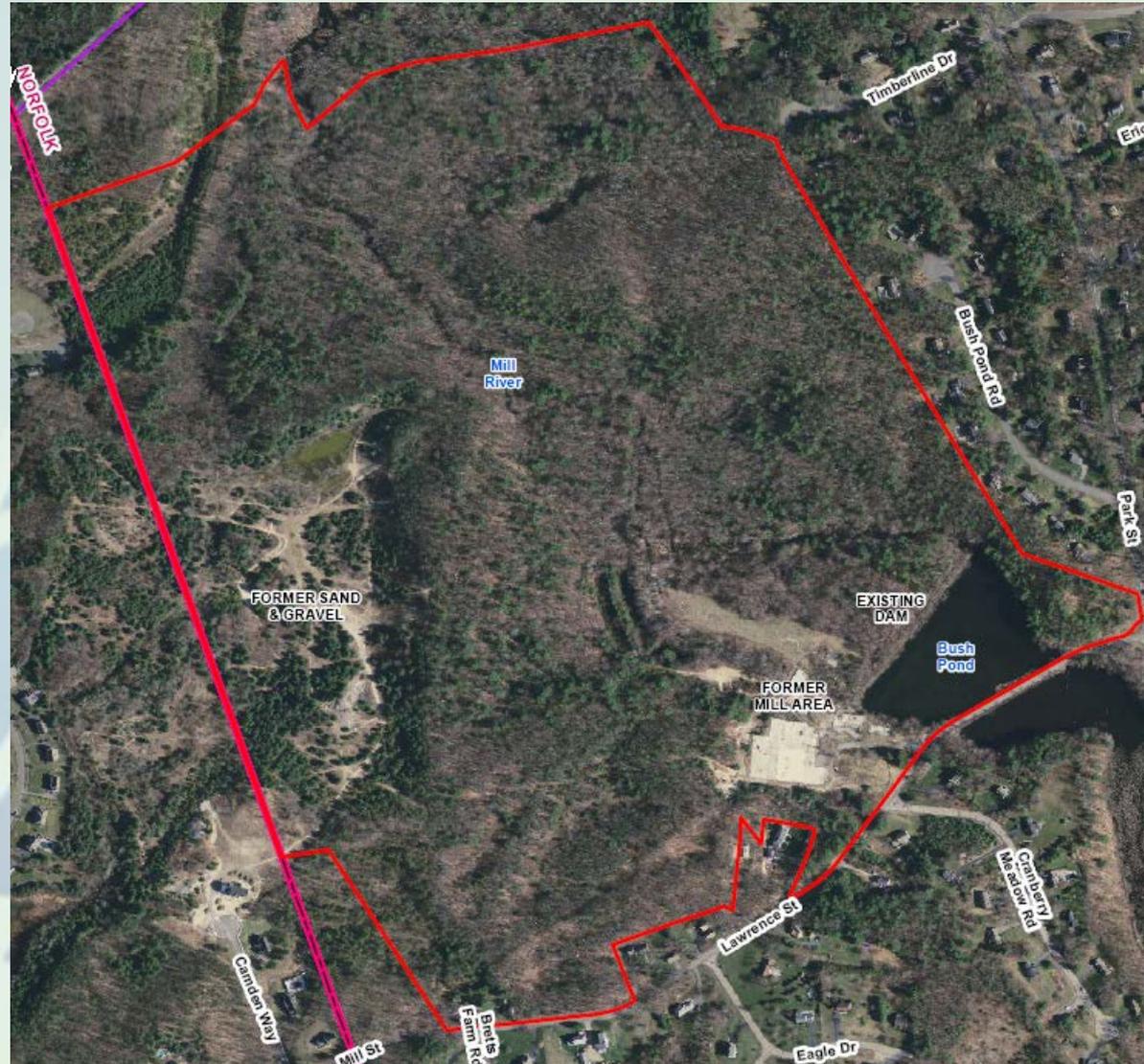


Abbyville Hydrogeologic Peer Review

- Topics:
 - Wastewater
 - Grading Plan
 - AUL Site



WWTF Sensitive Receptors

Test Wells

Mill River

AUL

WWTF

Private Wells

Abbyville Commons
17 Lawrence Street
Norfolk, MA 02056

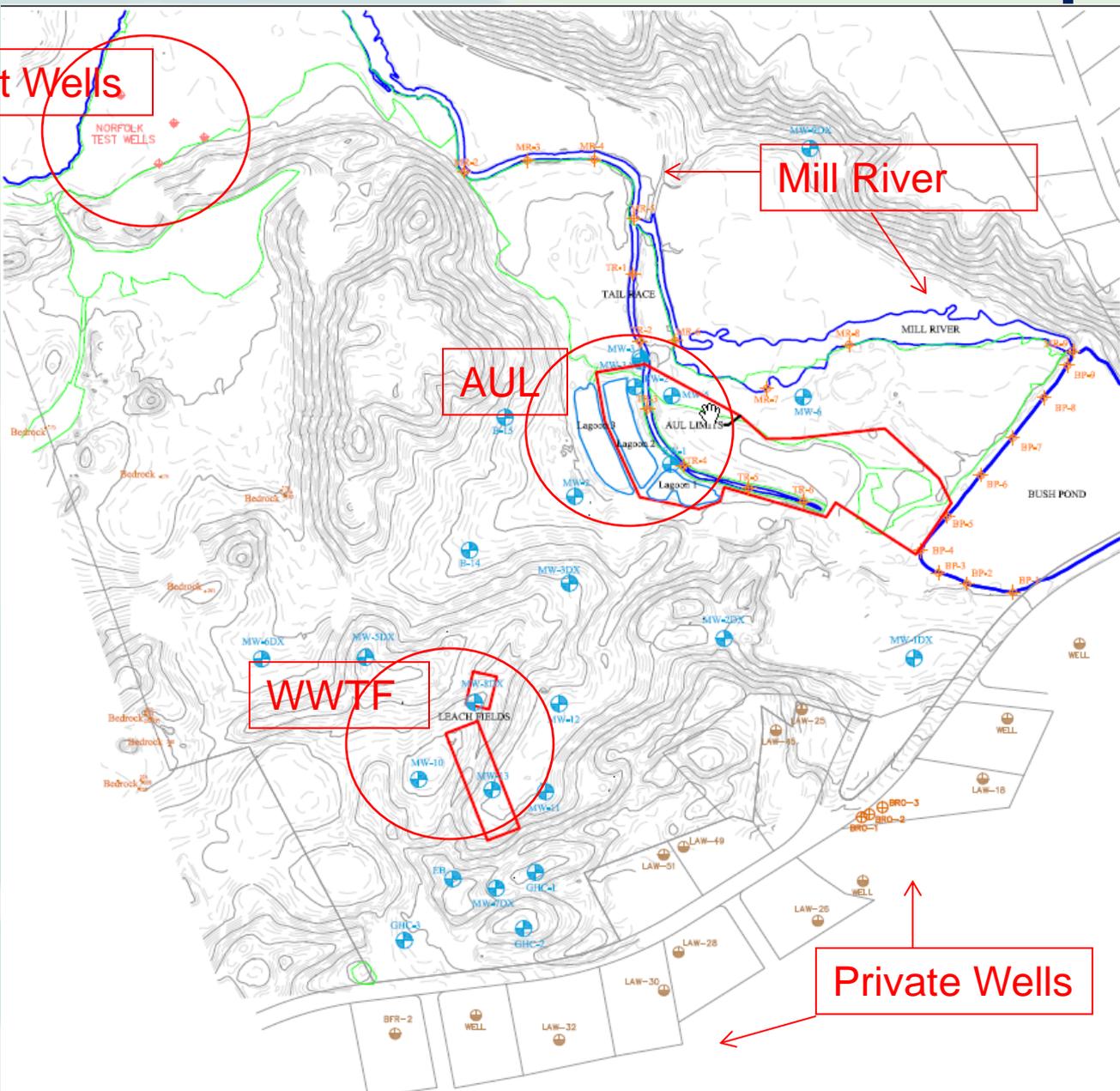
Figure 1A. Site Features.

- LEGEND:
-  MW-12 Groundwater Monitoring Well and Soil Boring Locations.
 -  BP-5, MS-7, TR-4 Surface Water Measurement Locations: Bush Pond, Mill River, Tail Race.
 -  LAW-18 Private Well Locations with Driller's Log.
 -  BRO-1 Bedrock Outcrops on Lawrence Street.



Scale in feet

Project No. GHC#15029
Drafted SWS Checked
Date 2/1/18 Rev
Base Map: CAD File provided
by United Consultants, Inc.

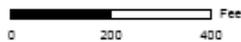




Legend

- Wells w 4/2/15 Data
- Wells w 11/15/17 Data
- HW Groundwater Contours¹
- GHC Groundwater Contours²
- 155.05 Surface Water Elevation³
- Water
- Proposed WWTF
- Parcels

¹ Based on Data from 4/2/15
² Based on Data from 11/15/17
³ Based on UCI Abbyville Survey from 11/20/17

