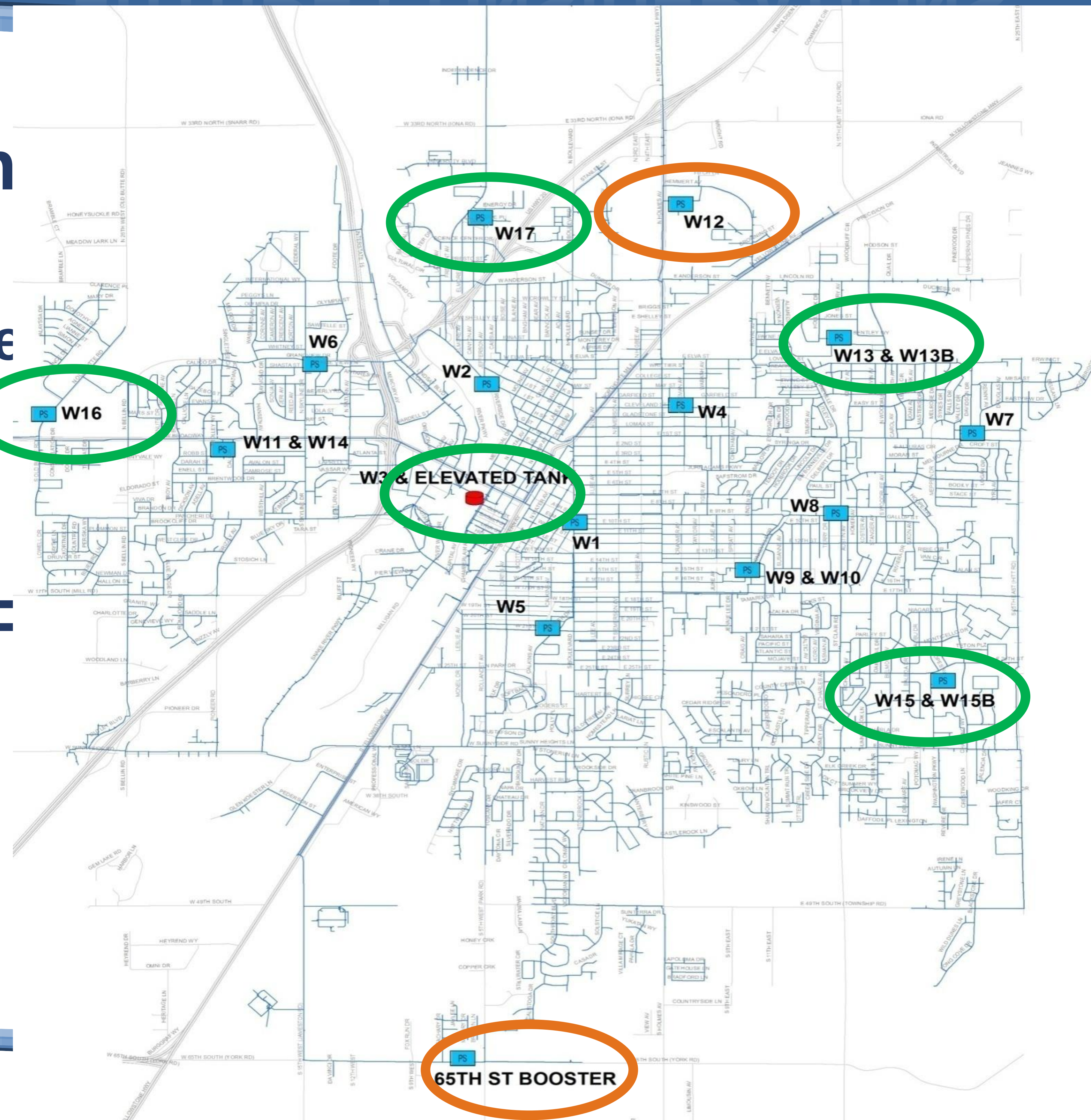
- Improvement concepts included new generators to help provide emergency power to all pumps in each facility
- Well 13
  - 750-800 kW
- Well 15
  - 200 kW (Well 15b only)
- Well 16
  - 500 – 600 kW

# IMPROVEMENT CONCEPT CONCLUSION

- ❑ **City would like to move forward with options that provide largest pump for each facility**
  - **Offers wider flow range than using existing pumps**
- ❑ **Implement 2 – 3 facilities concurrently**
  - **Allows for better system coverage**
  - **Potentially defers additional conversions**
  - **Stability in system operations while staff learn how to operate**
  - **Fits in available budget**

# FUTURE CONSIDERATIONS

- Add well to the 65th Street Facility
  - Allowing full year use
- Eliminate the elevated tank and convert Well 3 to VF
- Convert Well 17 to VFD



# NEXT STEPS

# NEXT STEPS

- ❑ Preliminary Design
- ❑ Refine Project Costs
- ❑ Determine potential system operation strategies to utilize proposed VFD sites
- ❑ Implement in FY2014 or FY2015 depending on budget availability