Welcome

to the
Community Liaison Committee
Meeting for
Hydro One – Clarington TS

CLC Meeting

Hydro One - Clarington TS

Outline

- **2014 Baseline Conditions Report**
  - Addendum, Addendum 2
- **2015 Annual Monitoring Report**
  - Water Levels
  - Water Quality
- **Permit to Take Water (PTTW) Monitoring**
  - Predicted vs. Actual

Baseline Conditions

Objectives

Assessment Potential Effects

- Will Station Construction Affect Groundwater Levels?
- Will Station Construction Affect Groundwater Quality?
- Will Water Features Continue to Function Naturally?
- Will Neighbouring Private Wells Be Affected?

…protect groundwater and surface water resources

Baseline Conditions

Document Existing Conditions

Methodology

- Geology / Stratigraphy Investigation
- Hydraulic Conductivity Testing
- Groundwater Quality Testing
- Groundwater Elevation Monitoring
- Groundwater Flow Direction

…refine our understanding of the Site

Baseline Conditions

Site Setting

Document Existing Conditions

- South Slope Physiographic Region
- 6 km South of Oak Ridges Moraine Sediments
- Surficial Soils Mapped as Silty to Sandy Till

Baseline Conditions

Site Setting

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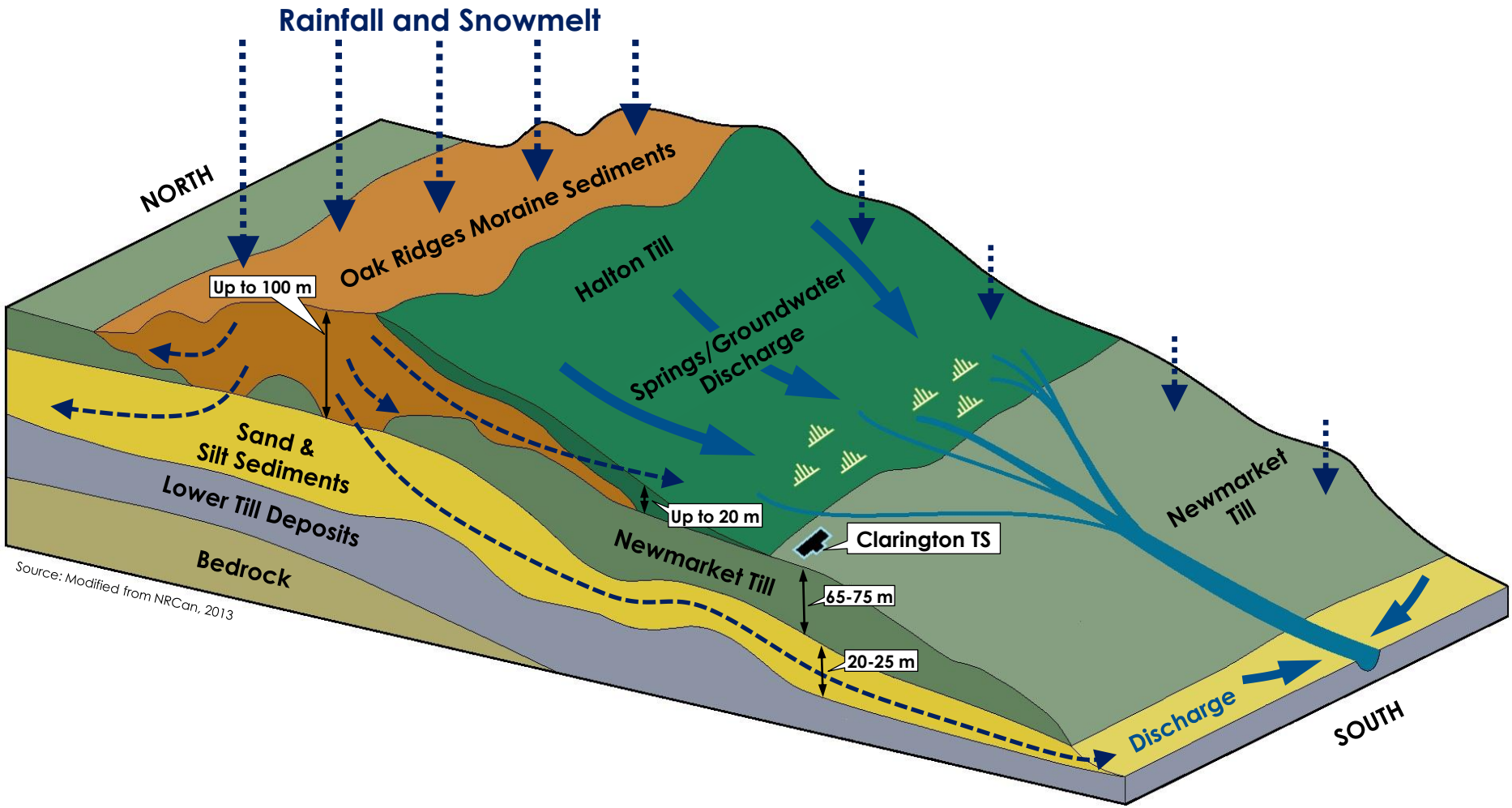
- South Slope Physiographic Region
- 6 km South of Oak Ridges Moraine Sediments
- Surficial Soils Mapped as Silty to Sandy Till

Baseline Conditions

Site Setting

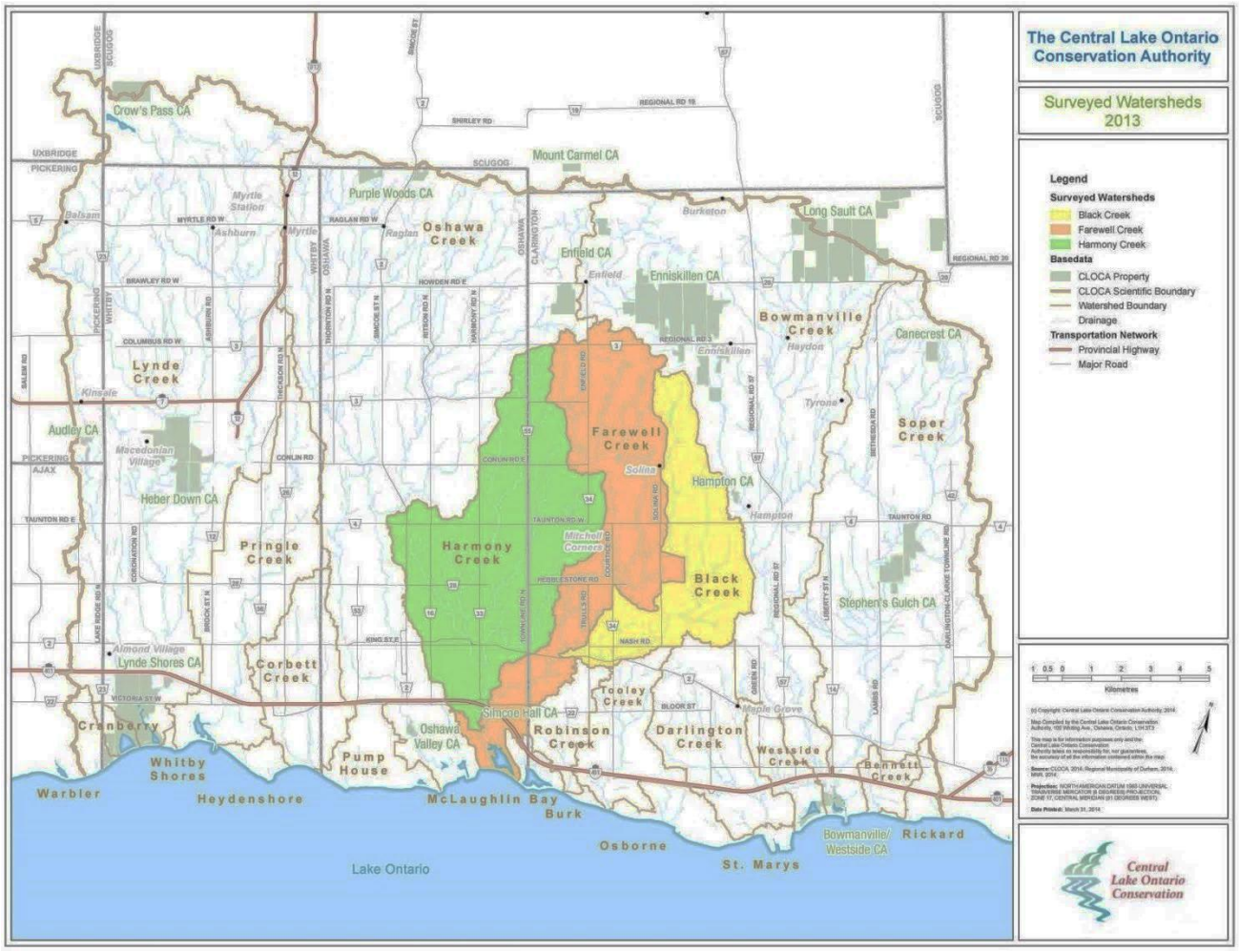


Baseline Conditions

Harmony Creek Subwatershed

East - Farewell Creek

West – Oshawa Creek



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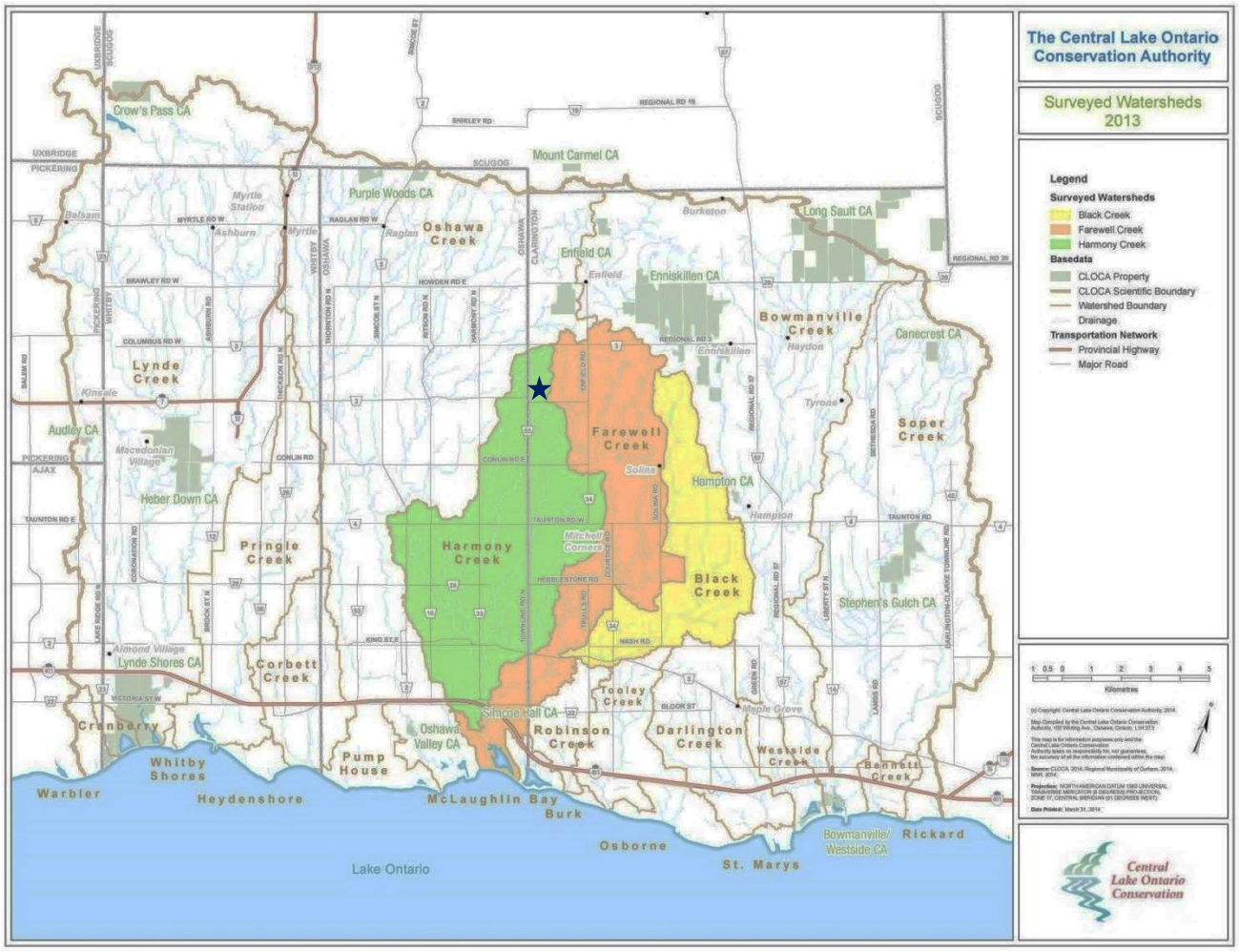
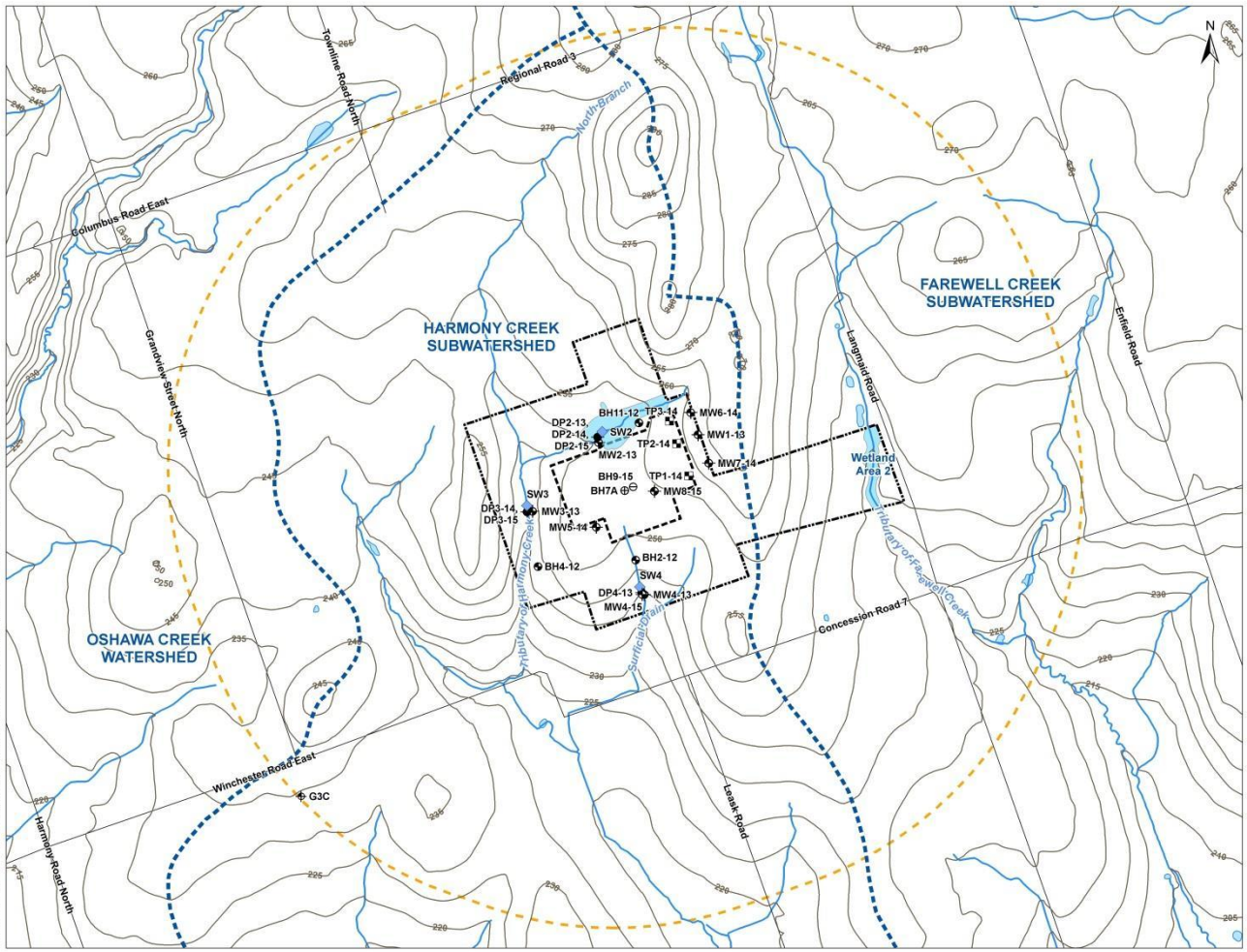


