CITY OF LONGVIEW

COWLITZ RIVER COLLECTOR WELL

PHASE I INVESTIGATION TEST RESULTS

&

OVERALL DRINKING WATER QUALITY UPDATE

CITY COUNCIL/BHWSD COMMISSIONER JOINT SPECIAL MEETING

MARCH 24, 2016

OVERALL WATER QUALITY UPDATE

WATER QUALITY COMPLAINTS - 2016

- City of Longview: 12 complaints logged in 2016
- Beacon Hill Water and Sewer District : Approximately 1 complaint per month

MAIN FLUSHING

- Auto Flushers: Seven operating 2 hours each day
  - Three in Highlands, One by Hospital, One at Florida/28th, Two on dead ends
  - Florida Street site has observed great improvement
    - Iron concentration reduced from 1.35 ppm to 0.14 ppm
    - Chlorine increased from 0.66 ppm to 1.02 ppm
- Flushing Program: Annual flushing (main zone areas 1-4) this month

UPDATE ON MAIN REPLACEMENTS

Year	Location	6”	8”	12”	Total
2014	Beech St, 16/17th Ave alley		2,250	2,750	5,000
2015	15/16th Ave and 15th/OR Wy alleys	380	2,480		2,860
2015	17/18th Ave alley	155	2,225		2,380
2016	Nichols Blvd – OR Way to 16/17th		670		670
2016	Nichols Blvd and 19/20th Ave alley	150	3,500		3,650
2016	15th/ Oregon Way alley	150	1,500		1,650
Total		16,210 LF			

MINT FARM INTERIM MEASURES UPDATE

POST CHLORINATION

- Contract awarded to J. H. Kelly; NTP issued February, 2016
- Early summer completion anticipated

DISSOLVED OXYGEN ADDITION

- Tested commercially available in-line aeration system
- In-home evaluations underway in two homes
  - Baseline sampling done in January
  - Comparison sampling scheduled in late March
  - Homes A and B not able to comment on taste
  - Improved chlorine odor in Home B
  - Grainy black residue in Home B dishwasher (also seen pre-trial in clothes washer)

MINT FARM INTERIM MEASURES UPDATE (CONT'D)

ORGANIC NITROGEN REMOVAL

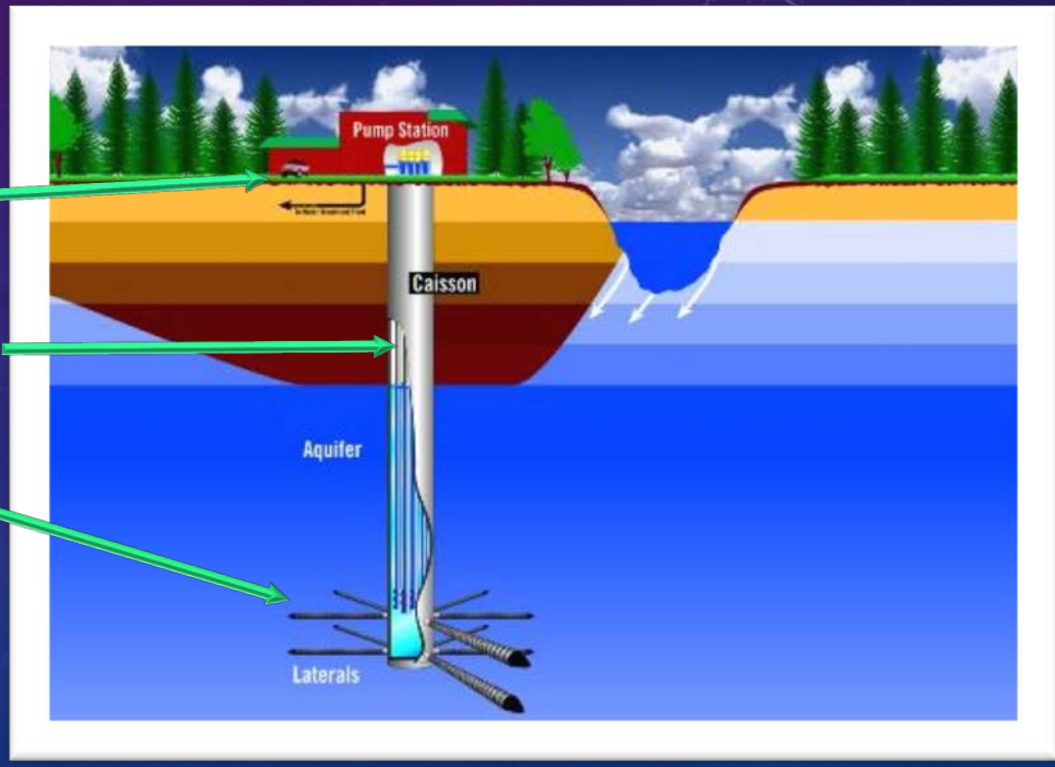
- Bench scale testing done in October, 2015
- Inconsistent organic nitrogen levels and reactivity presented challenges
- Coagulant Addition
  - Not a viable alternative to reduce chloramines, total or organic nitrogen
- Hydrogen Peroxide Addition
  - Measureable reduction in total nitrogen (20%) and organic nitrogen (56%)
  - No effect on ammonia levels
  - Ongoing monthly nitrogen study sampling to monitor changing levels
  - Began bi-weekly chlorine decay test to monitor changing reactivity
  - Consider repeating bench scale effort to test lower range of doses

COLLECTOR WELL INVESTIGATION PROCESS

- **Phase I Drilling Investigation:**
  - Conduct Preliminary Drilling and Water Quality Screening at three potential sites along the Cowlitz River from Fishers Lane WTP to Riverside County Park.
- **Determine Feasibility of Additional Testing**
  - Determine the best location for possible additional detailed aquifer test
- **Phase II Drilling Investigation:**
  - Continue detailed investigation with higher capacity and longer duration pumping at one site to further define aquifer characteristics and analyze water quality. Determine if Collector Well is fully suitable for site.

TYPICAL COLLECTOR WELL PROFILE

- Pump Station
- Reinforced Concrete Caisson
- Horizontal Well Screens



COLLECTOR WELL INSTALLATIONS
FLUSH GRADE PUMP STATIONS

COLLECTOR WELL INSTALLATIONS AT-GRADE PUMP STATIONS

COLLECTOR WELL INSTALLATIONS ABOVE FLOOD ELEVATION PUMP STATIONS

Phase I Purpose

An investigation to determine best potential collector well location

- Conduct Capacity Analysis at three locations to determine feasibility of Collector Well to supply between 12 to 18 MGD (replacement of existing Mint Farm Capacity)
- Collect Water Quality Samples to screen and determine potential fatal flaw constraints