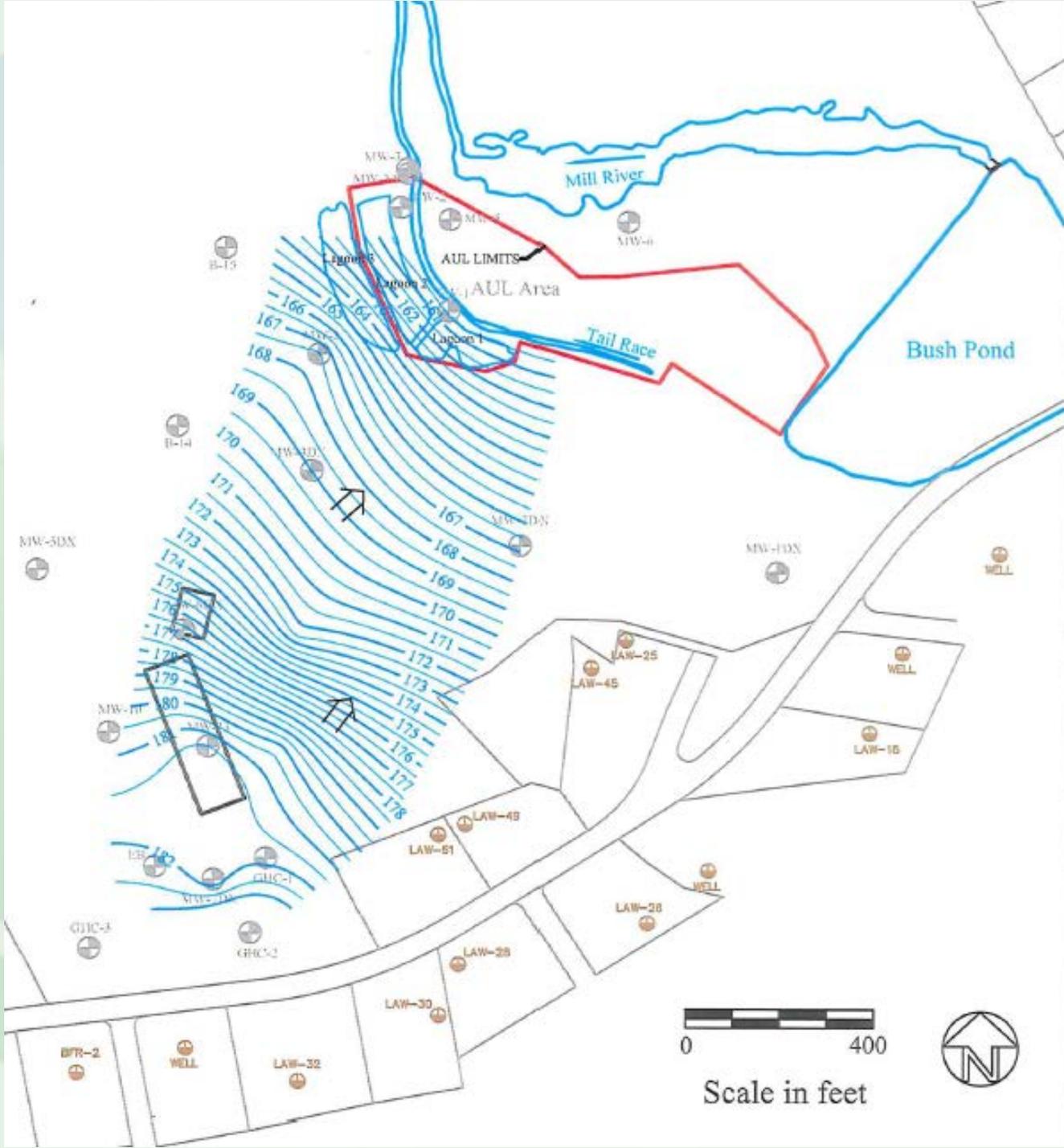


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Comparative Groundwater
 Contour Mapping
 Abbyville Commons
 17 Lawrence Street
 Norfolk MA 02056



Figure 10. Simulated Mounded Seasonal High Groundwater Contour Elevations, Wastewater Discharge: 80% of 64,000 GPD.



LEGEND:

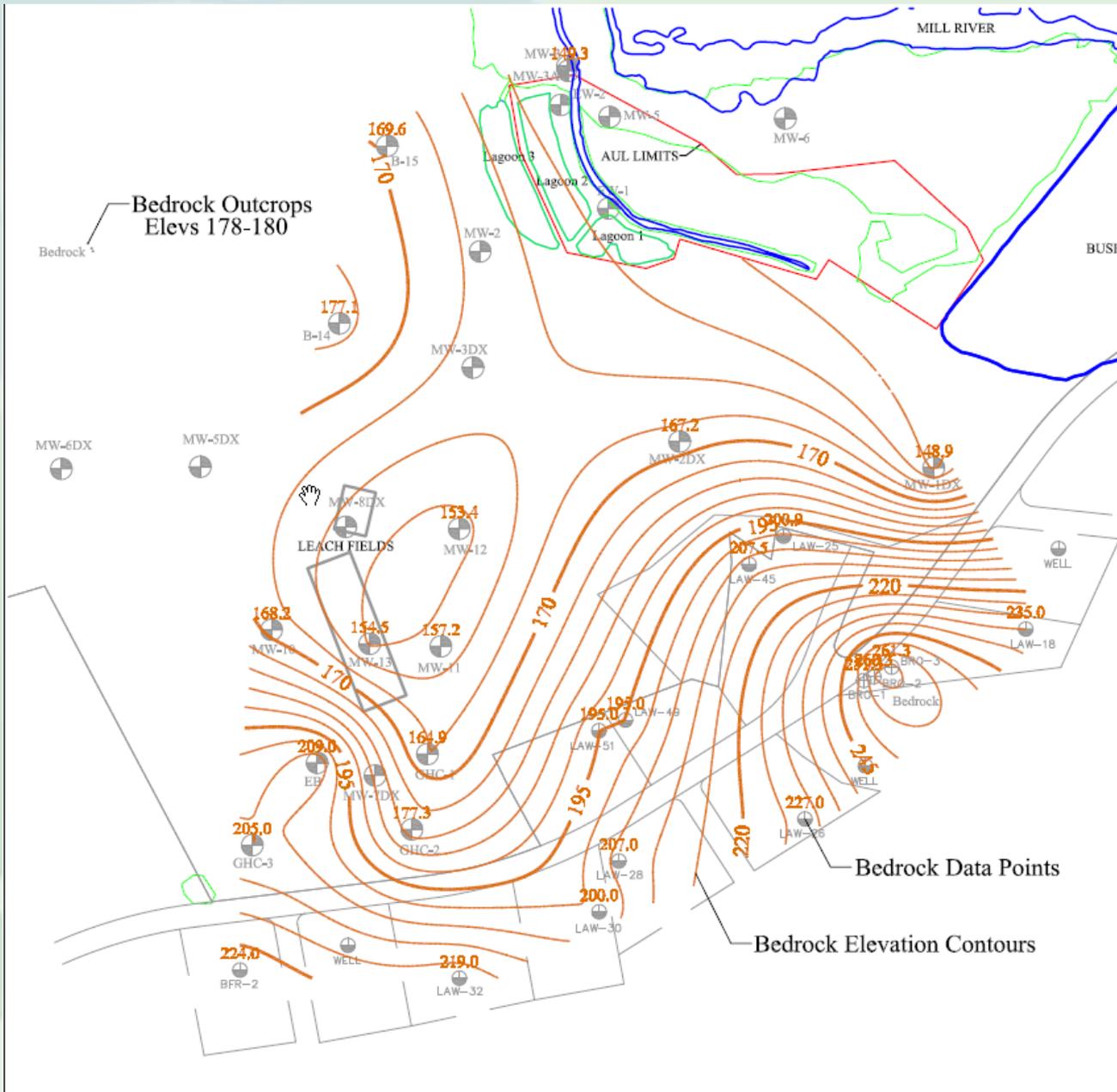
-  Groundwater Elevation Contours. Interval = 0.5 foot.
-  Inferred Groundwater Flow Direction.
-  Groundwater Monitoring Well Locations.

NOTES:

1. Groundwater contour data are calculated and interpreted as described in the text.
2. Treated wastewater discharge = 64,000 gallons per day. Modelled 80% of 64,000 gpd.
3. Total Leaching footprint = 39,168 square feet.
4. Groundwater contours are presented for the purposes of this report only.

Project No. GHC#15029
 Drafted SWS Checked
 Date 12/12/17 Rev 2/27/18
 Base Map: CAD File provided
 by United Consultants, Inc.

Private Wells



Abbyville Commons
17 Lawrence Street
Norfolk, MA 02056

Figure 2. Revised
Bedrock Elevation
Contours.



Scale in feet



Project No. GHC#15029
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Base Map: CAD File provided
by United Consultants, Inc.