Baseline Conditions

Harmony Creek Subwatershed

Station Location:

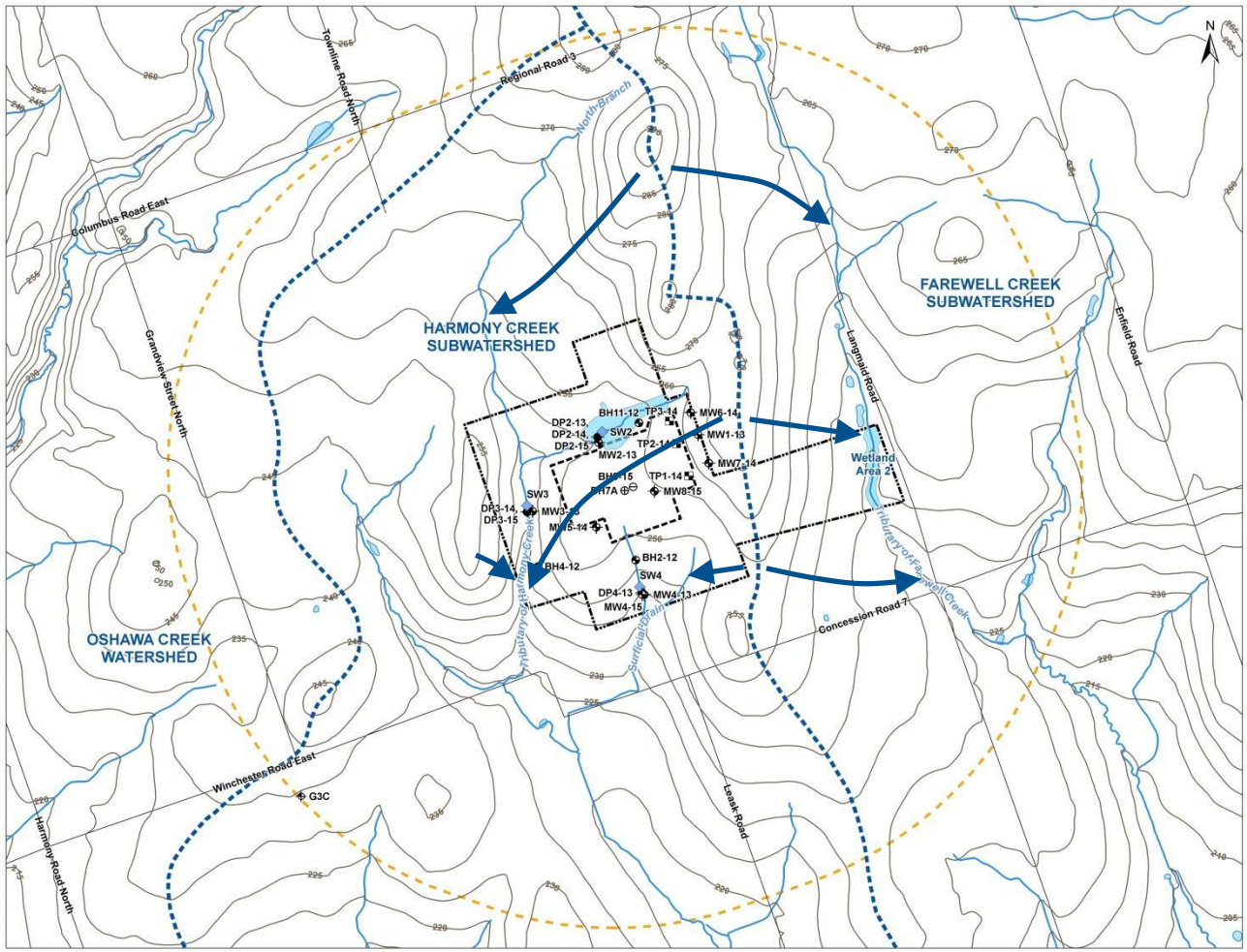
on West Side of Ridge Separating Harmony Creek and Farewell Creek Subwatersheds



Baseline Conditions

Harmony Creek Subwatershed

Surface water runoff toward Tributaries of Harmony Creek

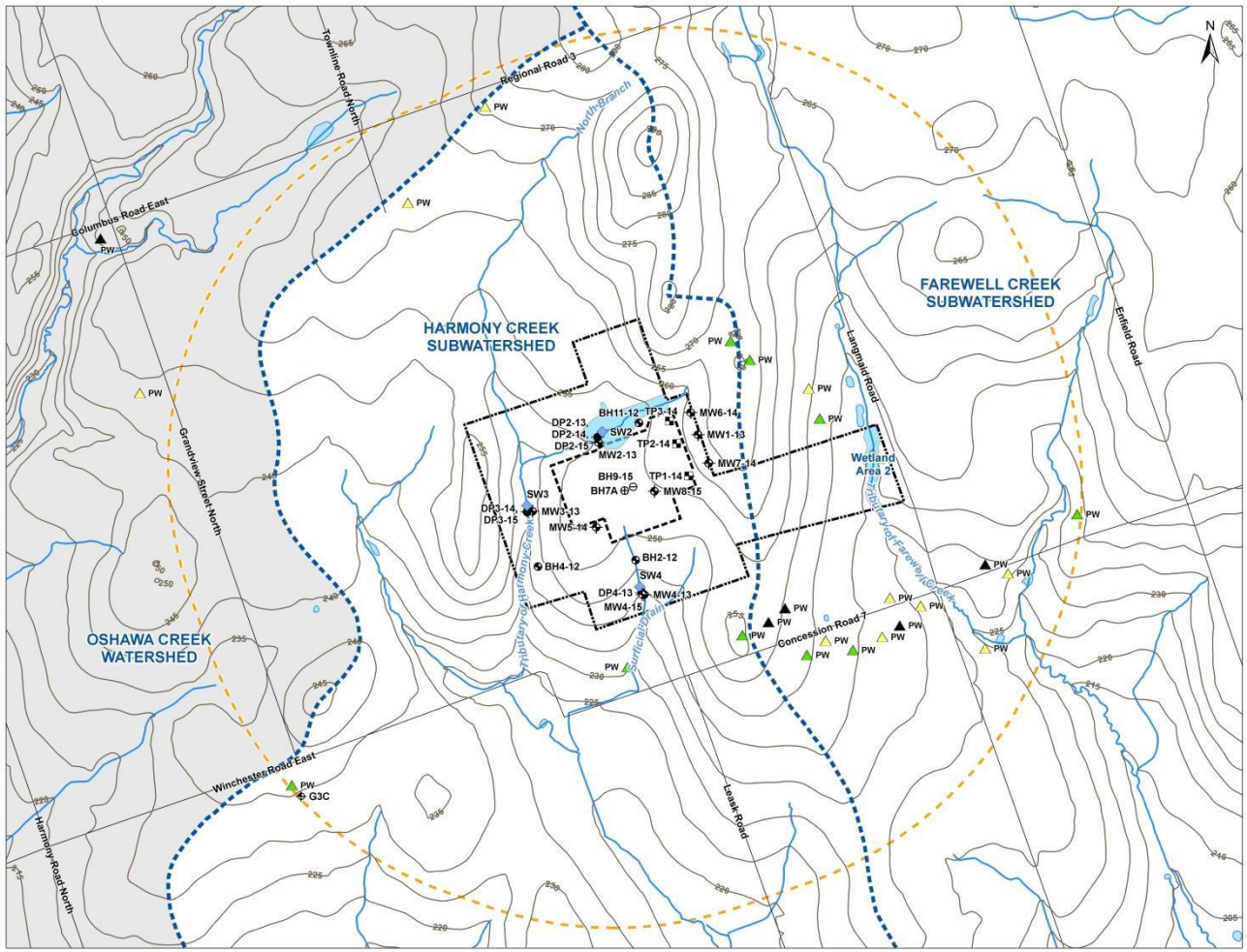


Baseline Conditions

Harmony Creek Subwatershed

Surface water runoff toward Tributaries of Harmony Creek

Oshawa Creek - west



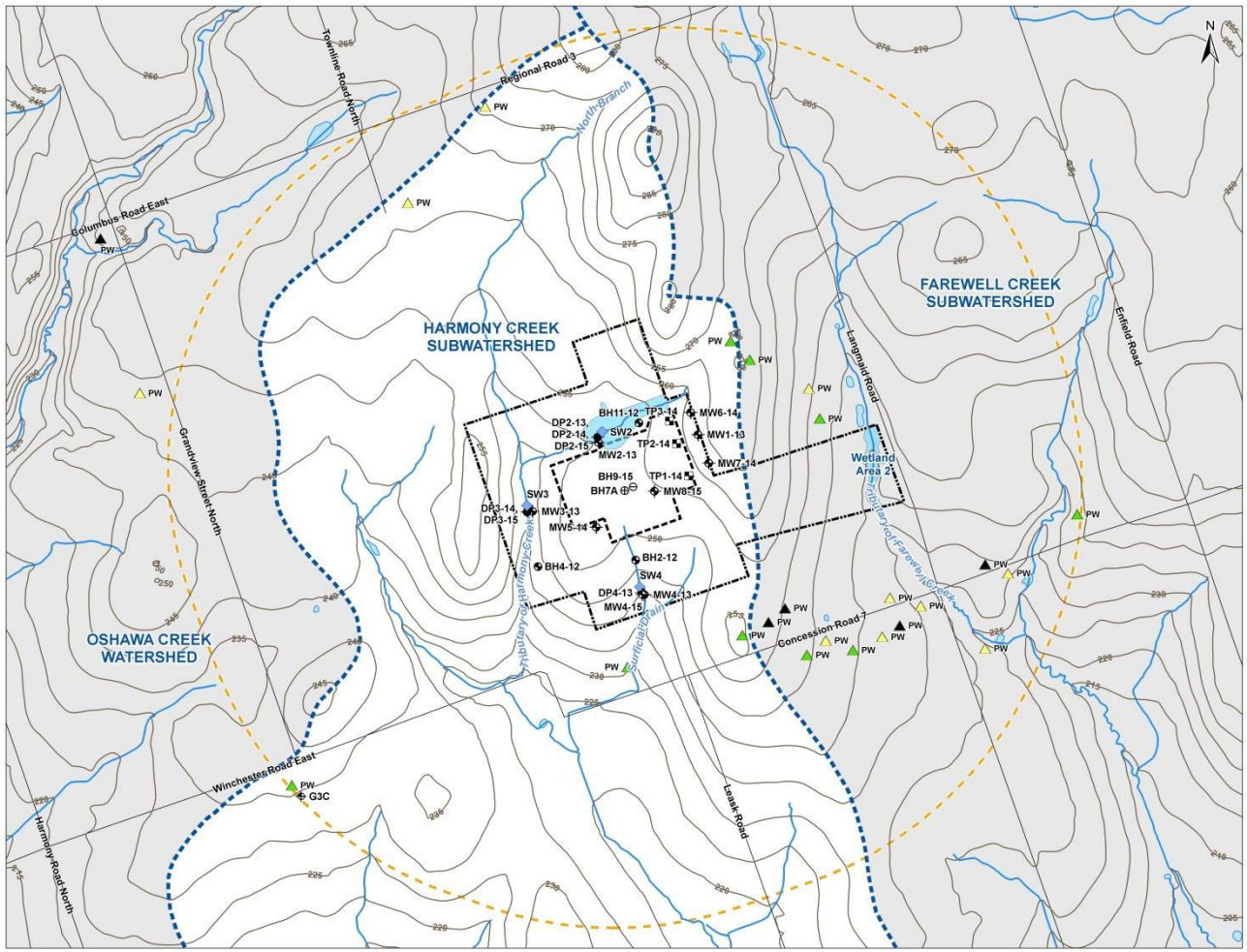
Baseline Conditions

Harmony Creek Subwatershed

Surface water runoff toward Tributaries of Harmony Creek

Oshawa Creek - west

Farewell Creek - east



Baseline Conditions

Scope of Work

Hydrogeologic Investigation

- Build on Geotechnical Investigation
- Installation of 17 Monitoring Wells
- Installation of 3 Surface Water Piezometers
- Hydraulic Testing
- Groundwater Elevation Monitoring
- Groundwater Quality Testing