PHASE I DRILLING ACTIVITIES

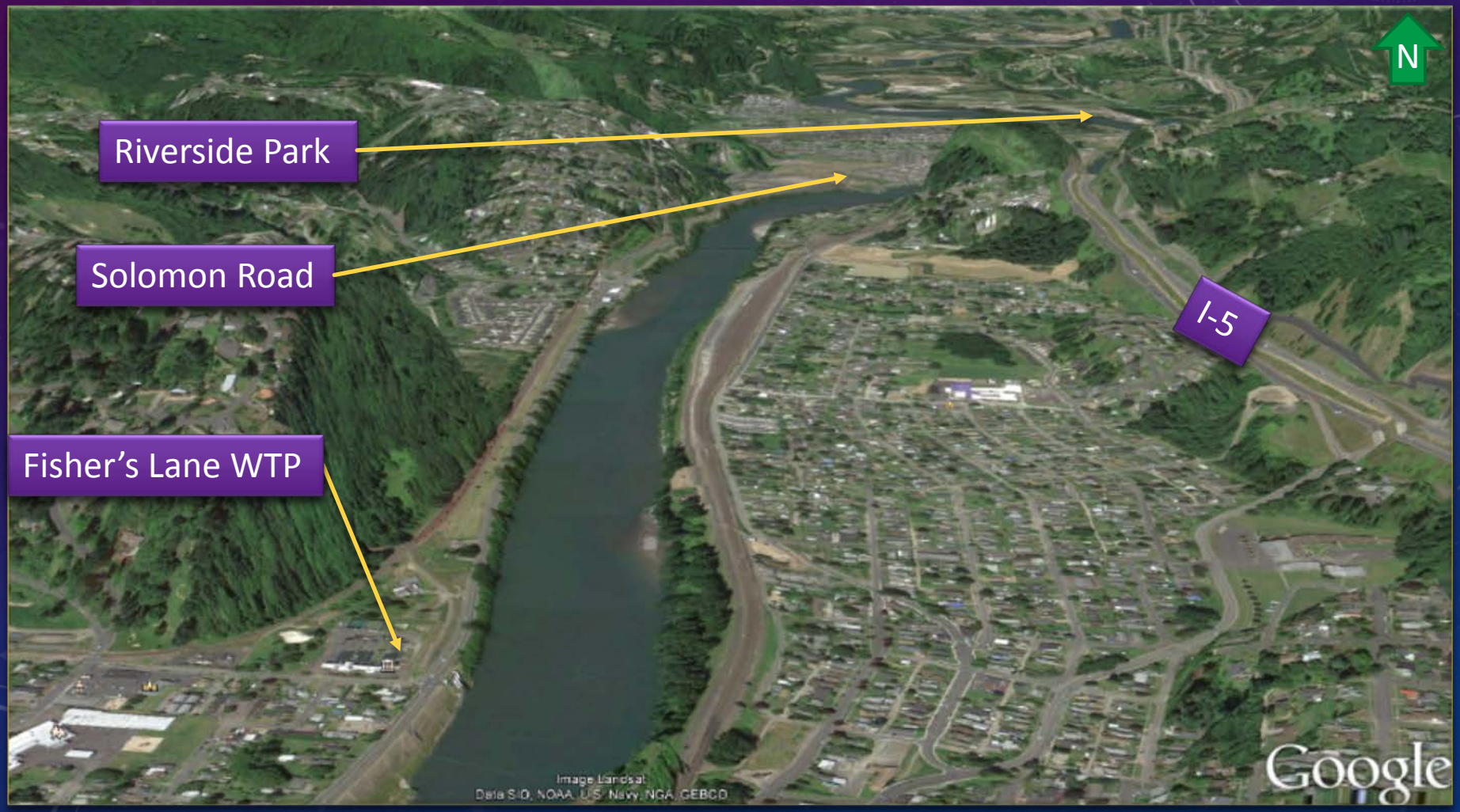
- **Riverside Park**
- **Solomon Road**
- **Fishers Lane WTP**

Riverside Park

Solomon Road

Fishers Lane WTP

PHASE I DRILLING LOCATIONS
THREE SITES



PHASE I DRILLING ACTIVITIES

- Obtained Permits and Access Rights
- Drilled Exploratory Well - 8” Borehole
- Geologic Logging
- Screen Installation
- Well Development
- Pump Installation
- Four Hour Pump Test
- Water Quality Screening Analysis
- Drilling and Analysis Report