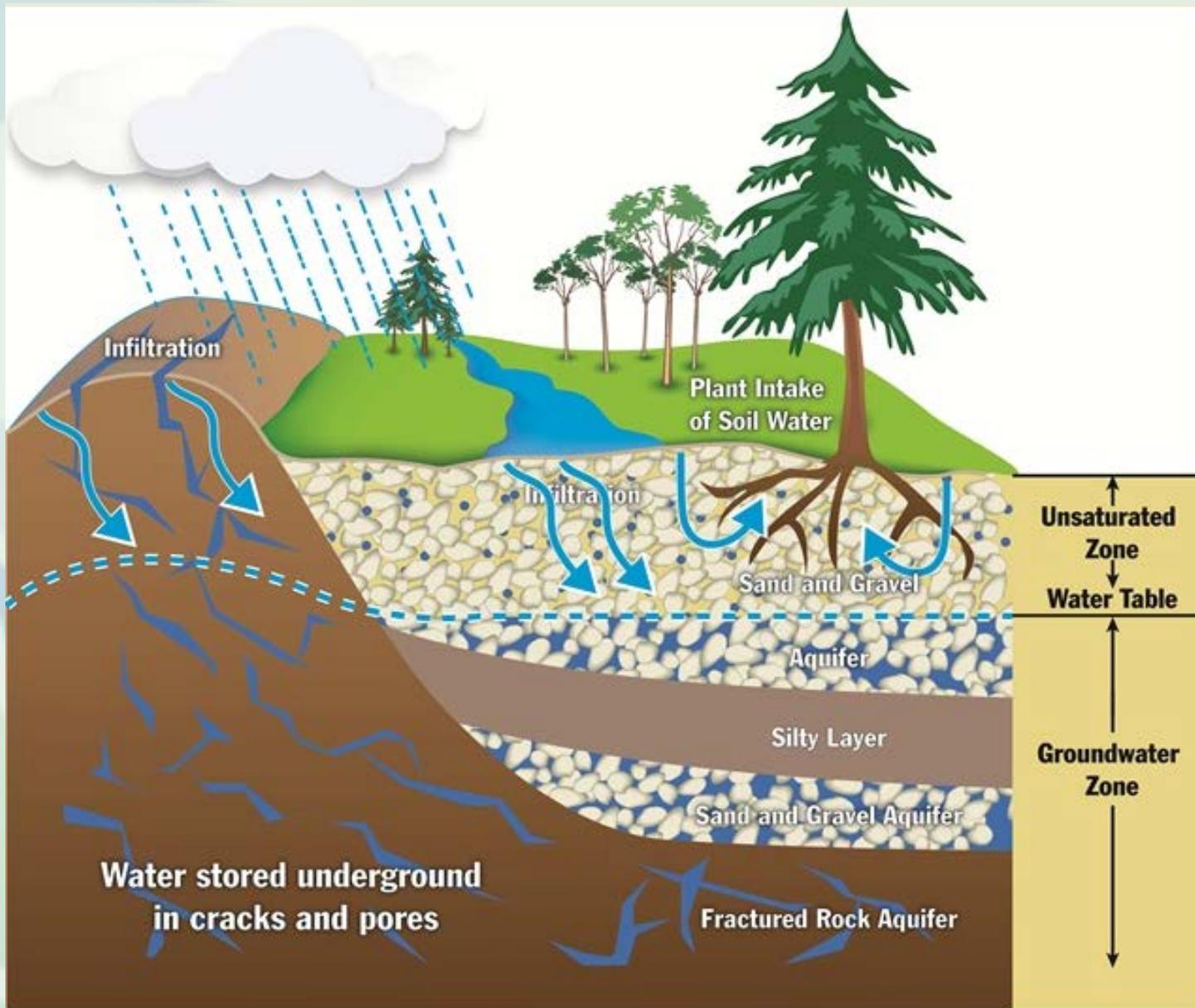
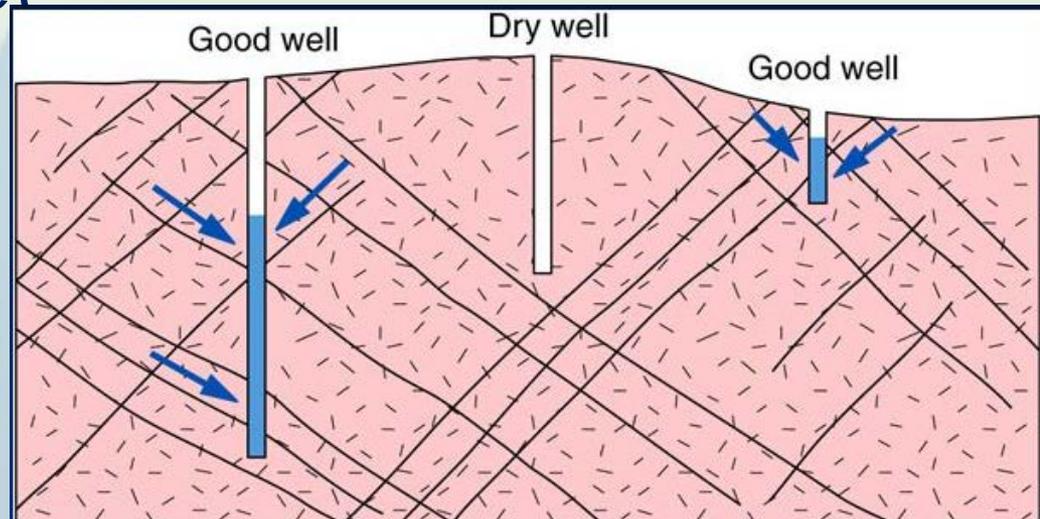