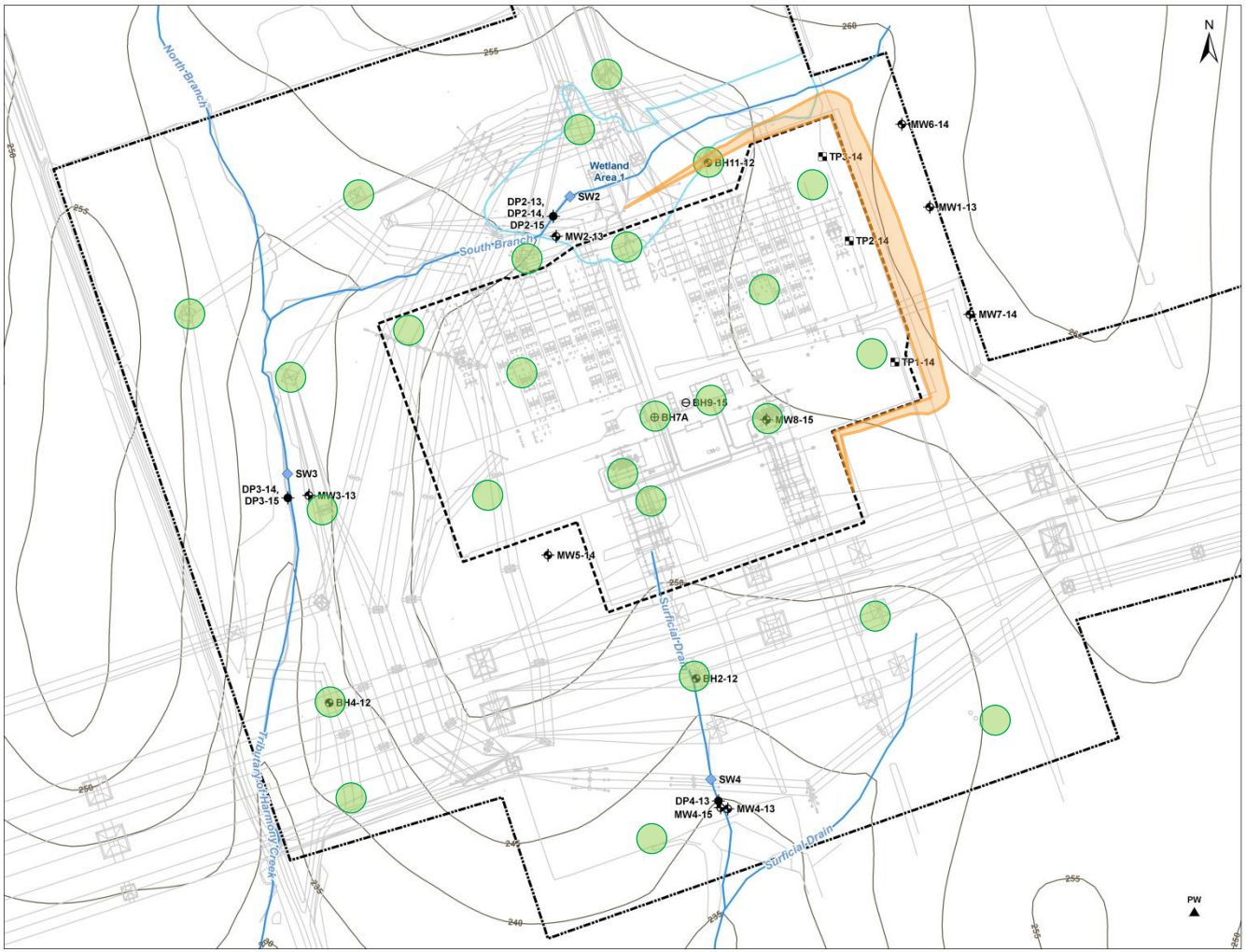
…refine our understanding of the Site

Baseline Conditions

Hydrogeologic Investigation

Geotechnical Boreholes

- 29 Boreholes

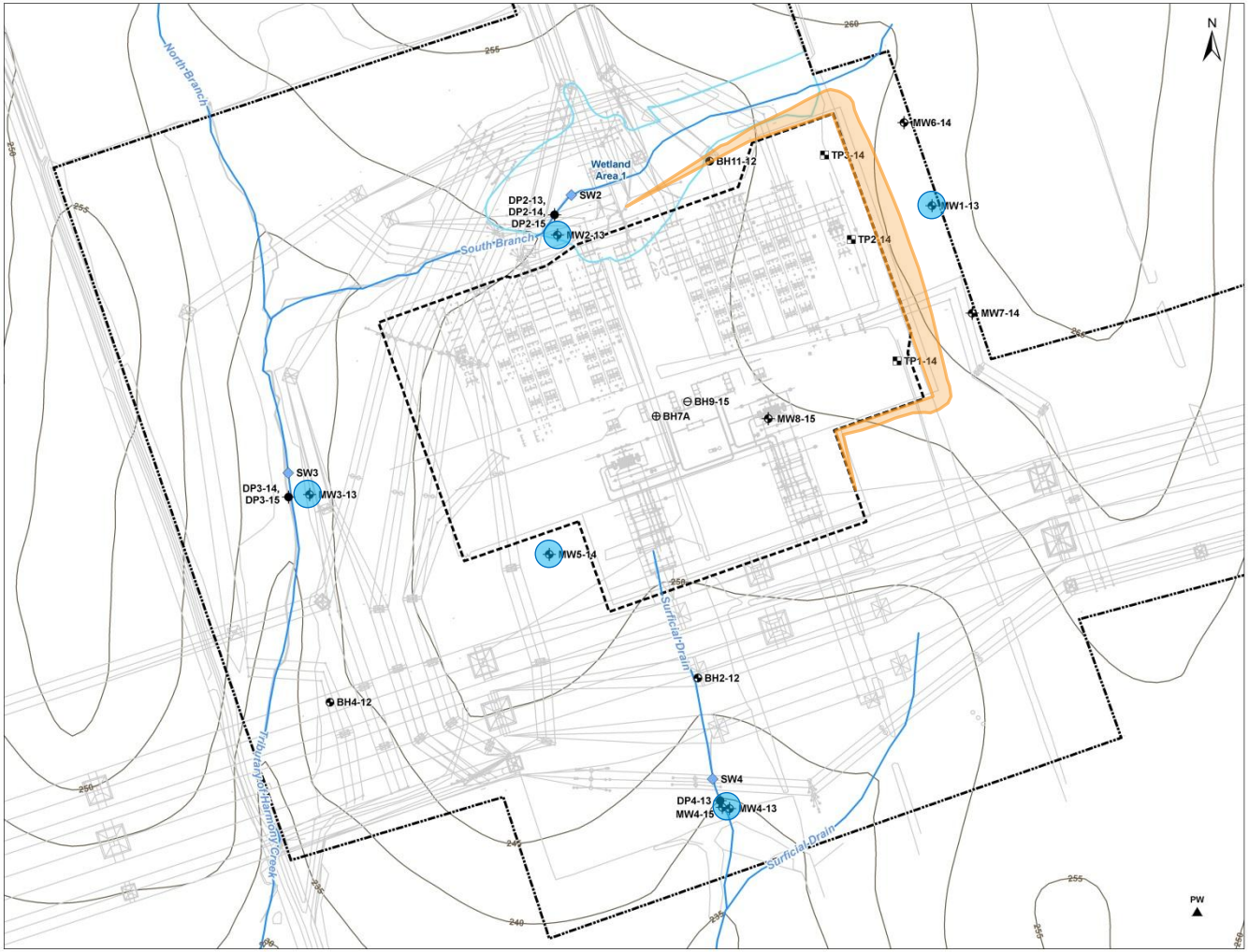


Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells

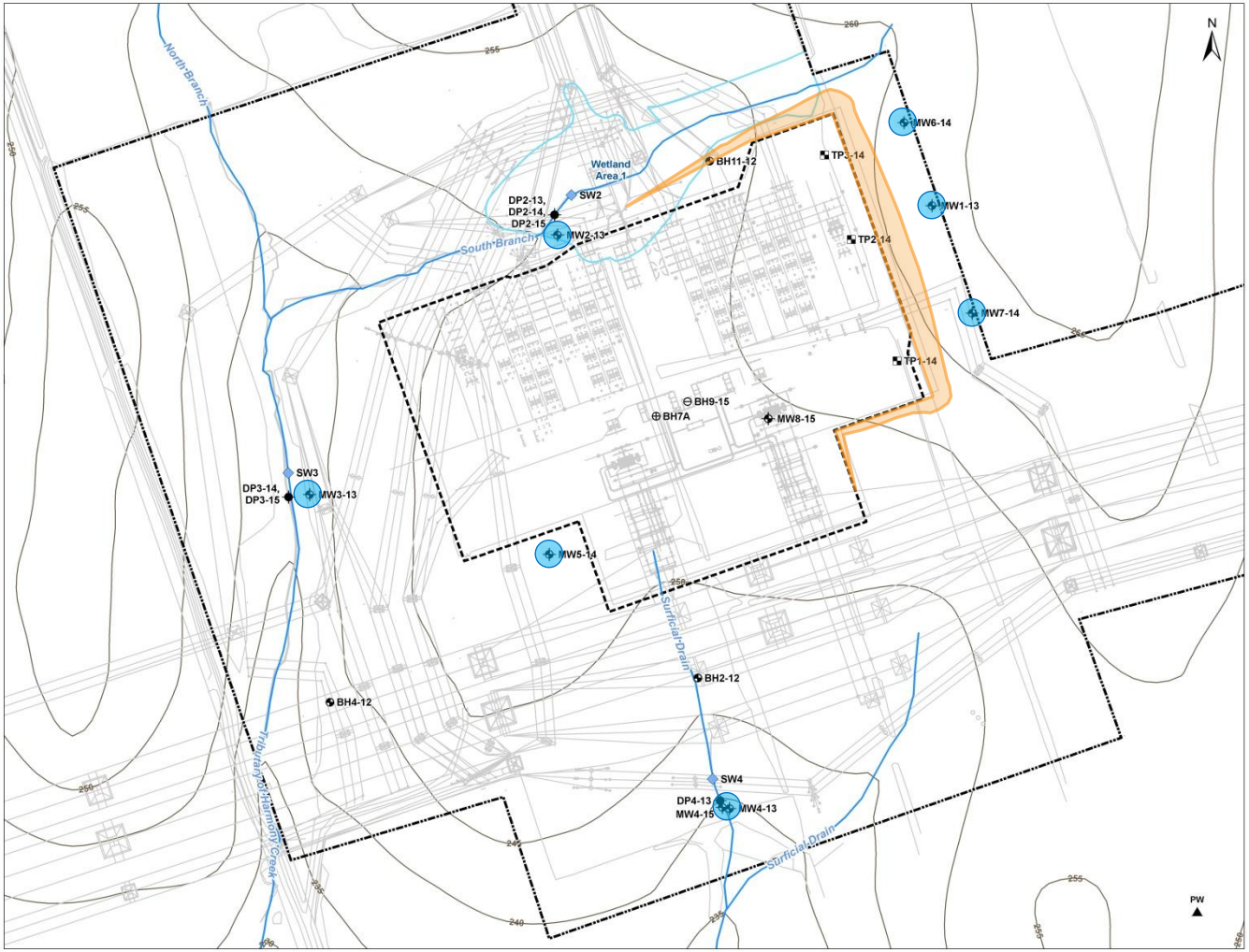


Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells
- 2 PTTW Wells

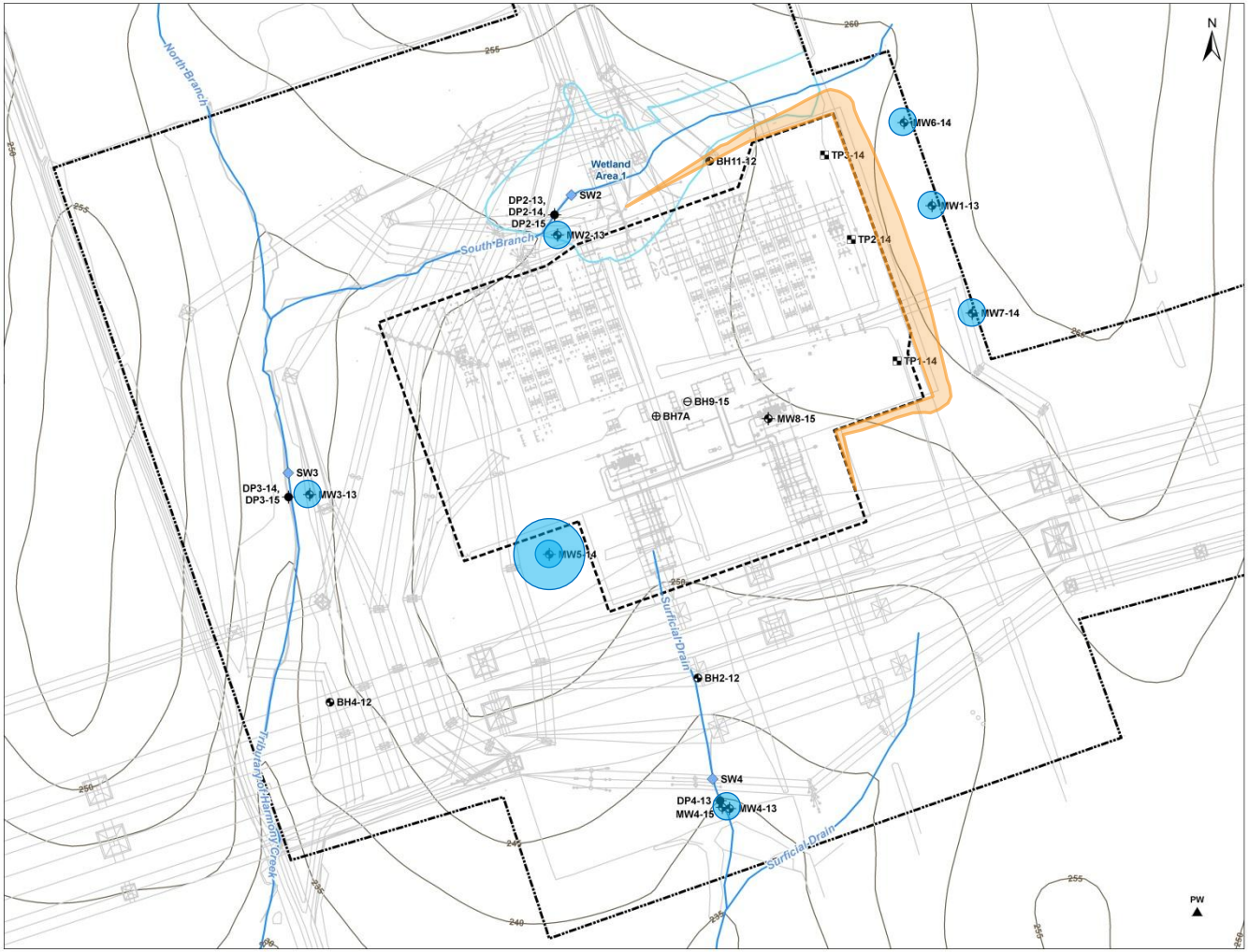


Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells
- 2 PTTW Wells
- 2 Deep Wells (Bedrock)
- 1 Shallow Wells