Drilling

Geologic Logging

Setting Screen

Aquifer Testing

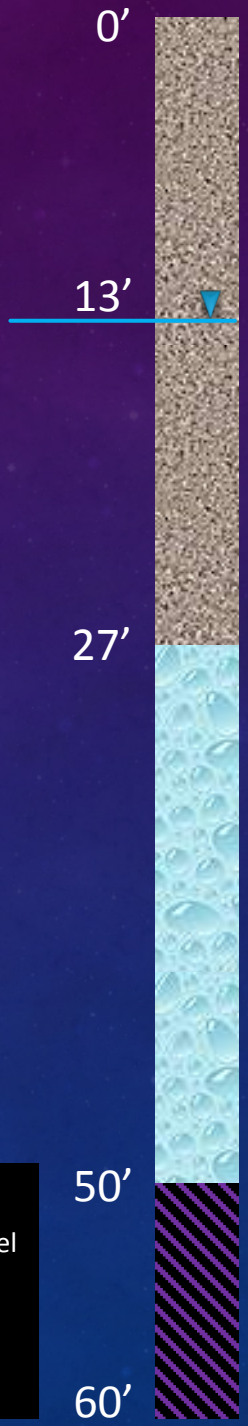
MAPPED DRILLING LOCATIONS 2016 & 1977

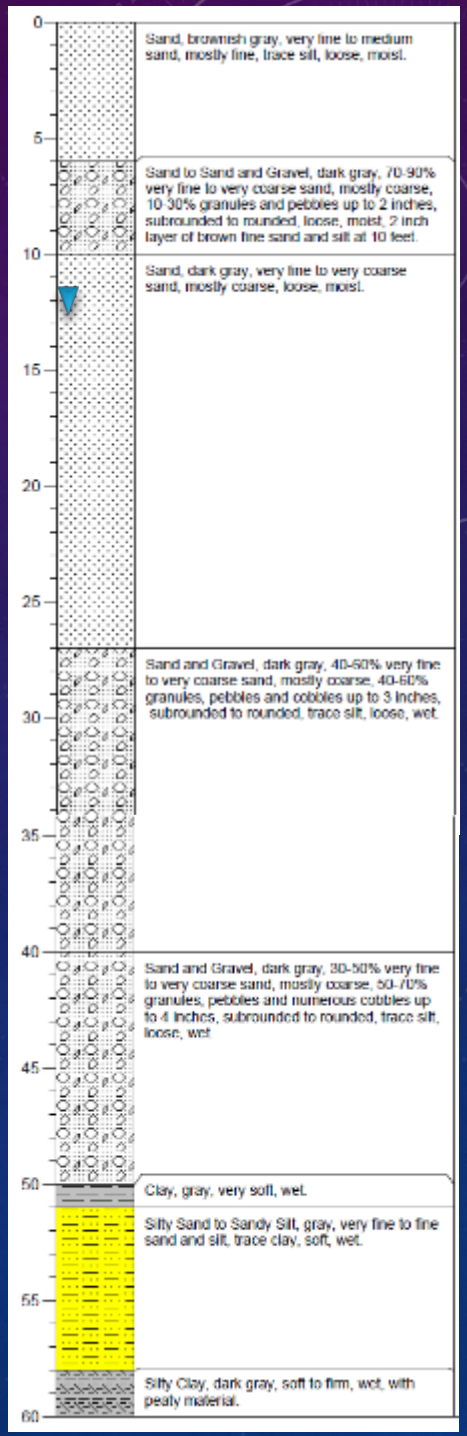
Fisher's Lane WTP

Solomon Road

Riverside Park

DRILLING LOG
TH-1: RIVERSIDE PARK

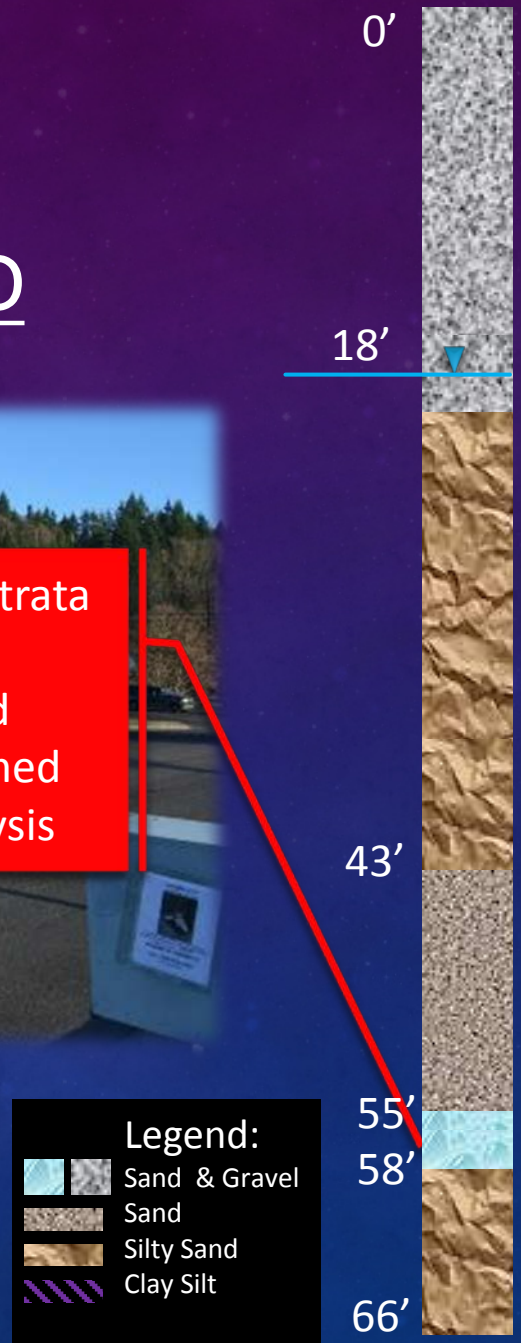


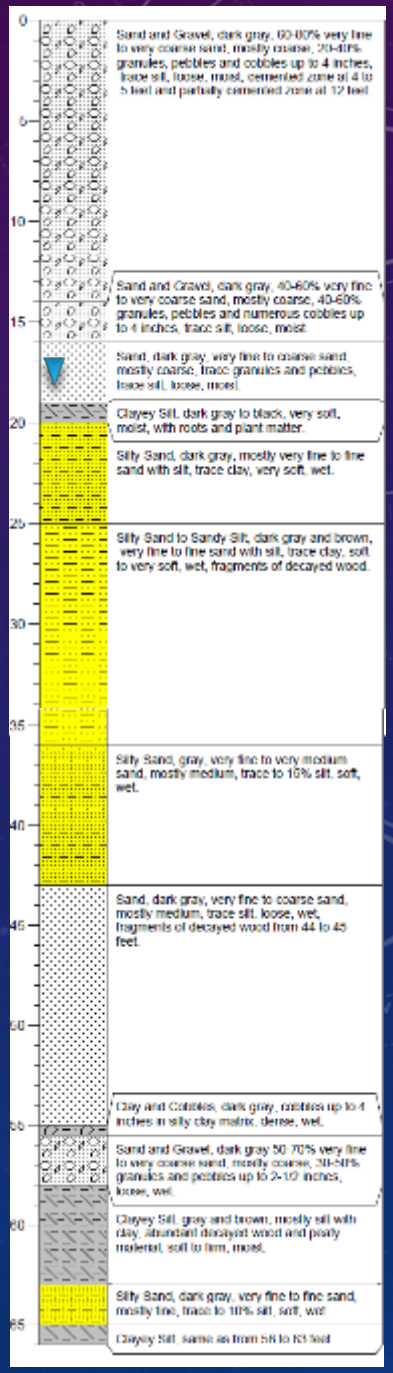


DRILLING LOG
TH-2: SOLOMON ROAD

Minimal Water Bearing Strata

Test Hole Abandoned
No Aquifer Test Performed
No Water Quality Analysis





SOLOMON ROAD SOIL SAMPLES

Note:

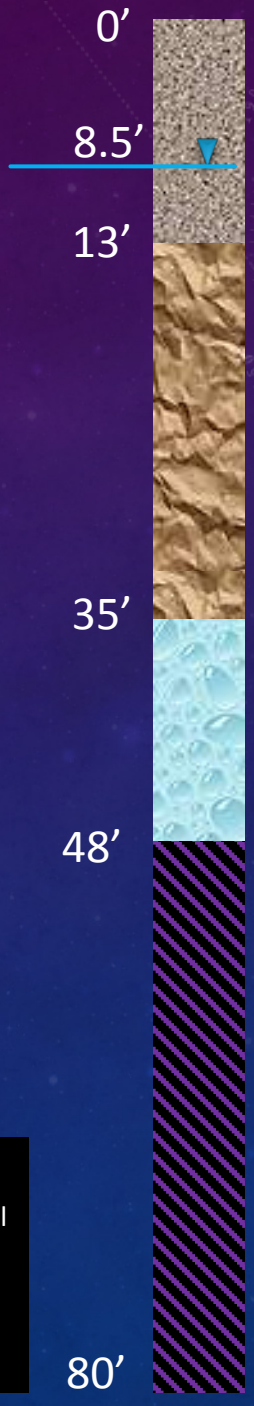
1. Measurements shown are feet below ground surface