Image from Cucamonga Water District, CA



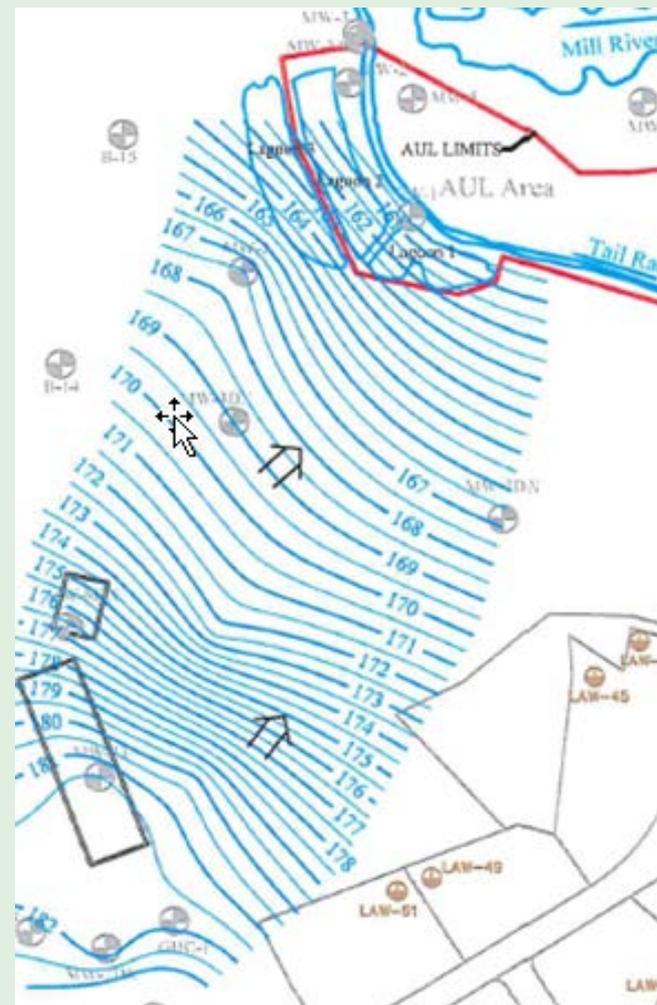
Private Wells

- Bedrock Wells -
Approximately 14 in
Proximity, 160 - 525 feet
Deep
- Wells Tap Multiple
Fractures in Various 3D
Orientations
- Fracture Water from
Where Fractures Intersect
Overburden Aquifer
- Capture Zones of Bedrock
Wells Difficult to Specify



Private Wells

- Conductivity of Overburden Aquifer on Site Much Higher Than Fractured Bedrock
- Intersection of Overburden Aquifer With Bedrock at Bottom
- WWTF GW Flow Traveling Horizontally and Downward
- Opportunity for Significant Contribution from WWTF to Private Wells Minimal



Private Wells

- Still Recommend High Level WWTF Treatment for 2-Year TOT to Public Drinking Water Wells
- Pre and Post Construction Monitoring of Intervening Monitoring Wells and Private Wells Themselves