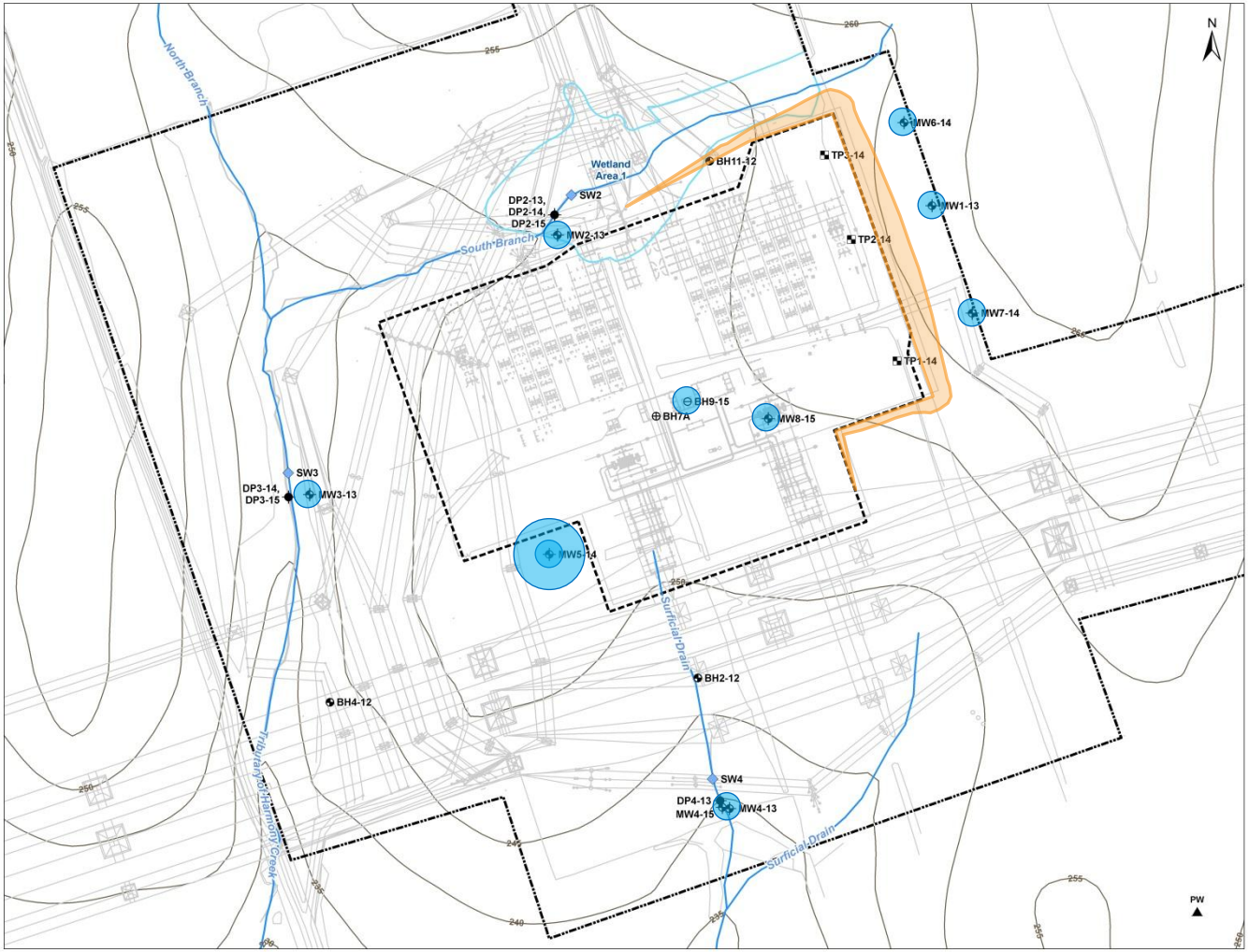


Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells
- 2 PTTW Wells
- 2 Deep Wells (Bedrock)
- 1 Shallow Wells
- 1 Central Well
- 1 Central Borehole

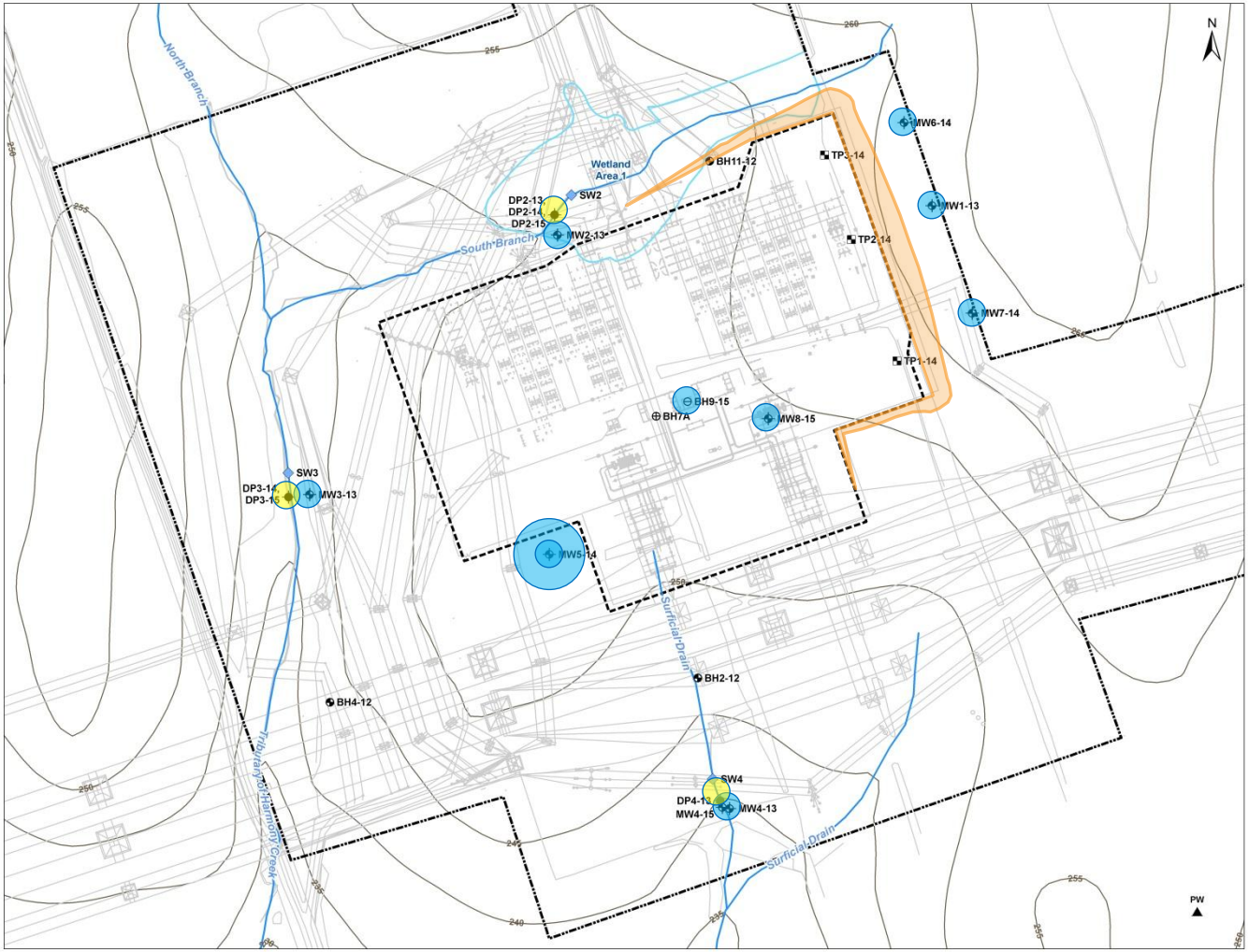


Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells
- 2 PTTW Wells
- 2 Deep Wells (Bedrock)
- 1 Shallow Wells
- 1 Central Well
- 1 Central Borehole
- 3 Surface Water Monitors



Baseline Conditions

Hydrogeologic Investigation

Monitoring Wells

- 5 Pairs of Shallow /Deep Wells
- 2 PTTW Wells
- 2 Deep Wells (Bedrock)
- 1 Shallow Wells
- 1 Central Well
- 1 Central Borehole
- 3 Surface Water Monitors

Baseline Conditions

Refined Hydrogeologic Model

Station Site Geologic Model

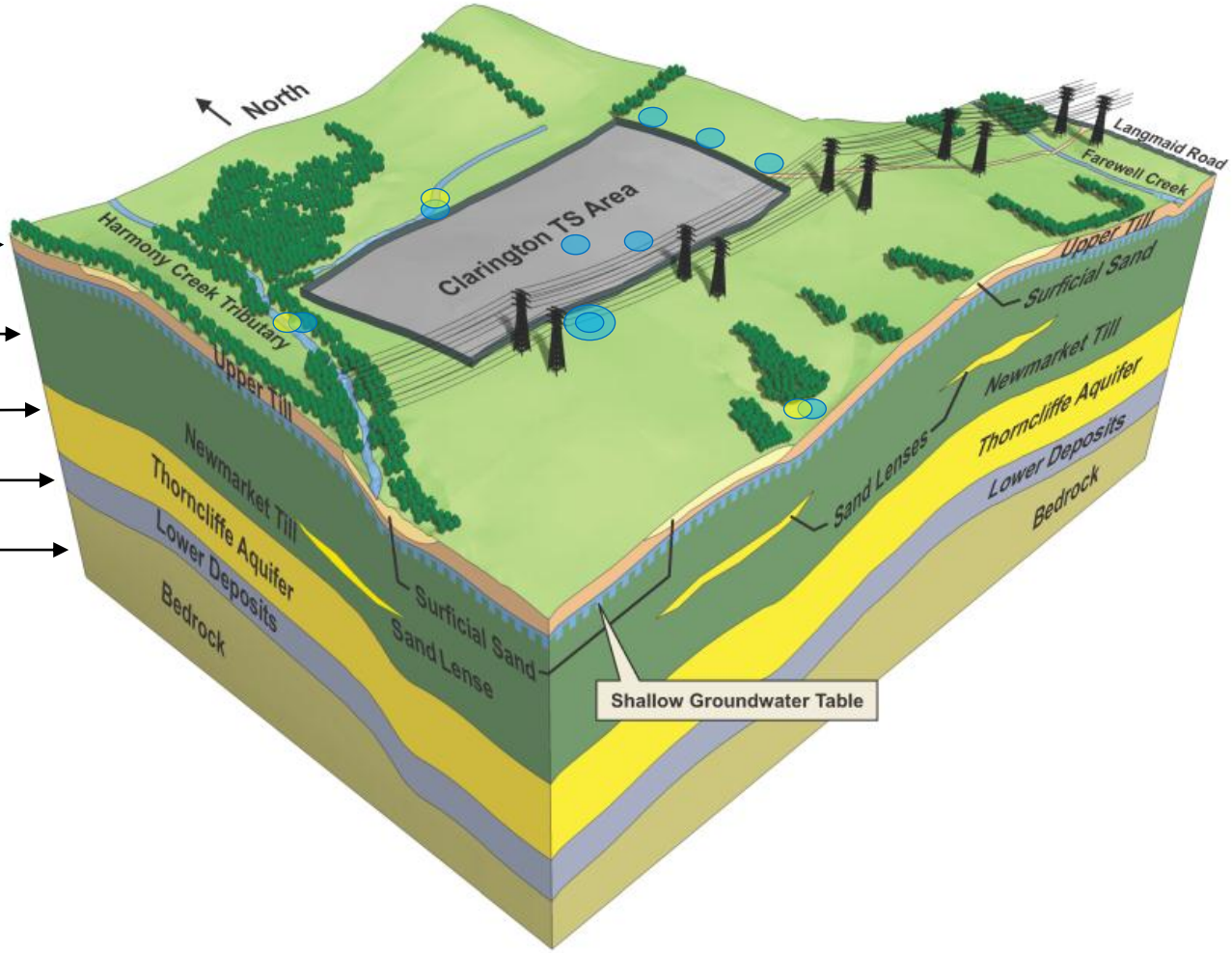
Surficial Sand/Weathered Till
0-6 m

Newmarket Till
65-75 m

Thorncliffe Aquifer
25-30 m

Lower Deposits
65-75 m

Bedrock
125-130 m Deep



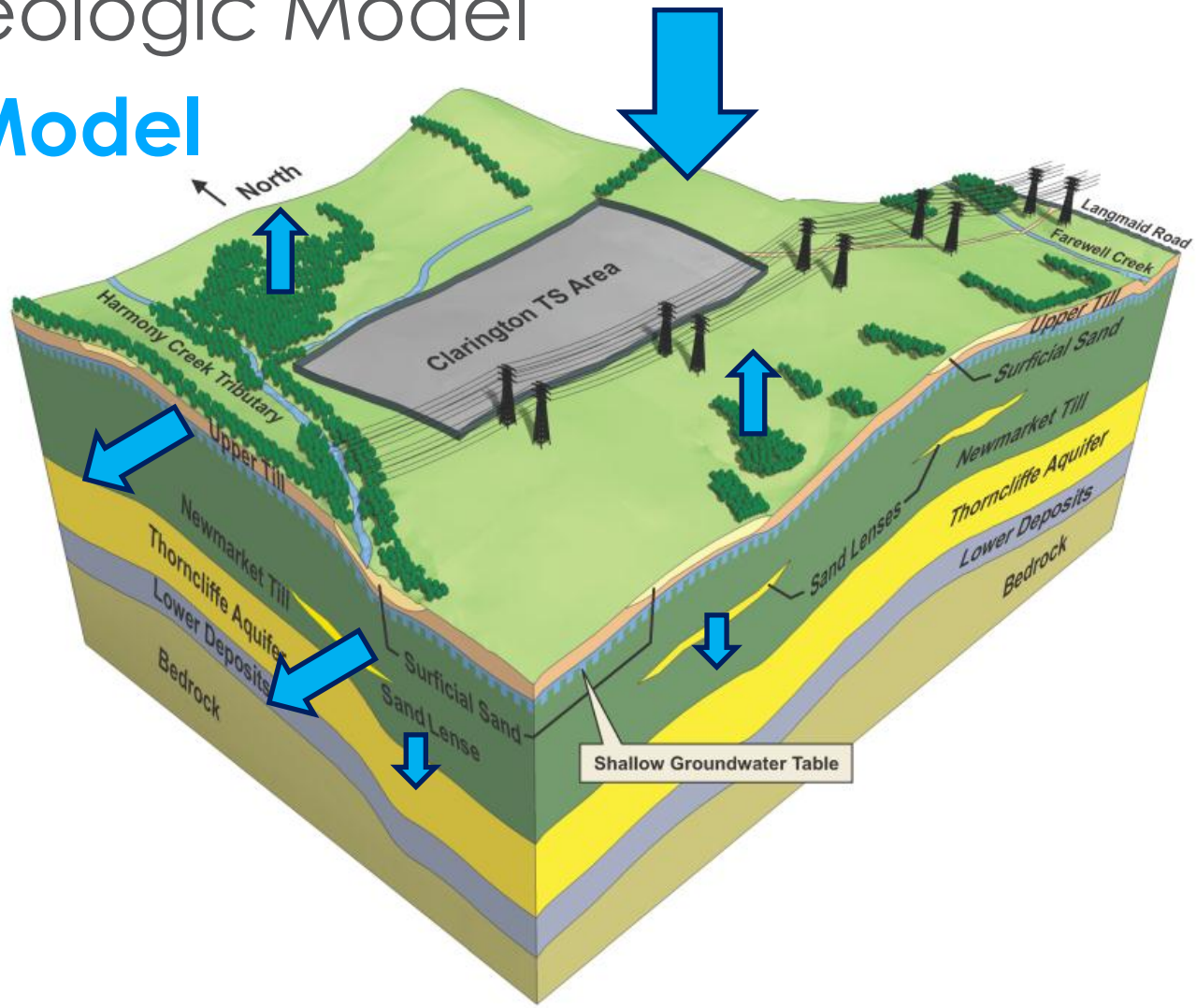
Over 65 m of Till Serves to Protect Underlying Regional Aquifer