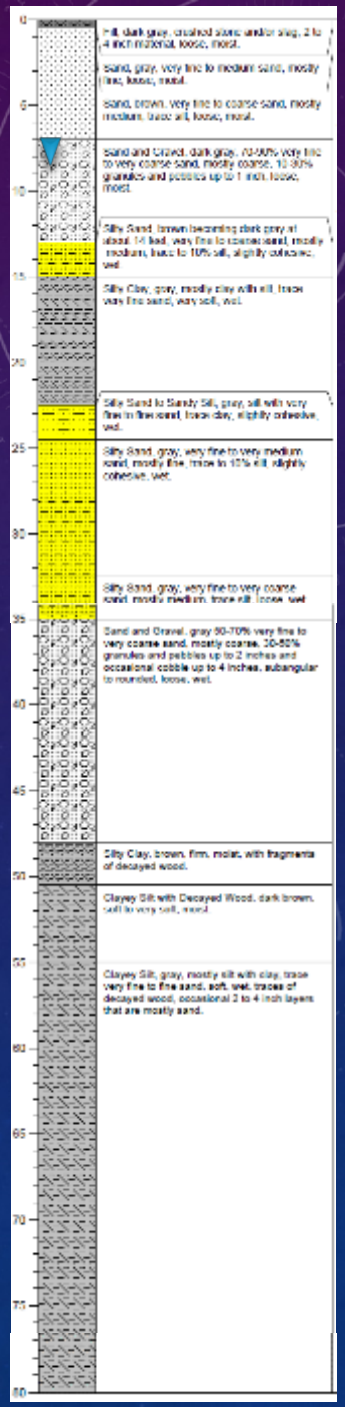
SOLOMON ROAD SOIL SAMPLES

SOLOMON ROAD SOIL SAMPLES BELOW 60’ BGS

Tree Branch

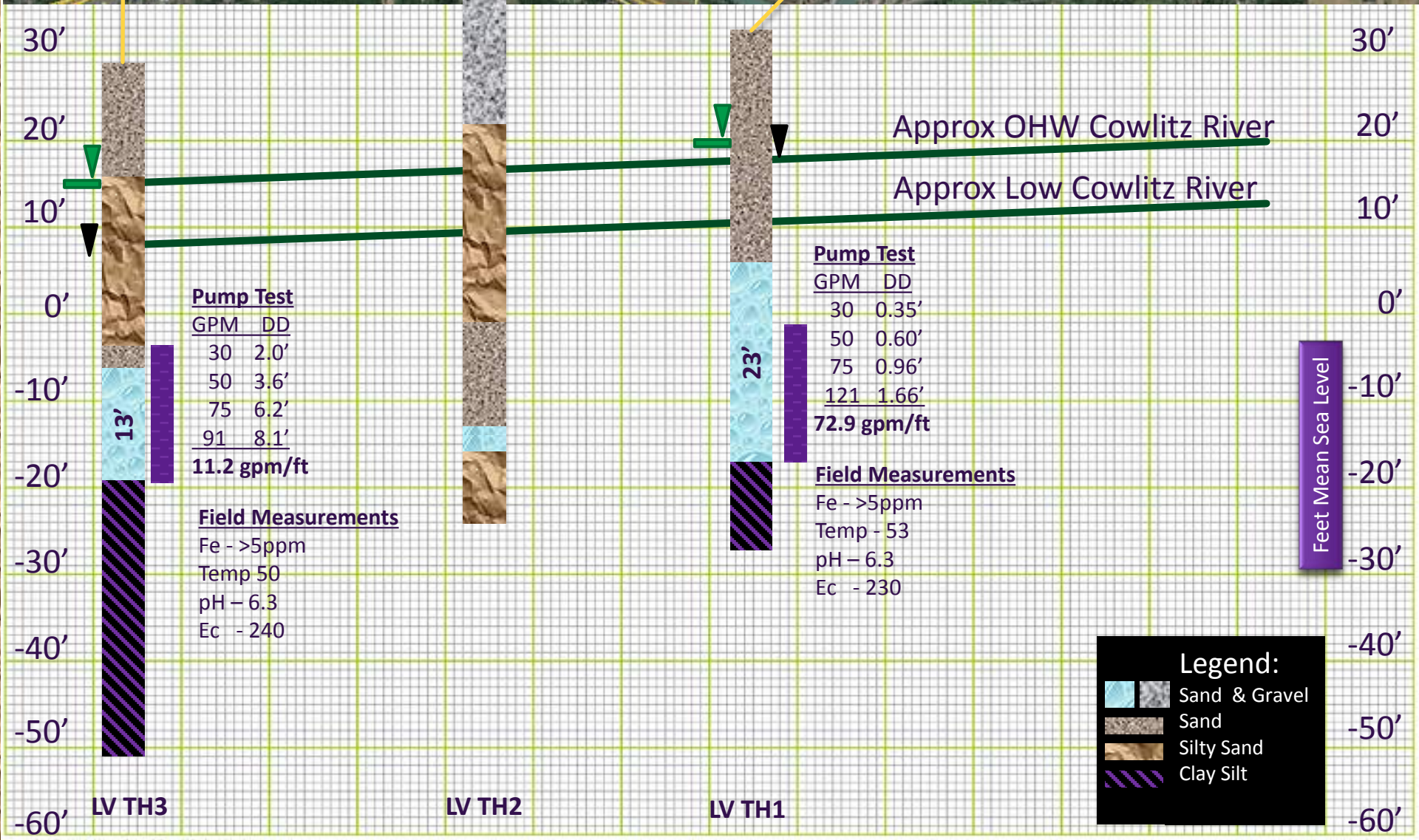
DRILLING LOG
TH-3: FISHERS LANE WTP





Legend:
- Sand & Gravel
- Sand
- Silty Sand
- Clay Silt

LV TH3
1977 TH1
LV TH2
1977 TH2
1977 TH4
1977 TH3
1977 TH5
1977 TH6
LV TH1

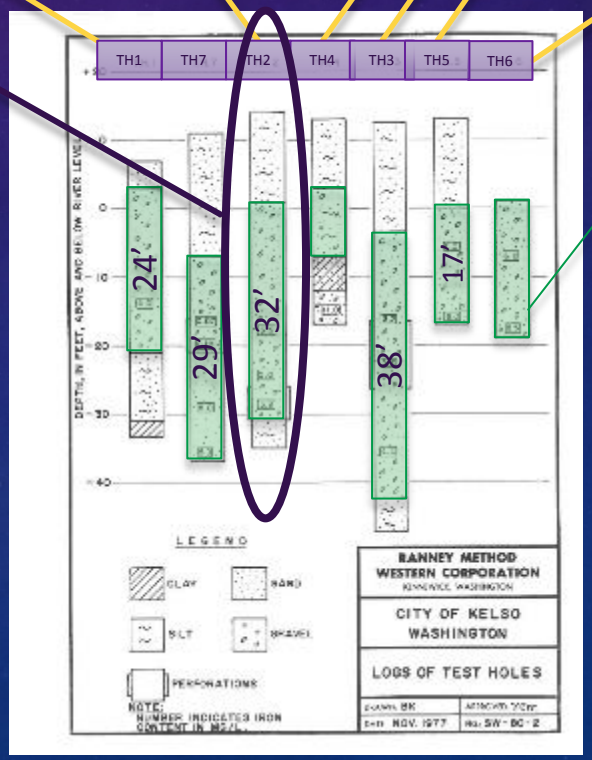

30'
20'
10'
0'
-10'
-20'
-30'
-40'
-50'
-60'
Approx OHW Cowlitz River
Approx Low Cowlitz River
13'
23'
Pump Test
GPM DD
30 2.0'
50 3.6'
75 6.2'
91 8.1'
11.2 gpm/ft
Field Measurements
Fe - >5ppm
Temp 50
pH – 6.3
Ec - 240
Pump Test
GPM DD
30 0.35'
50 0.60'
75 0.96'
121 1.66'
72.9 gpm/ft
Field Measurements
Fe - >5ppm
Temp - 53
pH – 6.3
Ec - 230
Feet Mean Sea Level
Legend:
Sand & Gravel
Sand
Silty Sand
Clay Silt
LV TH3
LV TH2
LV TH1