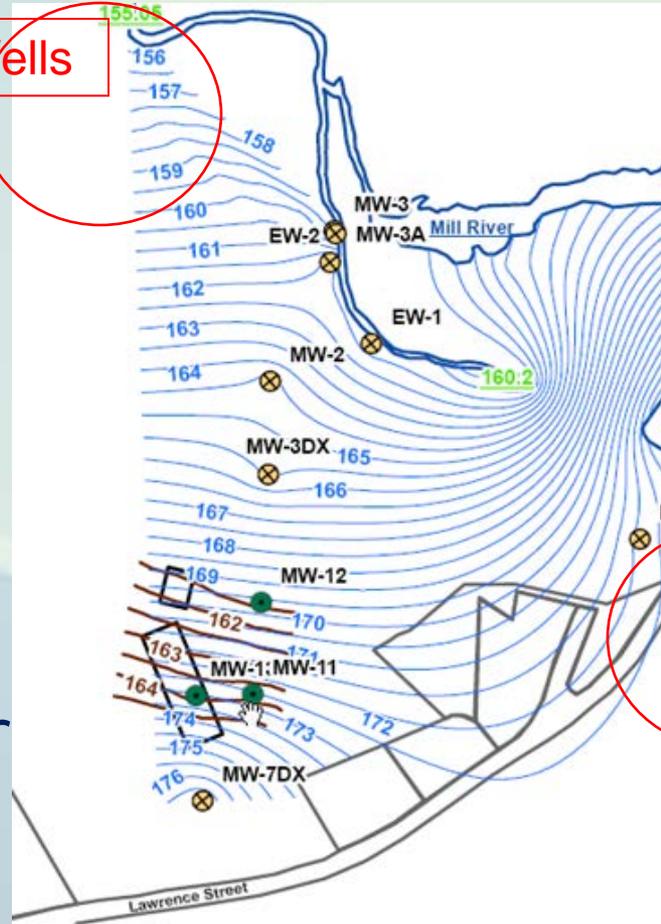
Agreed To By Applicant



Town Test Well Site & Franklin Wells

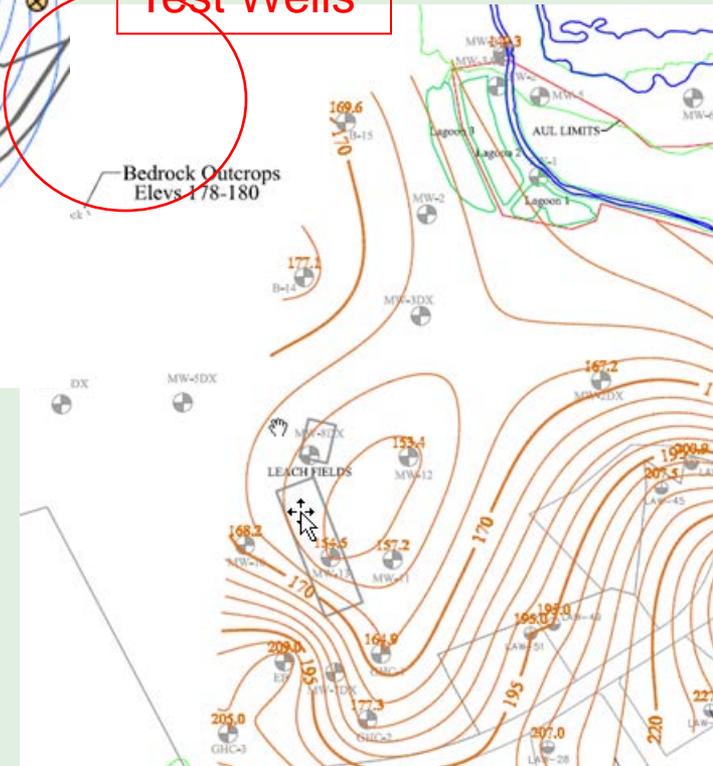
Test Wells

- Bedrock Protection Unknown
- More Likely to Receive Groundwater Flow from WWTF



Test Wells

Bedrock Outcrops Elevs 178-180



Town Test Well Site & Franklin Wells

- Test Well Site Calculated to be Approx. 1-Year TOT from WWTF
- Recommend Higher Treatment Standards for WWTF for Being < 2-Year TOT
- Recommend Pre & Post Construction Monitoring

Agreed To By Applicant



Mill River

- TMDL for Phosphorus Requires 50% Overall and 66% Wastewater Reduction
- Reductions from 2005 Time Period of TMDL Data
- This and all New Development Since 2005 Requires 100% Mitigation
- Stormwater Controls Pending New MS4 Permit
- WW Controls Per MassDEP. Enforcement Unknown



Mill River Recommendations

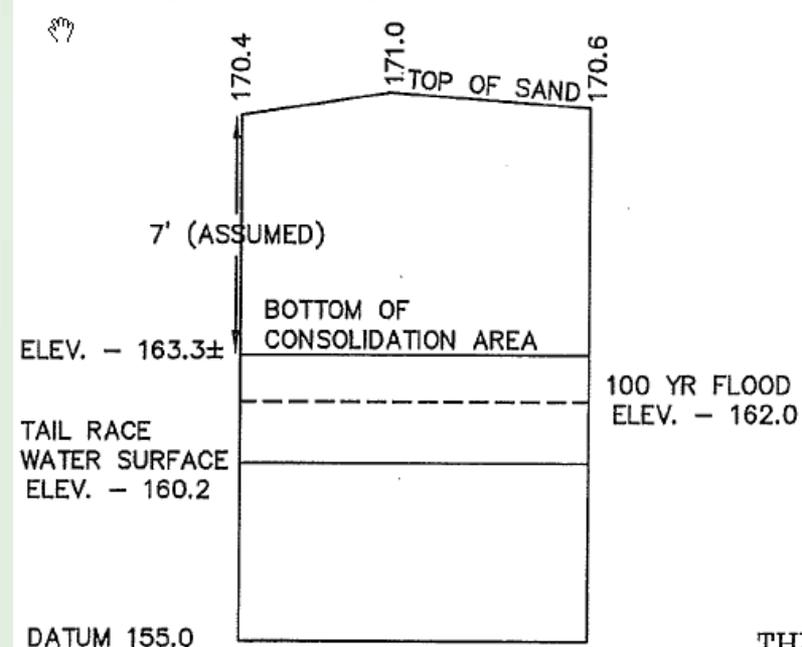
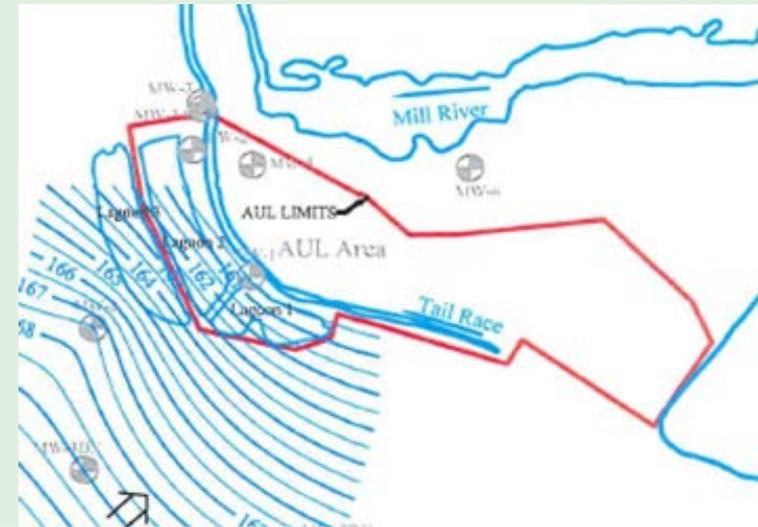
- Provide Phosphorus Mitigation to Extent Practical to Protect Town from Potential Future Regulatory Issues
 - Maximize Unsaturated Thickness Beneath WWTF Beds
 - Provide High Level P Treatment at WWTF
 - Provide Capacity for Future WWTF Expansion to Tie-in Existing Nearby Homes