Baseline Conditions

Refined Hydrogeologic Model

Water Balance Model

Recharge = Discharge



Over 65 m of Till Serves to Protect Underlying Regional Aquifer

Baseline Conditions

Refined Hydrogeologic Model

Water Balance Model

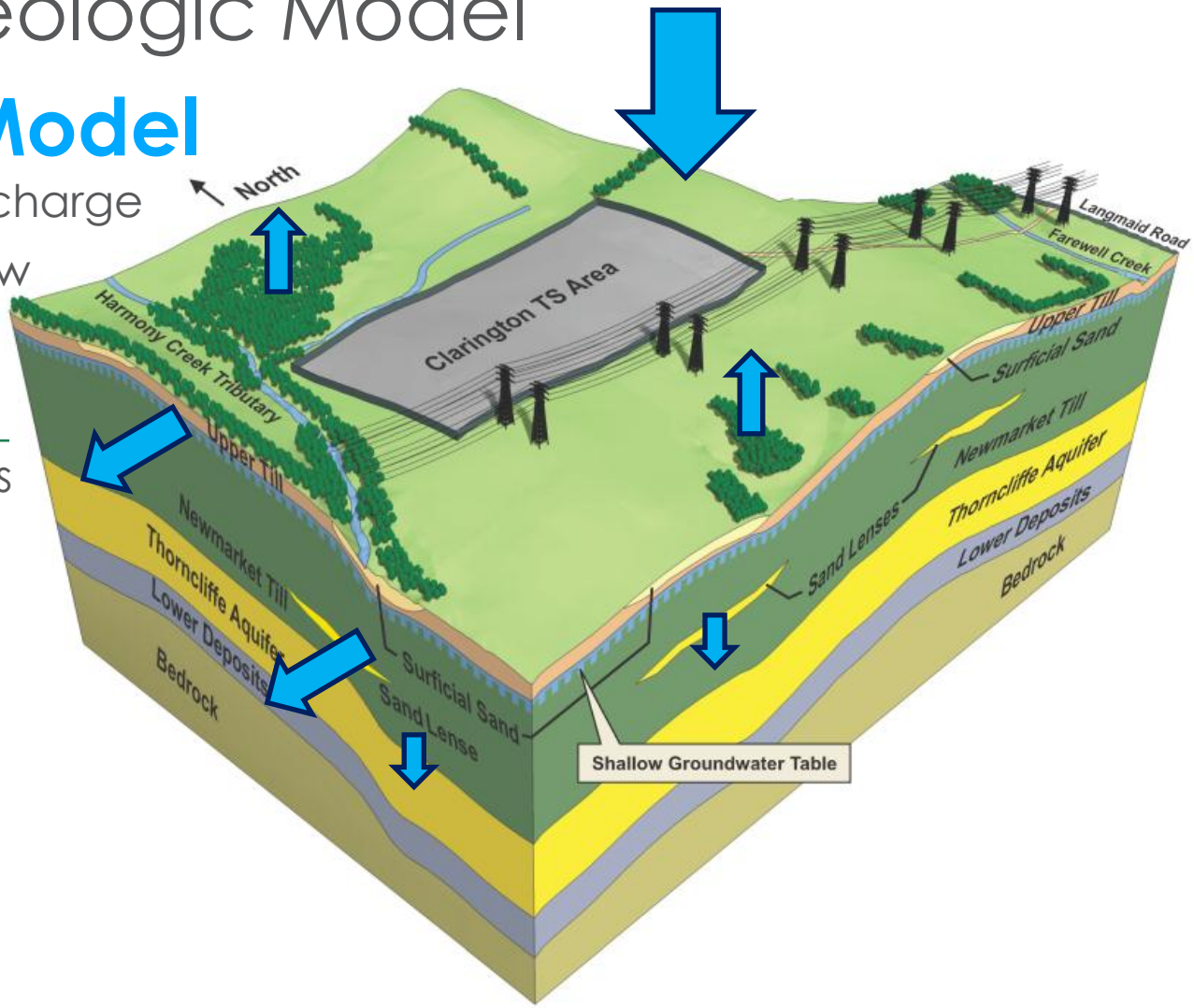
12,504 m^3/yrTot Available Recharge

-9,548 m^3/yr Surficial Sand Flow

-1,535 m^3/yr Weathered Till

-1,958 m^3/yr Newmarket Till

537 m^3/yr Discharge Surplus



Over 65 m of Till Serves to Protect Underlying Regional Aquifer

Monitoring Program

Groundwater & Surface Water Monitoring

Continuous/Seasonal Monitoring

- 14 Groundwater Monitoring Wells
- 3 Surface Water Monitoring Locations
- Water Levels and Water Quality
- Quarterly in 2014
- Semi-Annually 2015

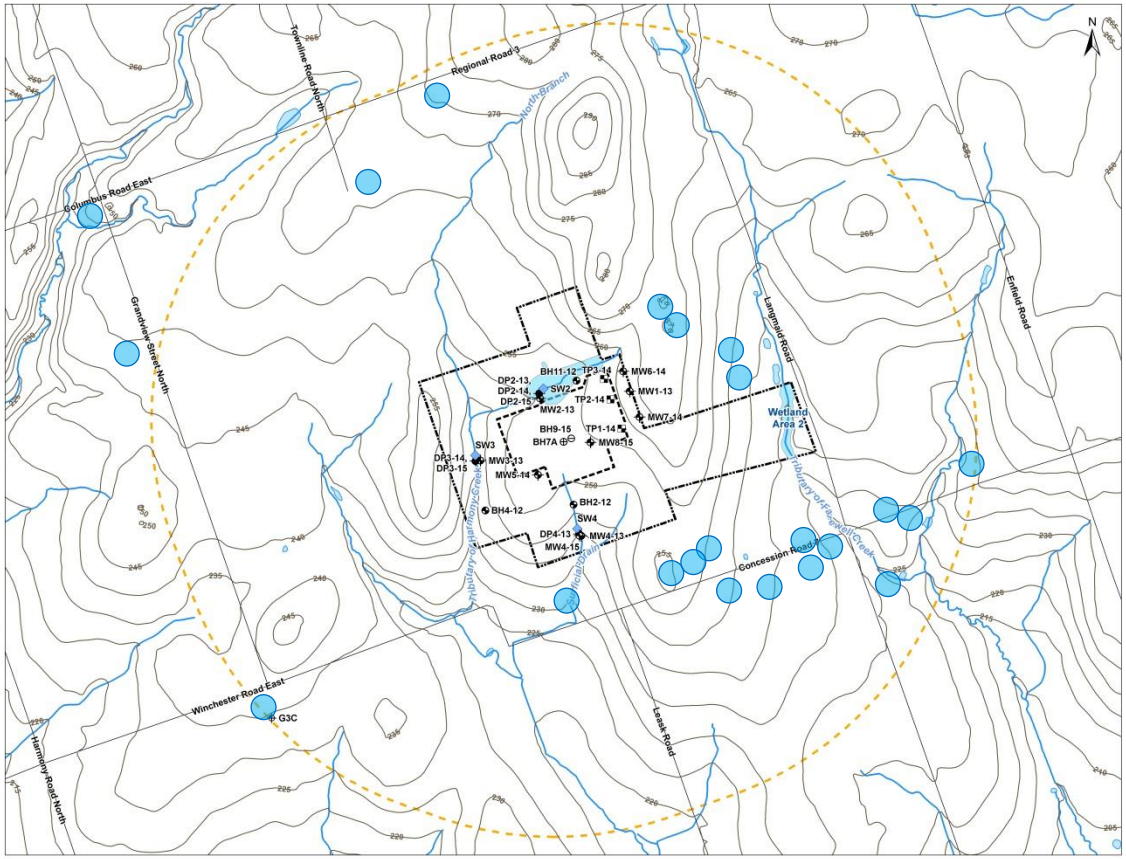
Protect Water Resources and Natural Habitat

Monitoring Program

Private Well Monitoring

Continuous/Seasonal Monitoring

- 15 Shallow Private Wells
- 10 Deep Private Wells
- Water Levels and Water Quality
- Quarterly in 2014
- Semi-Annually 2015



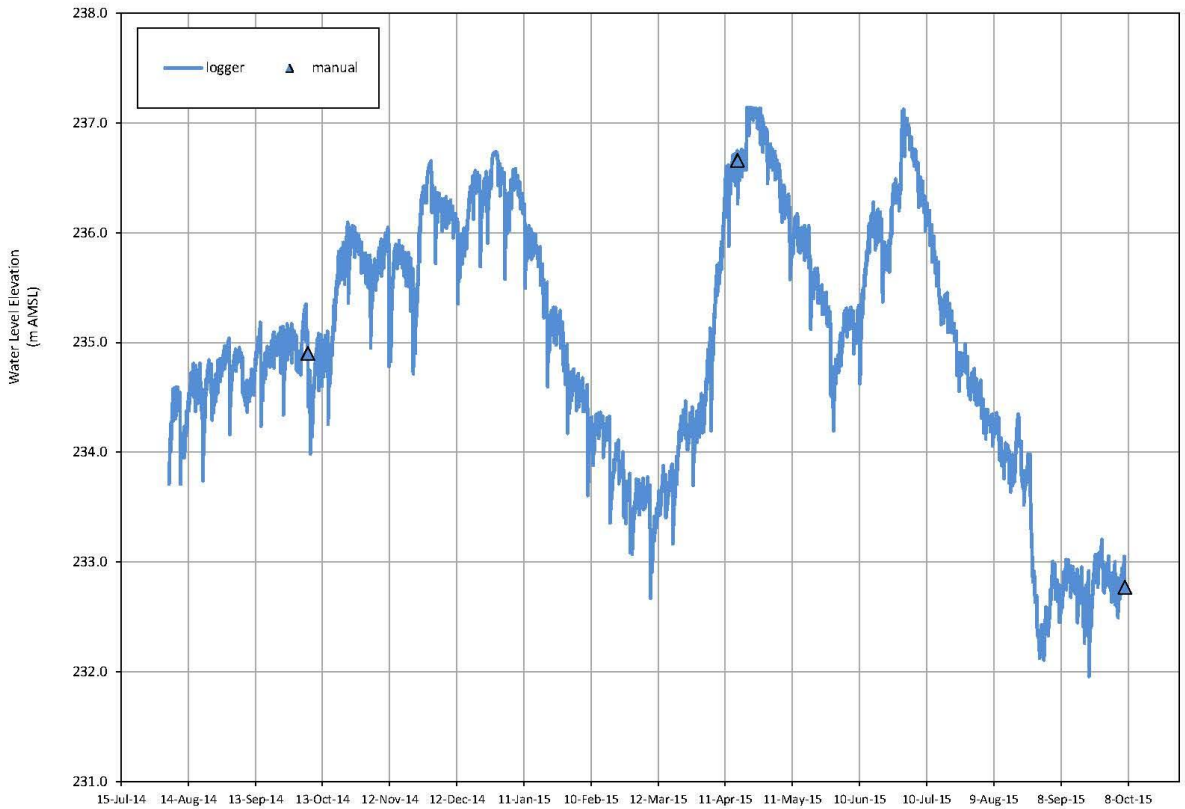
Monitoring Private Wells During and After Station Construction