1977 DRILLING LOGS
CITY OF KELSO INVESTIGATION

Rocky Point

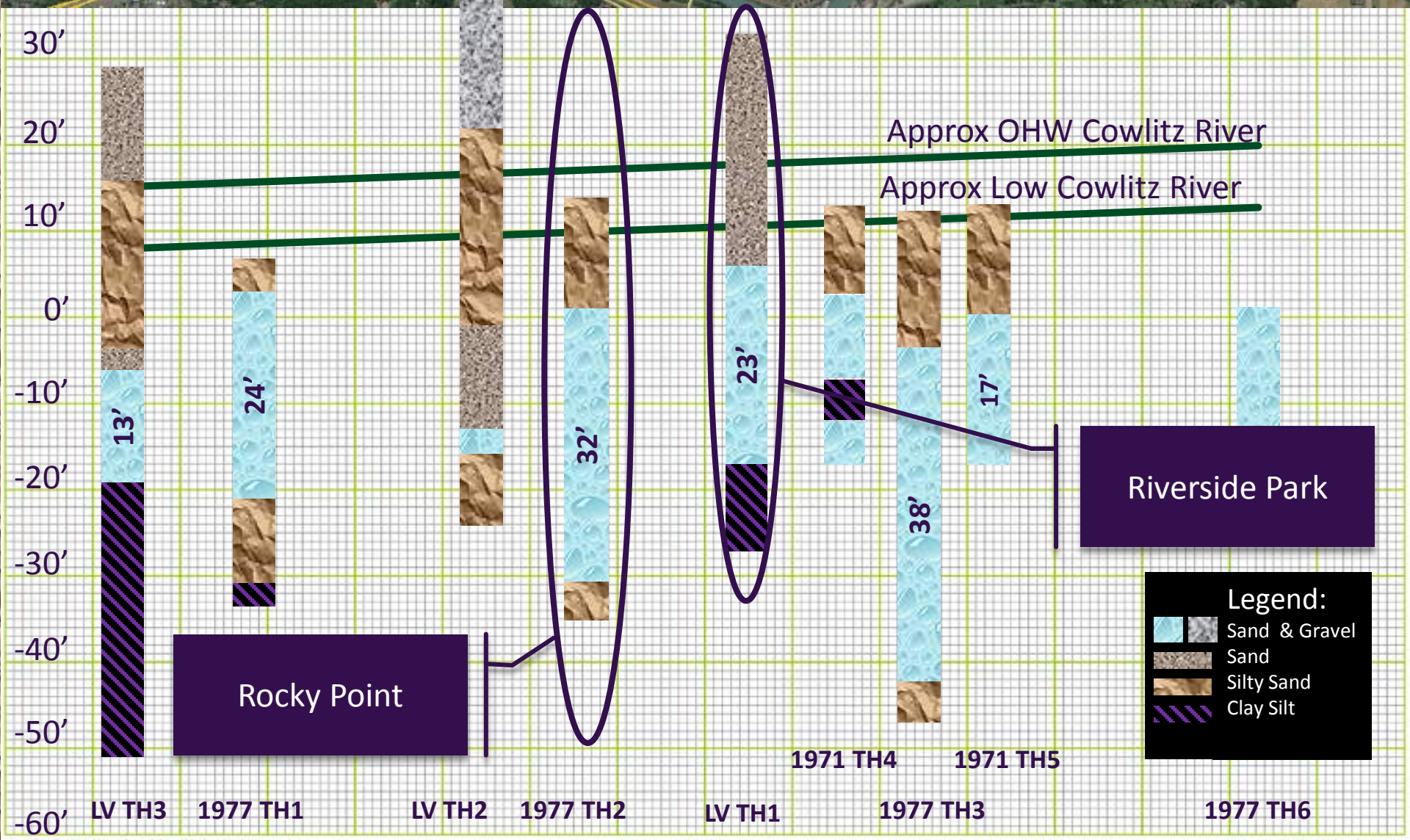
- 14-Ac. Property
- $900k list price

- 1.1 miles nearer to WTP
- Significant savings in raw water main cost
  - 20 MGD @ 36” = $4M

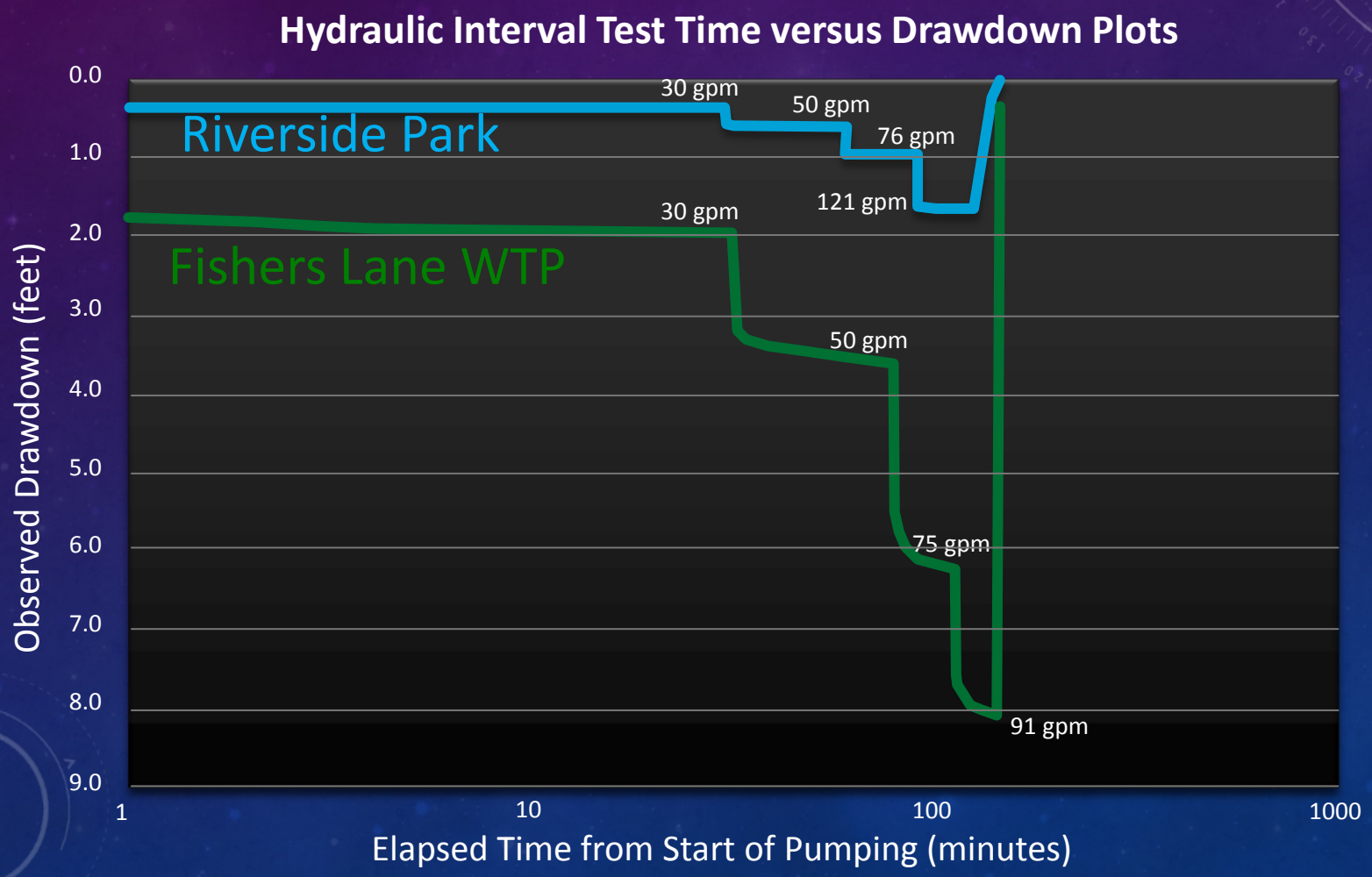


Saturated Water Bearing Zone

LV TH3
1977 TH1
LV TH2
1977 TH2
1977 TH4
1977 TH3
1977 TH5
LV TH1
1977 TH6


30'
20'
10'
0'
-10'
-20'
-30'
-40'
-50'
-60'
Approx OHW Cowlitz River
Approx Low Cowlitz River
13'
24'
32'
23'
38'
17'
Rocky Point
Riverside Park
Legend:
Sand & Gravel
Sand
Silty Sand
Clay Silt
1971 TH4
1971 TH5
LV TH3
1977 TH1
LV TH2
1977 TH2
LV TH1
1977 TH3
1977 TH6

COLLECTOR WELL CAPACITY ANALYSIS RESULTS FROM PHASE I TESTING



COLLECTOR WELL CAPACITY ANALYSIS PHASE I TESTING

	Capacity (MGD)	Transmissivity (gpd/ft^2)
Fishers Lane Collector Well	1 to 3	35,000
Riverside Park Collector Well[1]	5 to 9	135,000 to 240,000
Mint Farm RWTP[2]	17.4	1,030,000
Max Day Demand (2007) [3]	10.6	-
Max Day Demand (2010) [3]	9.0	-
Max Day Demand (2015) [4]	9.8	-
Max Day Demand (2032) [5]	11.9	-

12 MGD = 8,333 gpm

Notes:

1. Potential for multiple collector wells
2. Build-out capacity of 25 MGD to meet 50-year demand projections
3. Obtained from Fishers Lane WTP records for finished water production
4. Obtained from Mint Farm WTP records for finished water production
5. Projected water demand includes production and distribution losses, and water sold to BHWSD

WATER QUALITY ANALYSIS PHASE I TESTING

- Screening Level Water Quality Analysis Performed
- Water Quality represents localized groundwater
  - Short duration tests – low volume pump test
  - Little displacement of the native groundwater and no recharge from the river

WATER QUALITY ANALYSIS: PH I TESTS SUMMARY & COMPARISON

Analyte[1]	MCL or SMCL	Riverside Park PH I Test	Mint Farm	Cowlitz River	Kelso Collector Well
Aluminum	0.2[2]	0.044	0.006	0.3	
Ammonia	----	0.37	0.3-0.4	----	
Arsenic	0.01	ND	0.006	ND	
Hardness	----	81.4	98	24	
Iron	0.3[2]	11.1	1.1	0.43	3.7[4]
Manganese	0.05[2]	0.291	0.5	0.051	2.5[4]
Silica	----	58	58	18	19.5[5]
Dissolved Oxygen	----	1.09	<1.0	----	

Notes:

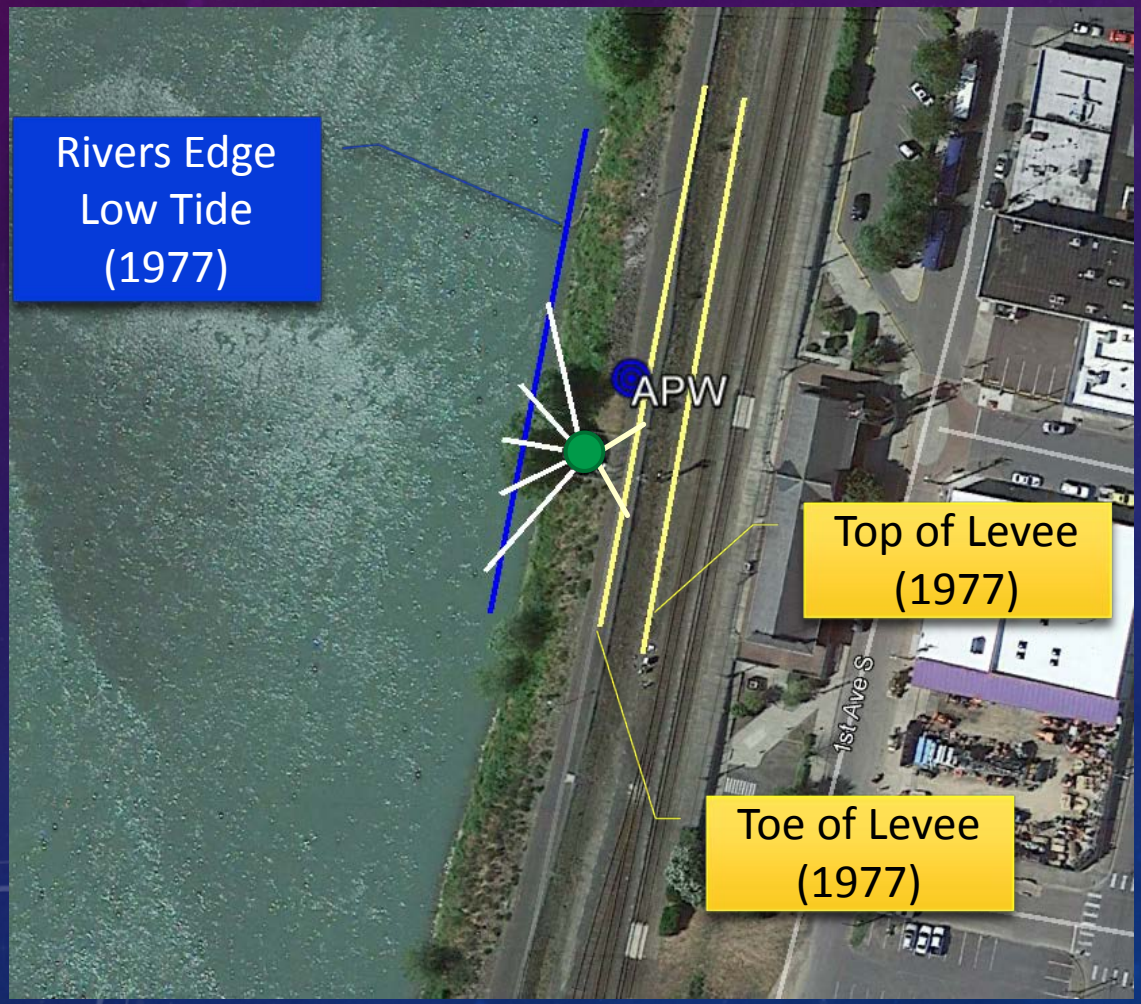
1. Not all Analytes Tested are Shown, refer to report for full suite of test results
2. Indicates Secondary Maximum Contaminant Level (aesthetics)
3. Values shown are ppm (milligrams/litre)
4. From Kelso 2014 Annual Water Quality Report
5. Sample Conducted by City of Longview Sept 2014

KELSO INVESTIGATION 1971 AT KELSO SURFACE WTP 12 DAY PUMP TEST

Iron Data
Test Well PW and P-4

Day into Test	PW Iron (ppm)	P-4 Iron (ppm)
0	12.1	11.0
1	12.1	8.2
2	12.1	7.7
3	9.9	6.0
4	9.9	5.0
5	12.1	4.7
6	11.2	4.6
7	9.9	4.6
8	9.9	4.2
9	11.0	3.9
10	11.0	4.1
11	11.0	3.5
12	11.0	3.9