Agreed To By Applicant



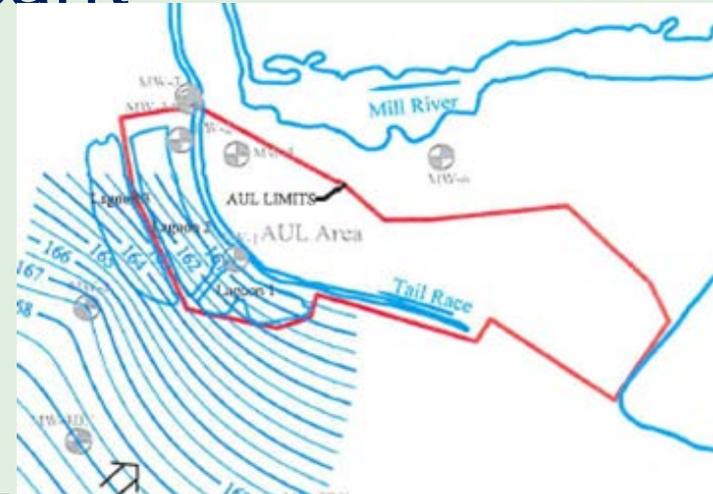
AUL Site

- Will Higher GW Levels & More Flow Spread Contaminants Towards Mill River?
- Predicted 0.4-Foot Rise of Water Table at AUL from WWTF
- Lagoons Already in Groundwater so No Further Influence Likely
- Based on Applicant's Review AUL Documents and Field Survey, Landfill Base Appears to be Above 100-Yr Flood El.



AUL Site

- Landfill Location Between Tail Race and River Makes Significant GW changes from Proposed WWTF Unlikely
- Sites are Closed and Under MassDEP Direction
- Applicant is Landowner and Thus Responsible Party to MassDEP
- Recommend Let MassDEP Opine if Concerned about WWTF Impacts



Site Grading

- Stormwater Infiltration Basins < 4-Ft SHGW Separation



From UCI

Table 1. Proposed Infiltration Basin Elevations and SHGW

Basin	Basin Bottom Elevation*	Groundwater Elevation**	Frimpter Adjustment	Est. SHGW Elevation	Est. SHGW Separation
1	172.0	166.5	2.36	168.86	3.14
2	170.0	164.3	2.36	166.66	3.34
3	166.0	160.6	2.36	162.96	3.04

*All Elevations in feet above NAVD88 datum.

** Groundwater elevations measured April 17, 2015.



Stormwater Basins

- Applicant Agreed to Base Inf. Basin Designs on SHGW Determined from Either:
 - Soil Mottling in New Test Pits Witnessed by Town Health Agent
 - Frimpter Adjusted Values Based on February 20, 2018 Data
- SHGW to be No Lower Than February 20, 2018 Readings



Steep Slopes Recommendations

- Can't Be Mowed. Seed and Plug for Trees/ Shrubs
- Hydroseed w Bonded Fiber Matrix
- Initial Seed Both NE Erosion Control & Rye/Fescue w Second Overseed
- Stormwater Controls at Top
- Benching to Break up Slope
- Monitor and Repair Erosion

Agreed To By Applicant



Recommendations

- Town to Submit Comments on GWDP When Engineering Report Submitted
- WWTF Designed to Treatment Levels for Less Than 2-Year TOT to Public Supply Wells

Agreed To By Applicant



Recommendations

- Maximize Unsaturated Thickness Beneath Disposal Beds
- Build WWTF with Excess Capacity to Tie in Existing Development
- Provide Curbside Public Water Supply Shutoffs for Lawrence Street Homes
- Pre and Post Construction Monitoring

Agreed To By Applicant



Recommendations

- Ensure Stormwater Infiltration Basins Meet MASWS
- Waiver Needed for Town Excavation Bylaw?
- Improved Steep Slope Stabilization and Monitoring

Agreed To By Applicant