Monitoring Results

Groundwater Level Monitoring

Shallow Private Wells

- Seasonal Water Level Changes
- Well Usage

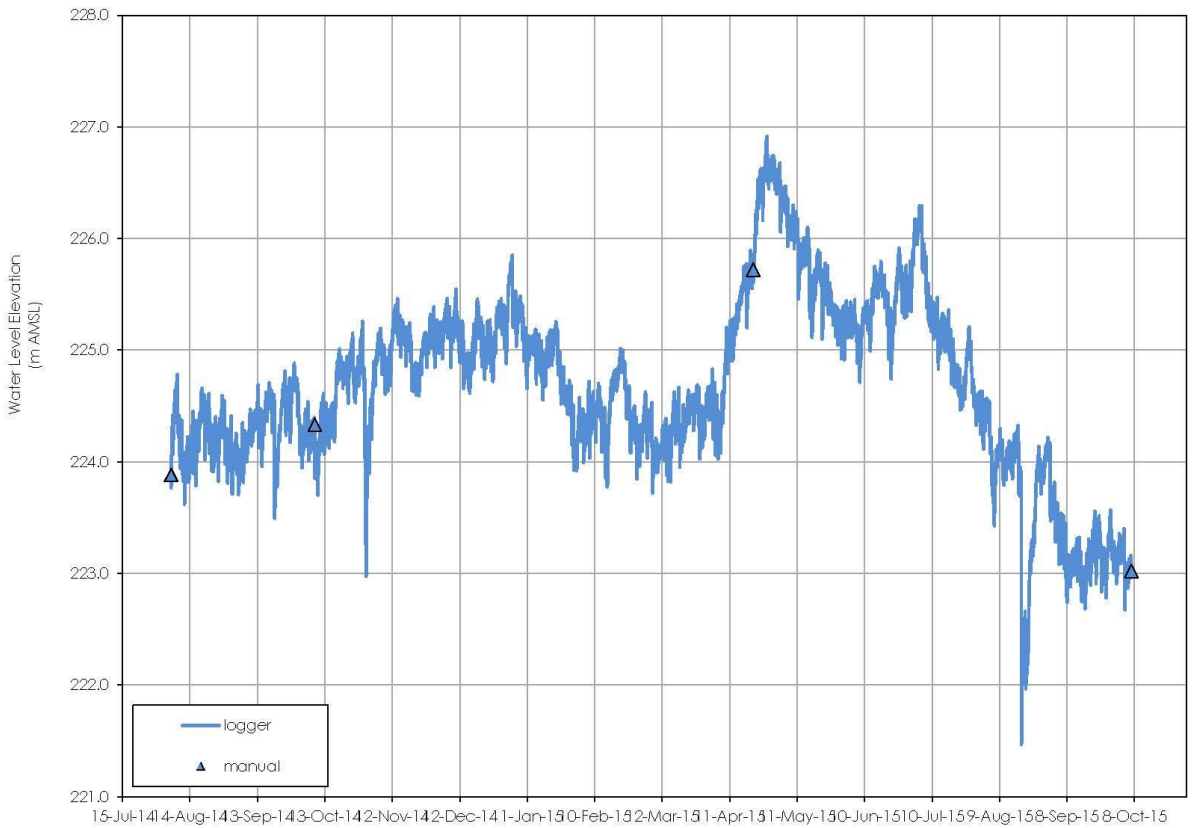


Monitoring Results

Groundwater Level Monitoring

Shallow Private Wells

- Seasonal Water Level Changes
- Well Usage

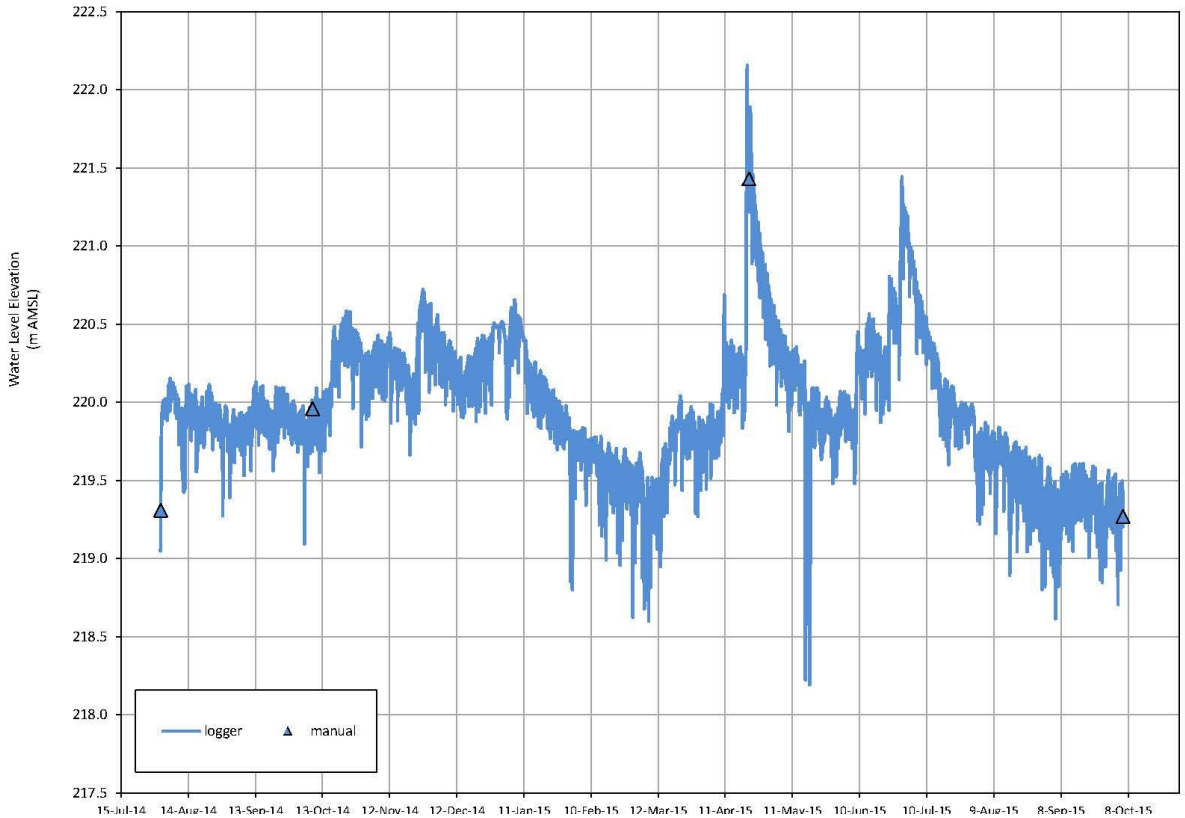


Monitoring Results

Groundwater Level Monitoring

Shallow Private Wells

- Seasonal Water Level Changes
- Well Usage

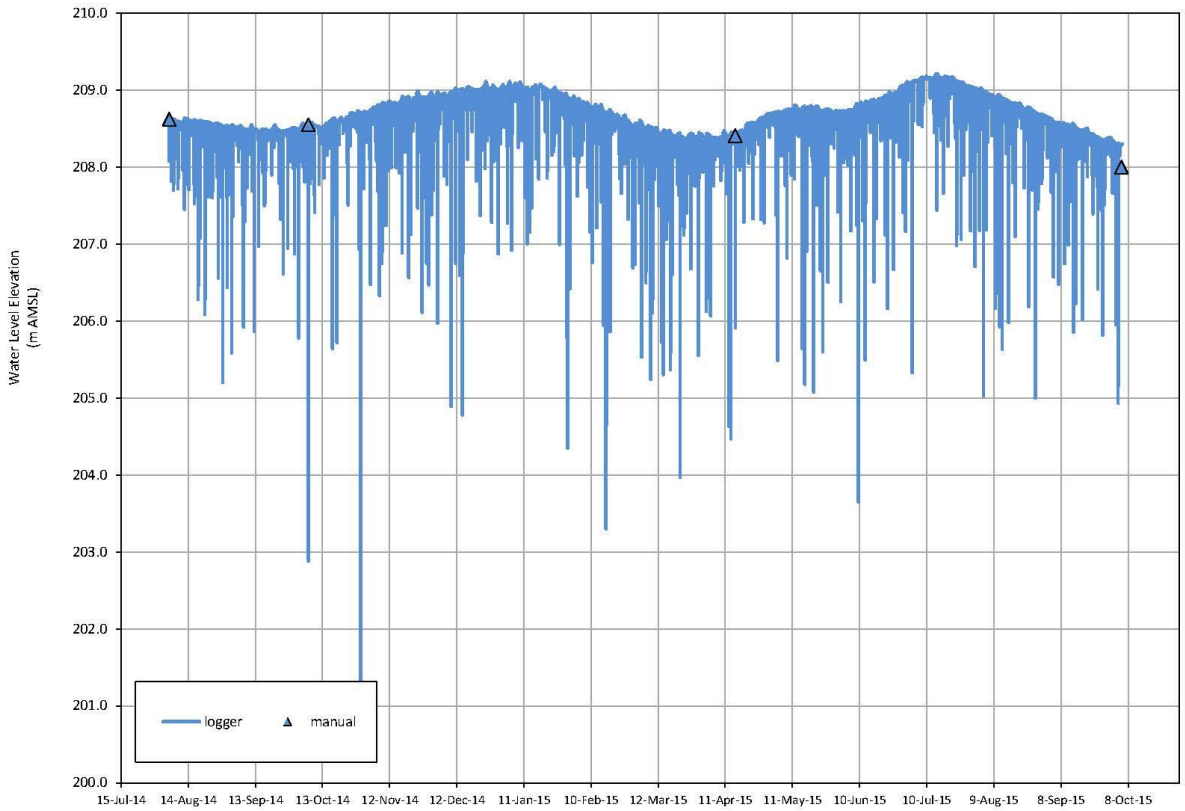


Monitoring Results

Groundwater Level Monitoring

Deep Private Wells

- Gradual Water Level Changes
- Well Usage

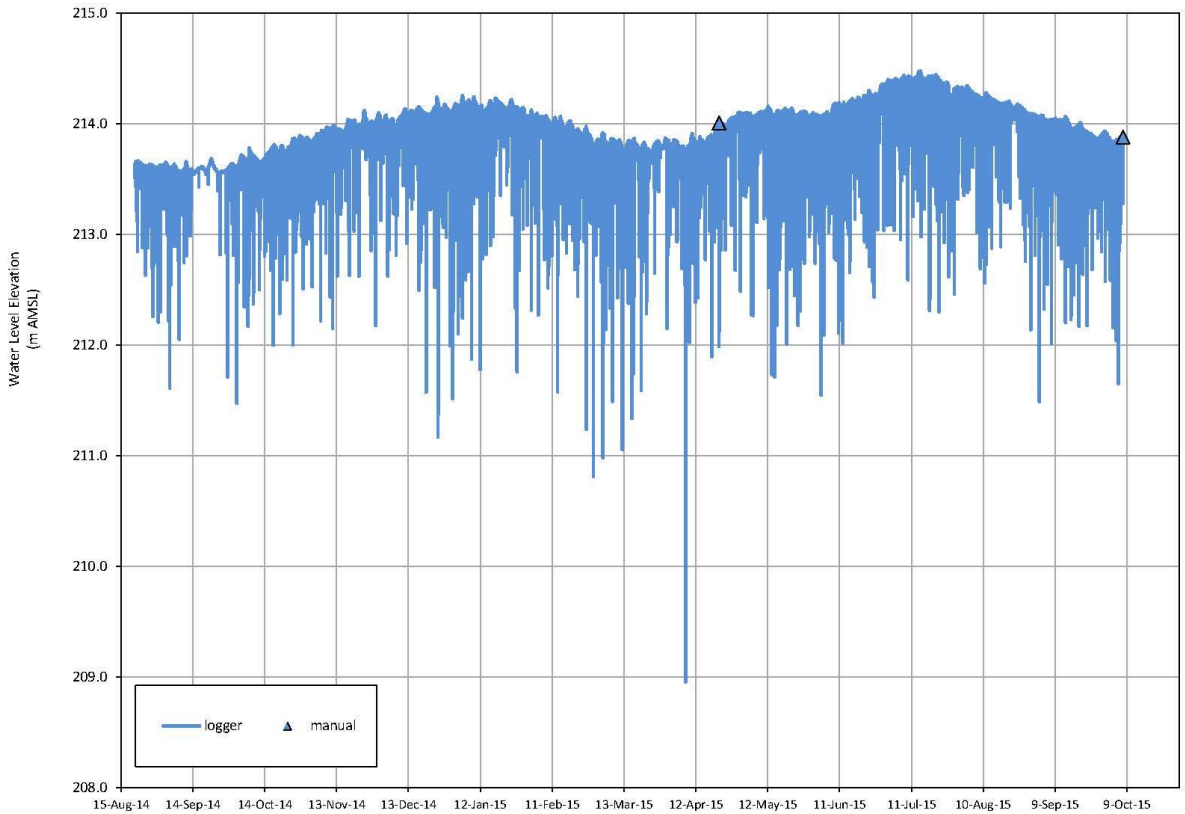


Monitoring Results

Groundwater Level Monitoring

Deep Private Wells

- Gradual Water Level Changes
- Well Usage

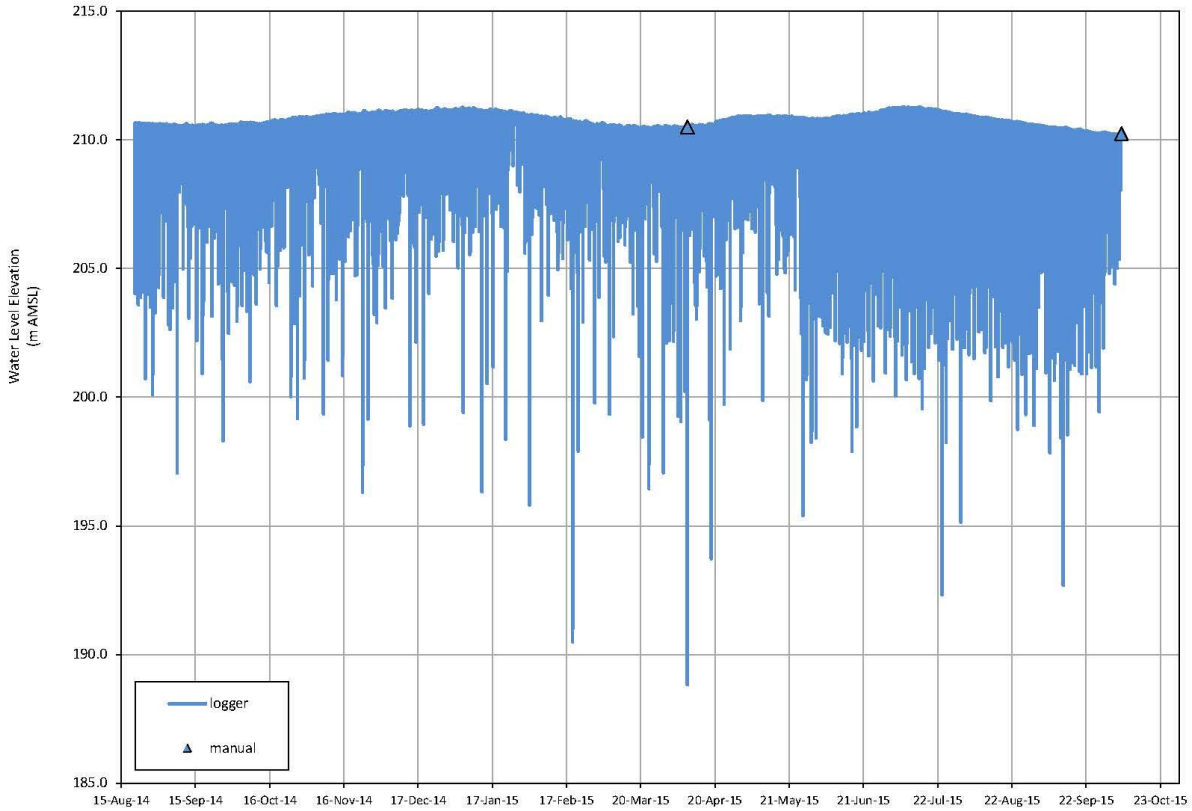


Monitoring Results

Groundwater Level Monitoring

Deep Private Wells

- Gradual Water Level Changes
- Well Usage

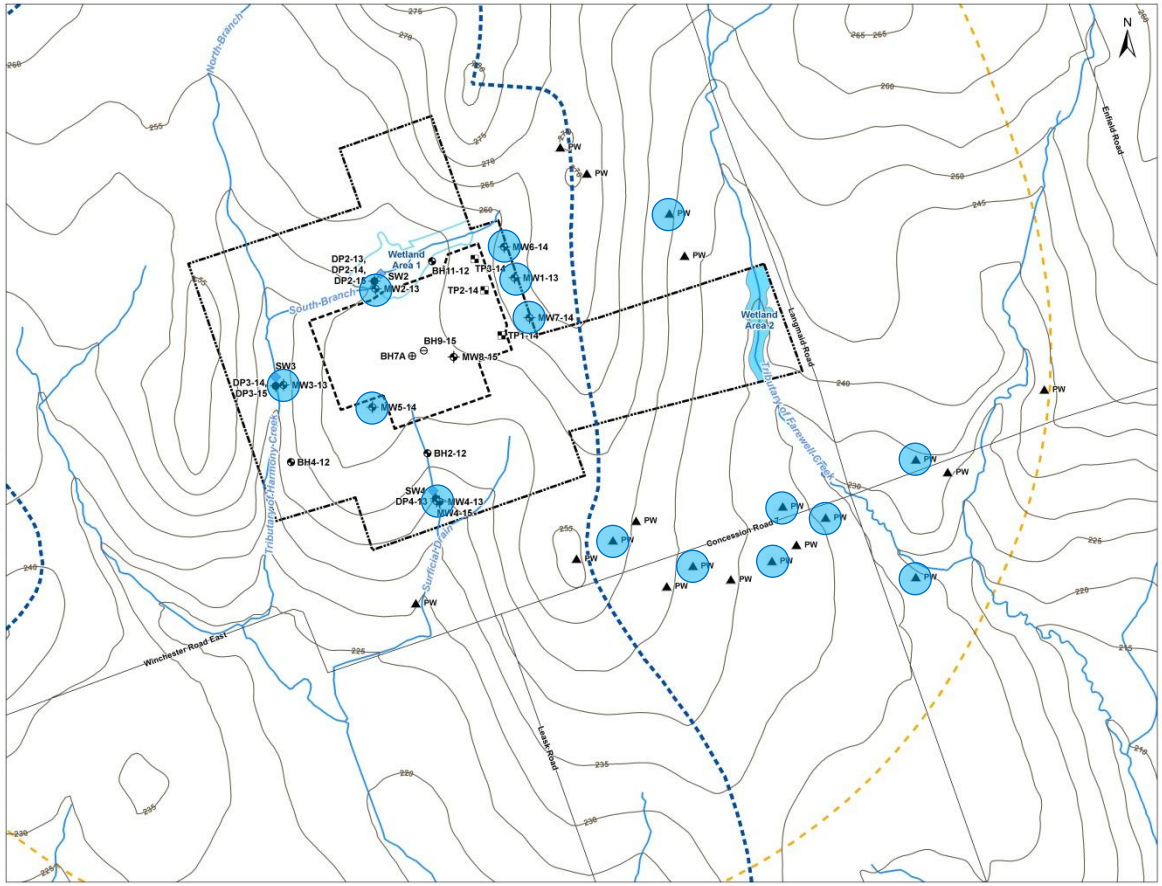


Monitoring Results

Groundwater Level Monitoring

Shallow Groundwater

- Monitoring Wells
- Private Wells

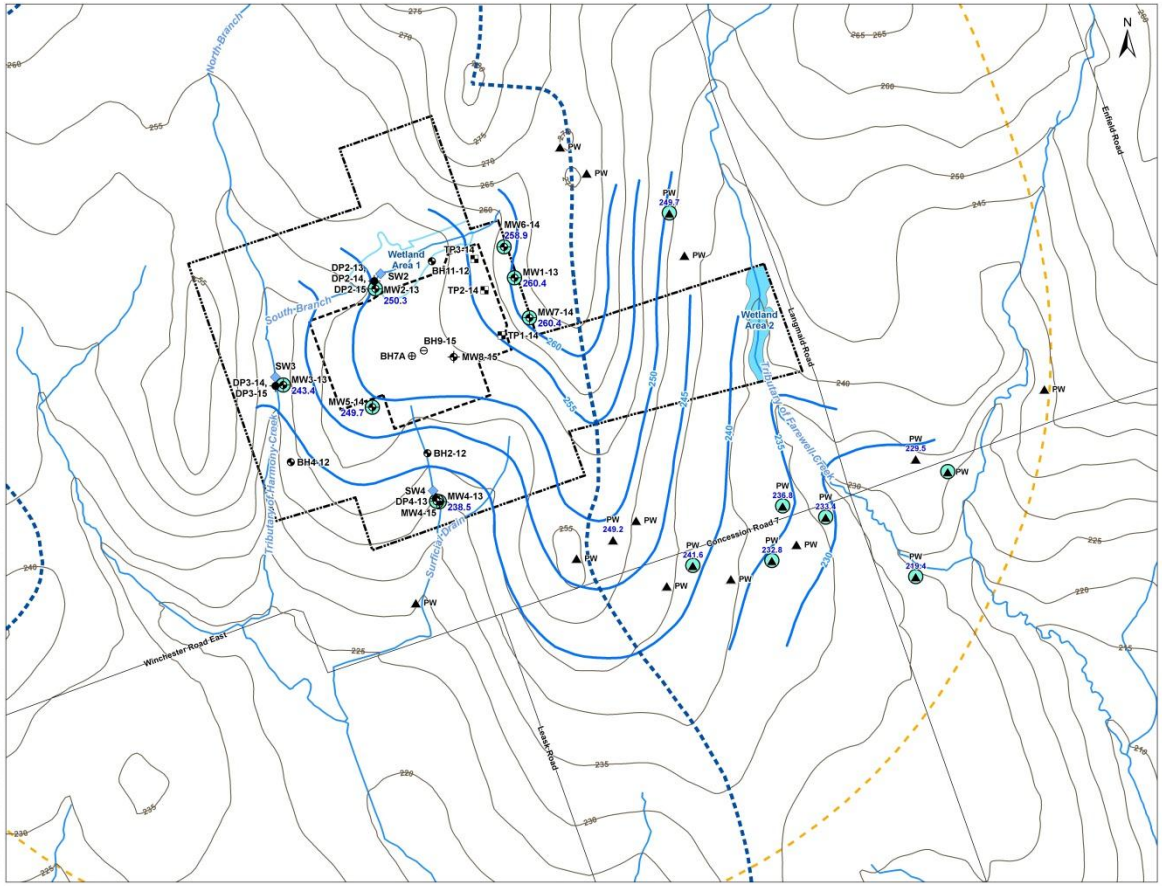


Monitoring Results

Groundwater Level Monitoring

Shallow Groundwater

- Groundwater Contours

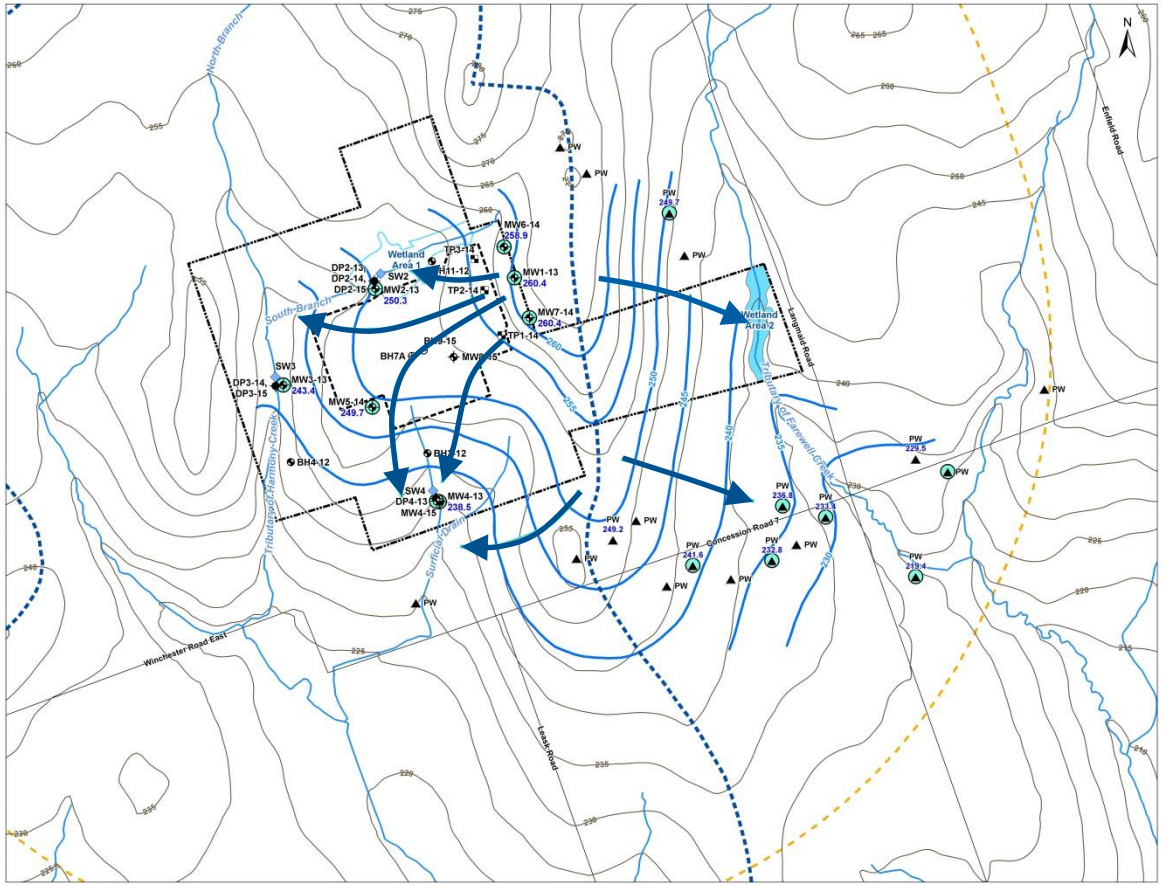


Monitoring Results

Groundwater Level Monitoring

Shallow Groundwater

- Groundwater Contours
- Groundwater Divide
- Groundwater Flow Direction

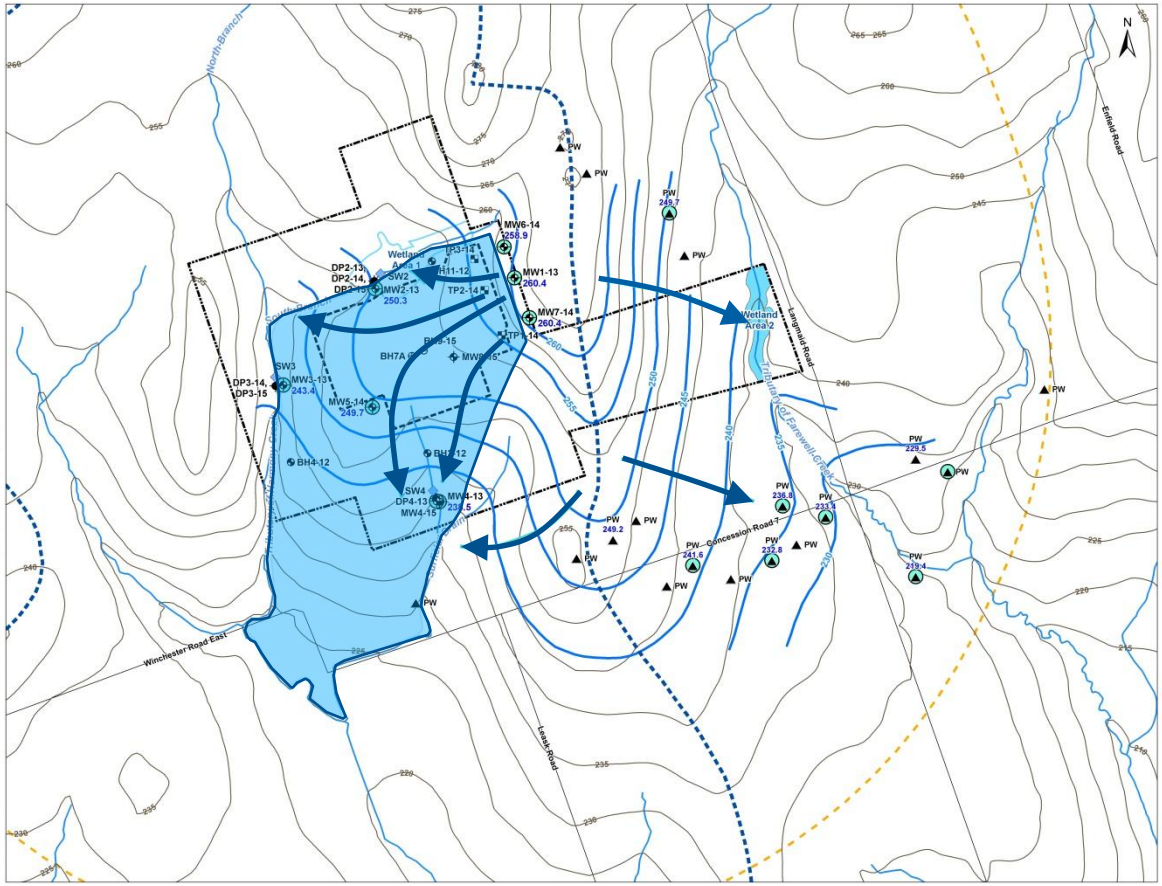


Monitoring Results

Groundwater Level Monitoring

Shallow Groundwater

- Groundwater Contours
- Groundwater Divide