KELSO RANNEY COLLECTOR INVESTIGATION AND INSTALLATION



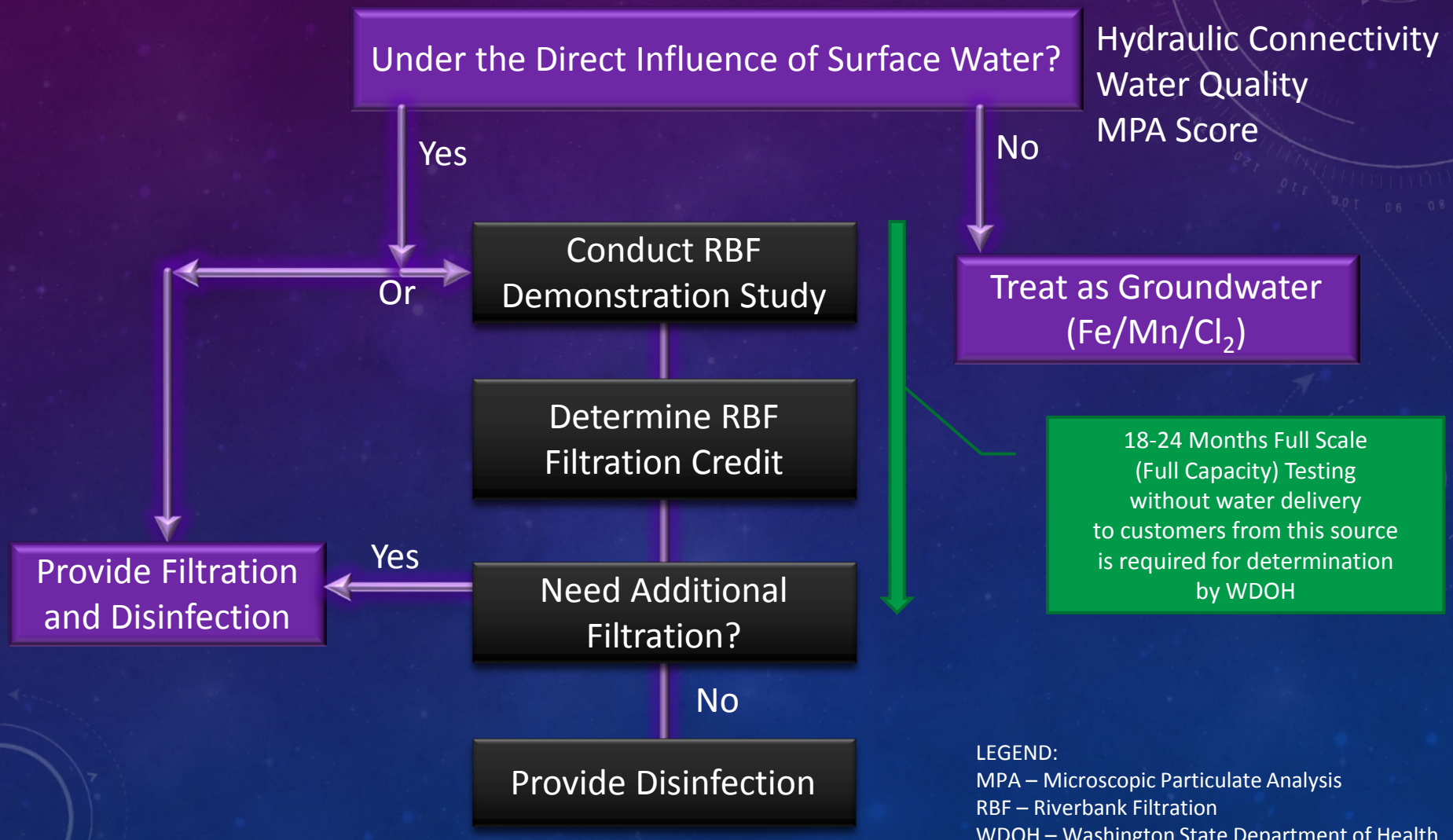
Iron Data
Test Well APW

Time into Test (hrs)	Iron (ppm)
0	0.2
2	0.94
16	1.06
24	0.80
36	0.66
48	0.32

PHASE I TESTING SUMMARY

- Three Sites were Explored
- Two Sites Analyzed for Capacity and Water Quality
- Riverside Park Site had highest yield potential at 5 to 9 MGD per Collector Well. Multiple collectors wells may be possible.
- Screening Level Water Quality Results (based on 4 hour pump test) indicate high levels of Iron and Silica, with Ammonia.
- Water Quality Chemistry may change with longer pumping test influencing the change in direction of subsurface water flow
- A Riverside Collector Well would likely require treatment for Iron & Manganese if water quality does not improve with pumping
  - Fishers Lane WTP did not treat for Iron or Manganese
- Additional treatment will likely be needed to meet WDOH regulations.

WATER TREATMENT DETERMINATION



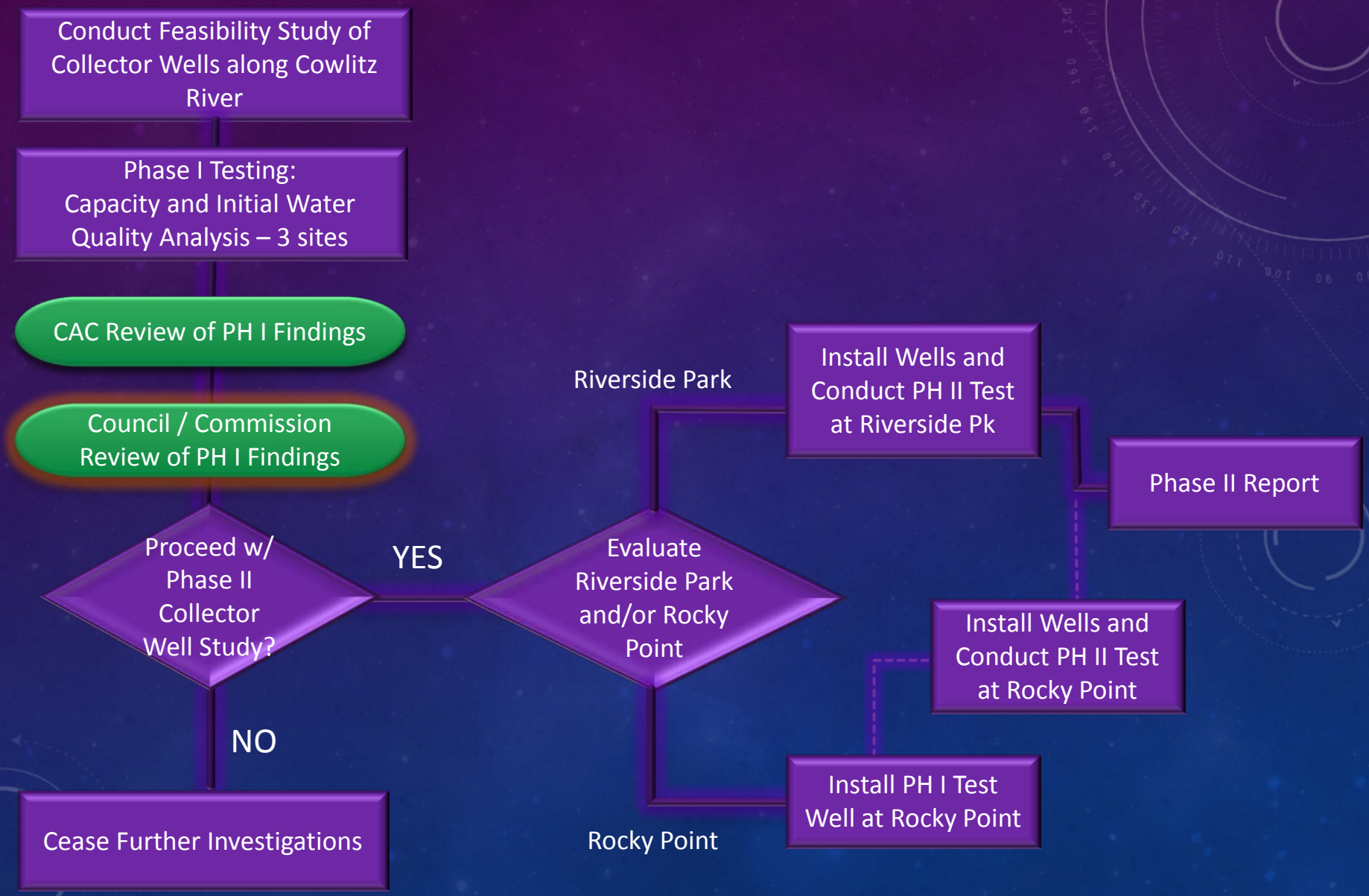
LEGEND:
MPA – Microscopic Particulate Analysis
RBF – Riverbank Filtration
WDOH – Washington State Department of Health