- Groundwater Flow Direction
- Area Downgradient of Station Site



Monitoring Results

Groundwater Quality Monitoring

Private Wells

- Bacteria
- General Chemistry
- Total Metals
- Hydrocarbons (F1-F4)
- BTEX
- PCBs
- SVOCs
- VOCs
- Compared to Ontario Drinking Water Quality Standards (ODWQS)

Monitoring Results

Groundwater Quality Monitoring

Private Wells

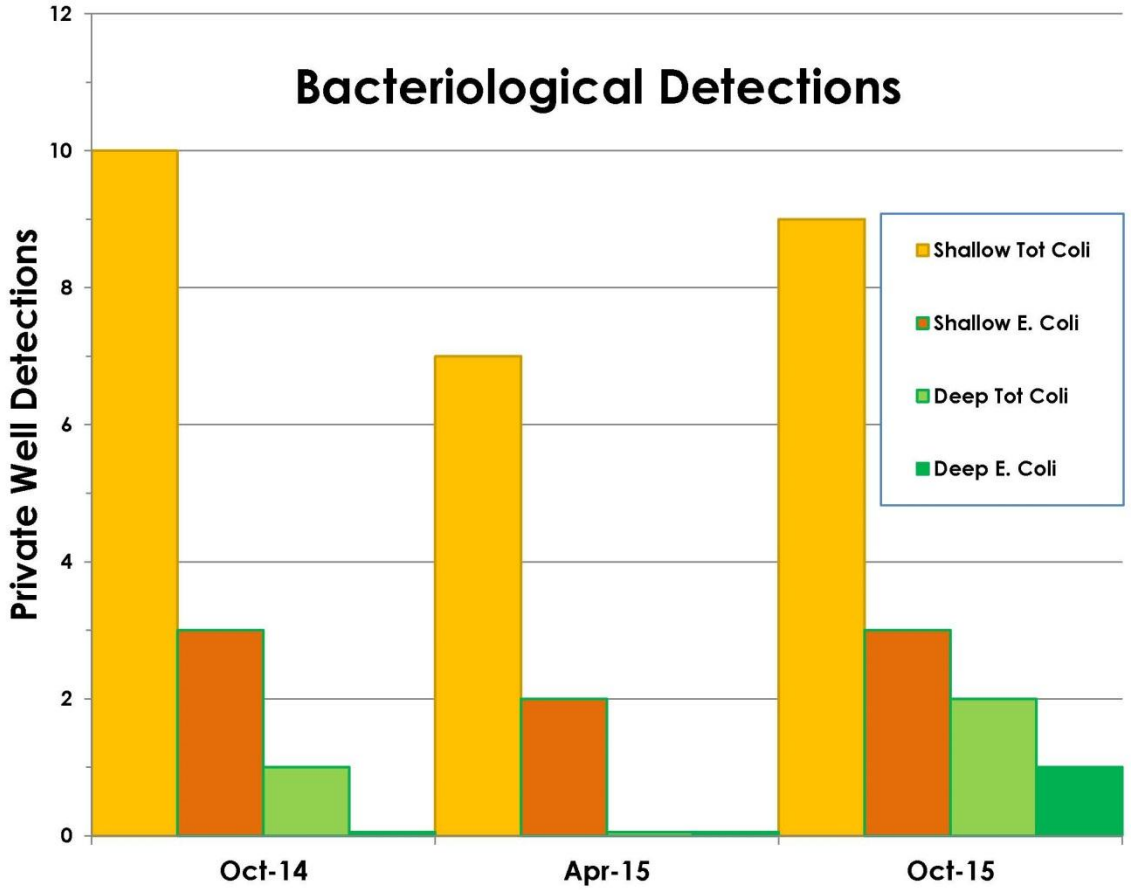
- **Ontario Drinking Water Quality Standards** (ODWQS)
  - Maximum Acceptable Concentration (MAC)
  - Ministry of Health Criteria (MOH)
  - Aesthetic Objectives (AO)
  - Operational Guidelines (OG)

Monitoring Results

Groundwater Quality Monitoring

Private Wells

- Bacteria Detections
- 73% of Shallow Wells
- 10% of Deep Wells
- Maximum Acceptable Concentration – 0



Monitoring Results

Groundwater Quality Monitoring

Private Wells

- Met all ODWQS-MAC with the exception of
  - Bacteriological Detections
  - Benzo(a)pyrene in one well in April 2015, not detected in same well in October 2015

- Met ODWQS - AO or MOH Criteria with exception of
  - Sodium (11 wells – MOH, and 3 wells –AO)
  - Chloride (2 wells)
  - TDS (6 wells)
  - Aluminum (1 well)
  - DOC (1 well)

Monitoring Results

Groundwater Quality Monitoring

Private Wells

- Met ODWQS-AO or OG in all deeper wells with exception of
  - Iron (8 wells)
  - Sodium (3 wells)
  - Turbidity (6 wells)

- Results are consistent with similar monitoring programs.
- Bacteria results indicate a number of wells require treatment to be suitable for human consumption.