TREATMENT & PROJECT COSTS SCORECARD

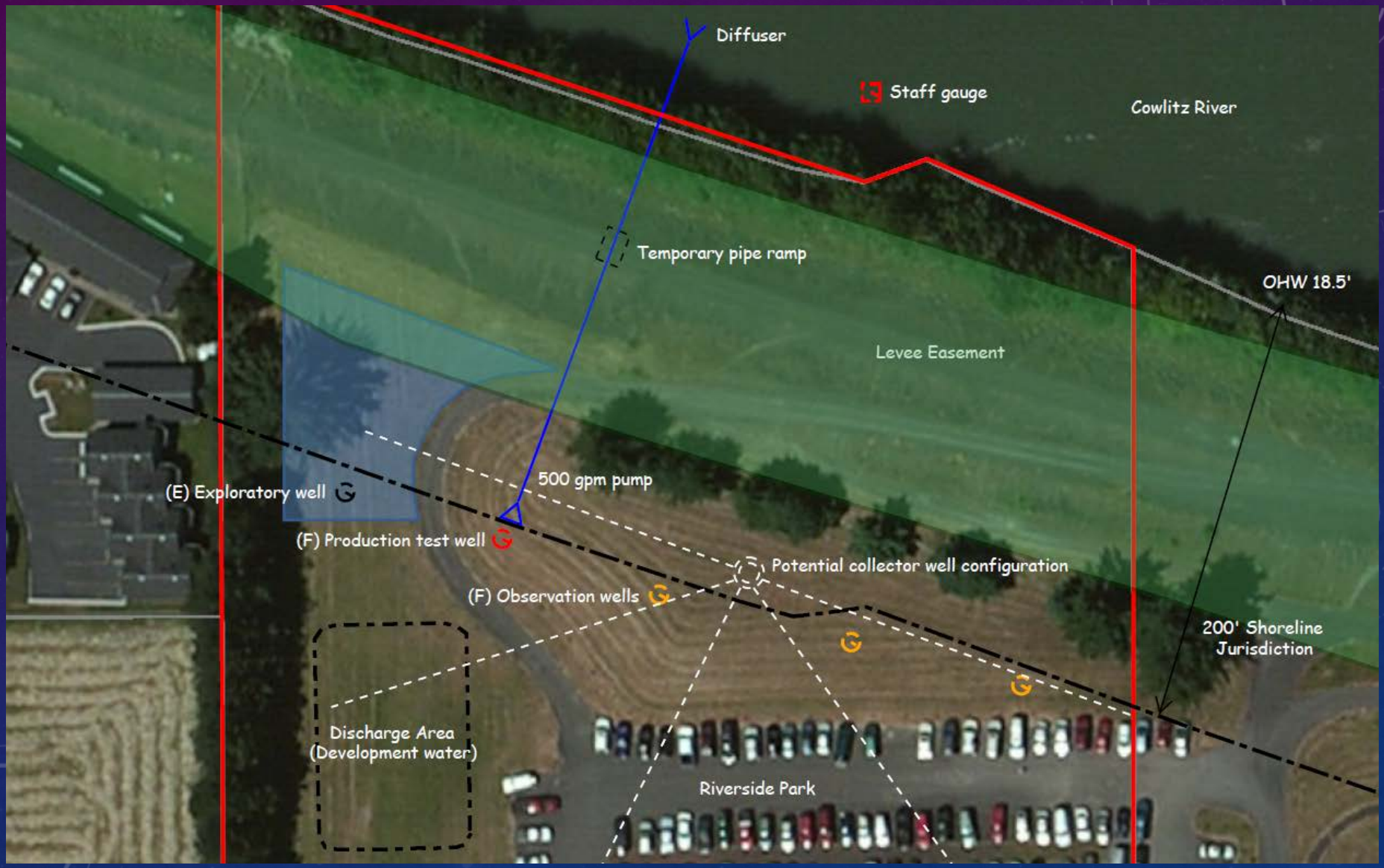
Groundwater		Groundwater Under the Direct Influence of Surface Water (GUI)			
Treatment 1	Treatment 2	Treatment 3		Treatment 4	Treatment 5
Chlorination Only	Use Mint Farm Pressure Filters	Ultraviolet Disinfection and Chlorination Only	Requires 18-24 Months Full Scale Testing and positive results meeting requirement of WDOH	Coagulant Addition, Filtration, Disinfection	Coagulant Addition, Clarification, Filtration, Disinfection
Groundwater with No Iron or Manganese	Groundwater with Iron and Manganese	Allowed if Riverbank Filtration credit is granted		Allowed if water quality meets certain limits	Required if little water quality data is available, or if turbidity is above 5 NTU
$29.5 million	$40.4 million	$33.2 million		$48.9 million	$55.1 million
High Iron – Requires Treatment	$9.65/ERU per month	$6.44/ERU per month		$11.38/ERU per month	$13.16/ERU per month

Estimates Based on:
Two Collector Wells At Riverside Park, Transmission Mains and Treatment

OPTIONS FOR MOVING FORWARD



OPTIONS FOR MOVING FORWARD: RIVERSIDE PARK – PHASE II



OPTIONS FOR MOVING FORWARD: ROCKY POINT – PHASE I AND II

ESTIMATED COSTS FOR MOVING FORWARD

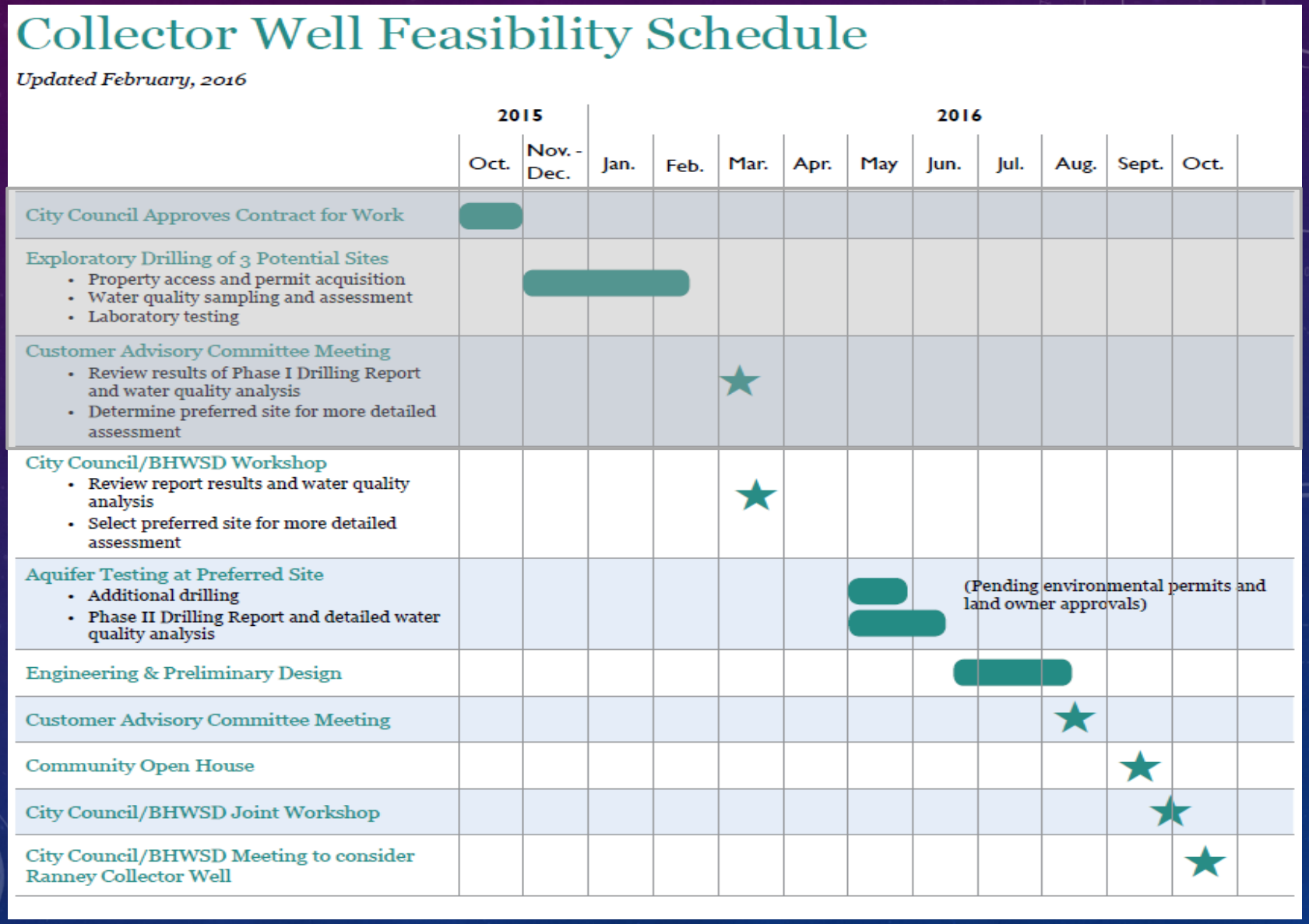
	Spent To Date	Riverside Park Phase II	Rocky Point Phase I/II	Both Riverside Park & Rocky Point
Exploratory Drilling	$115,000	$0	$45,000	$45,000
Aquifer Testing	$0	$101,750	$119,150	$220,900
Engineering Analysis	$5,000	$37,250	$43,000	$80,250
Community Outreach	$25,000	$27,150	$27,150	$27,150
Project Management	$6,000	$10,500	$13,000	$23,500
Contingency	$0	$3,350	$6,200	$9,550
Total	$151,000	$180,000	$253,500	$406,350
Additional Funding Authorization Needed	-	$0	$73,500	$226,350

CAC CONSIDERATIONS

MARCH 15 MEETING

Options	Votes
Riverside Park (Phase II) and Rocky Point (Phase I/II)	6
Riverside Park – Phase II	4
Rocky Point – Phase I	1
No Action / Status Quo	2

Note: Two members of the CAC were not able to attend the March 15 meeting

PROJECTED SCHEDULE

ASSUMES DECISION TO MOVE FORWARD WITH RIVERSIDE PARK – PHASE II