Monitoring Results

Groundwater Quality Monitoring

Project Area Monitoring Wells

- General Chemistry
- Total Metals
- Hydrocarbons (F1-F4)
- BTEX
- PCBs
- SVOCs
- VOCs
- Compared to Ontario Drinking Water Quality Standards (ODWQS)

Monitoring Results

Groundwater Quality Monitoring

Project Area Monitoring Wells

- Met ALL ODWQS Health-Related parameters
  - Maximum Acceptable Concentrations (ODWQS-MAC)
  - With exception of Nitrate
  - Not related to Station Construction activities
- Met ODWQS Aesthetic Objectives (AO) and Operational Guidelines (OG)
  - With exception of aluminum, DOC, hardness, iron, manganese, sodium, sulphate, TDS, and turbidity.
  - Consistent with 2013/2014 baseline results.

Monitoring Results

Groundwater Quality Monitoring

Project Area Monitoring Wells

- New Low-Flow Sampling Methodologies implemented since Addendum Report
  - No benzo(a)pyrene in 2015 sampling
  - Limited detections of phthalates, PAHs, and VOCs at low concentrations of below ODWQS and Ontario Regulation 153/04 Site Condition Standards

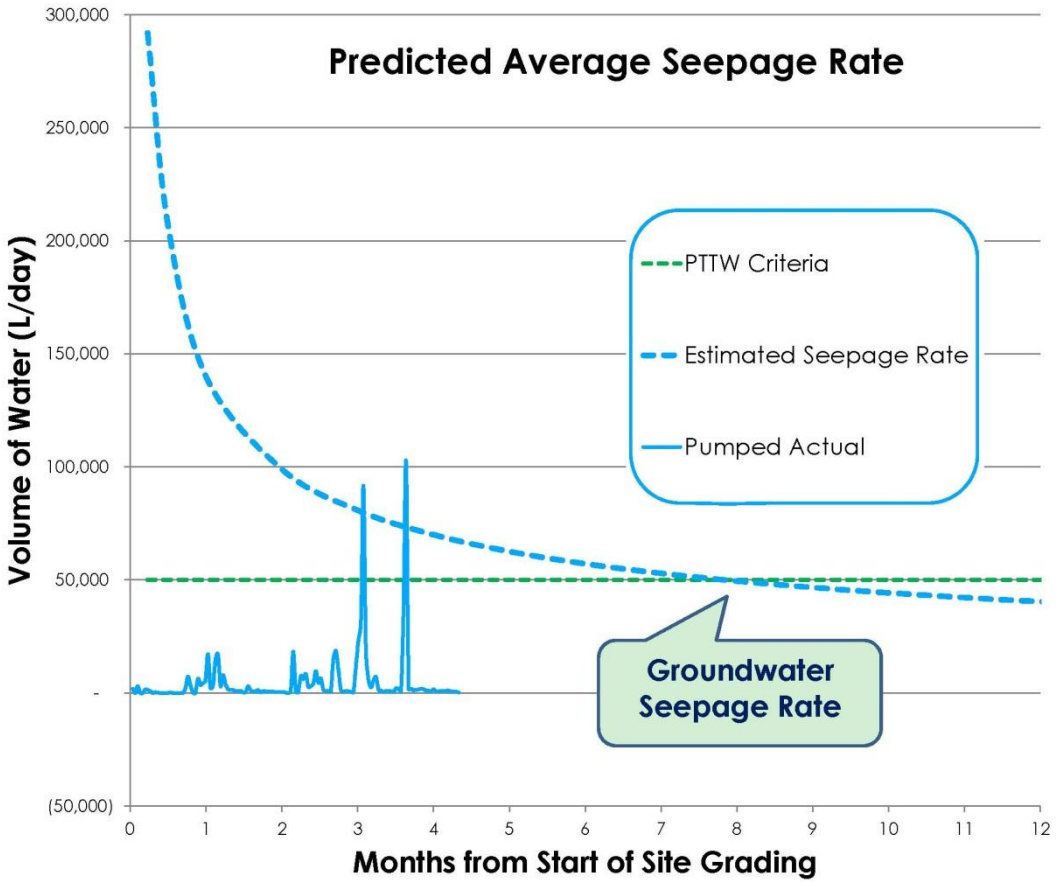
- Results indicate no adverse effect of construction on groundwater quality.

PTTW Monitoring

Water Taking

Actual vs. Permitted

- Permitted 800,000 L/day
- Significantly Lower than Permitted Volume

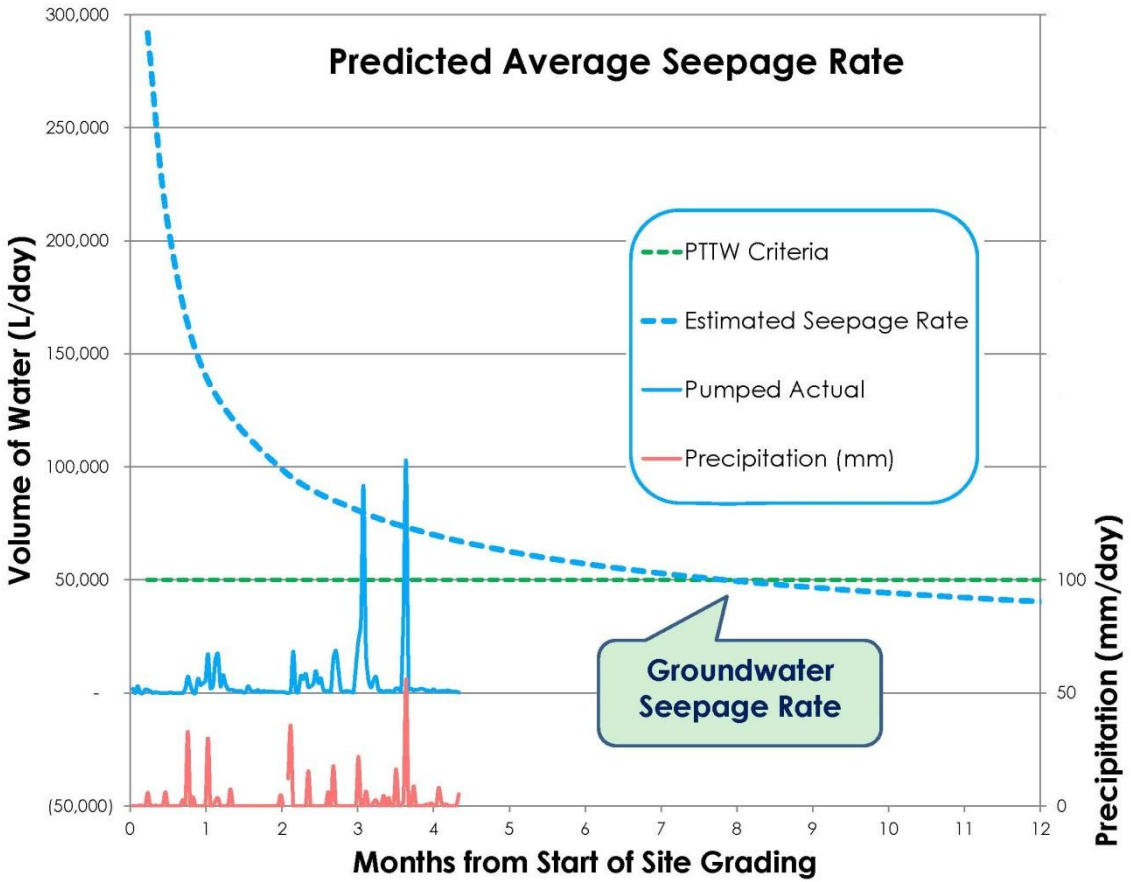


PTTW Monitoring

Water Taking

Actual vs. Permitted

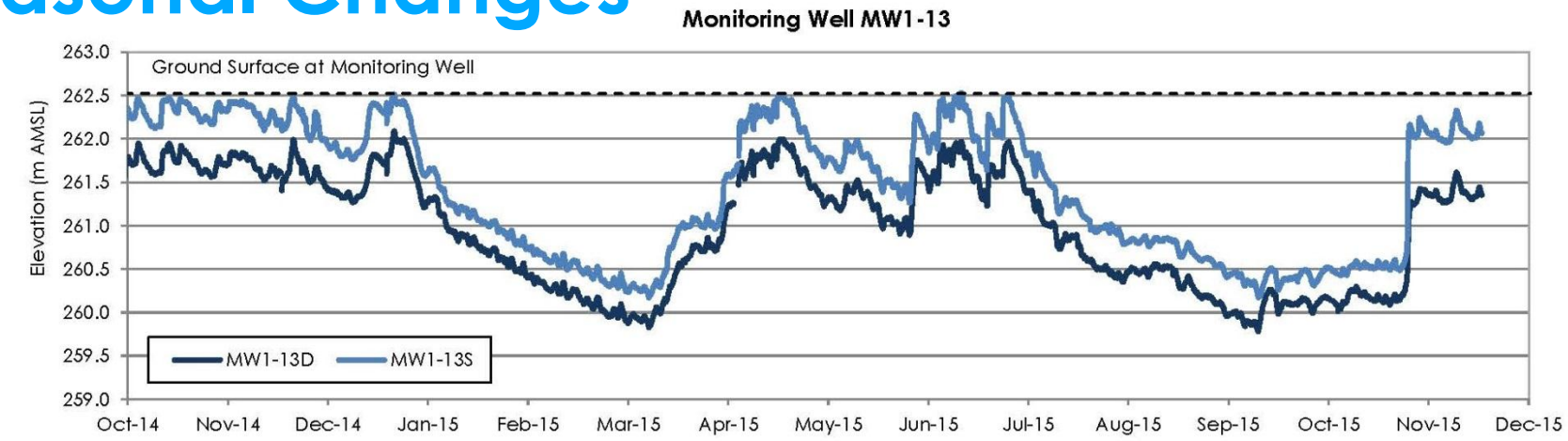
- Significantly Lower than Permitted Volume
- Direct Correlation with Precipitation



PTTW Monitoring

Water Level Monitoring

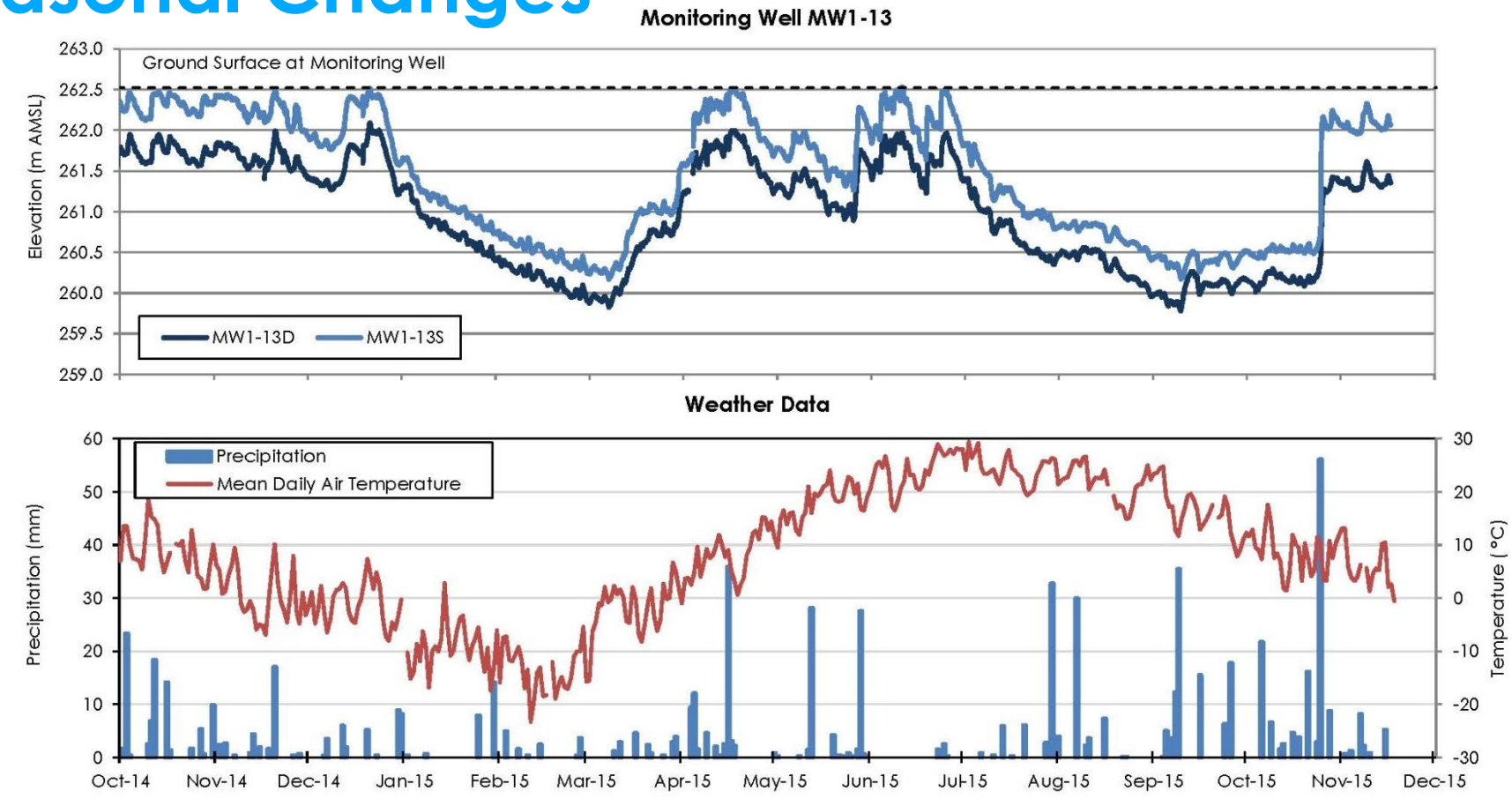
Seasonal Changes



PTTW Monitoring

Water Level Monitoring

Seasonal Changes



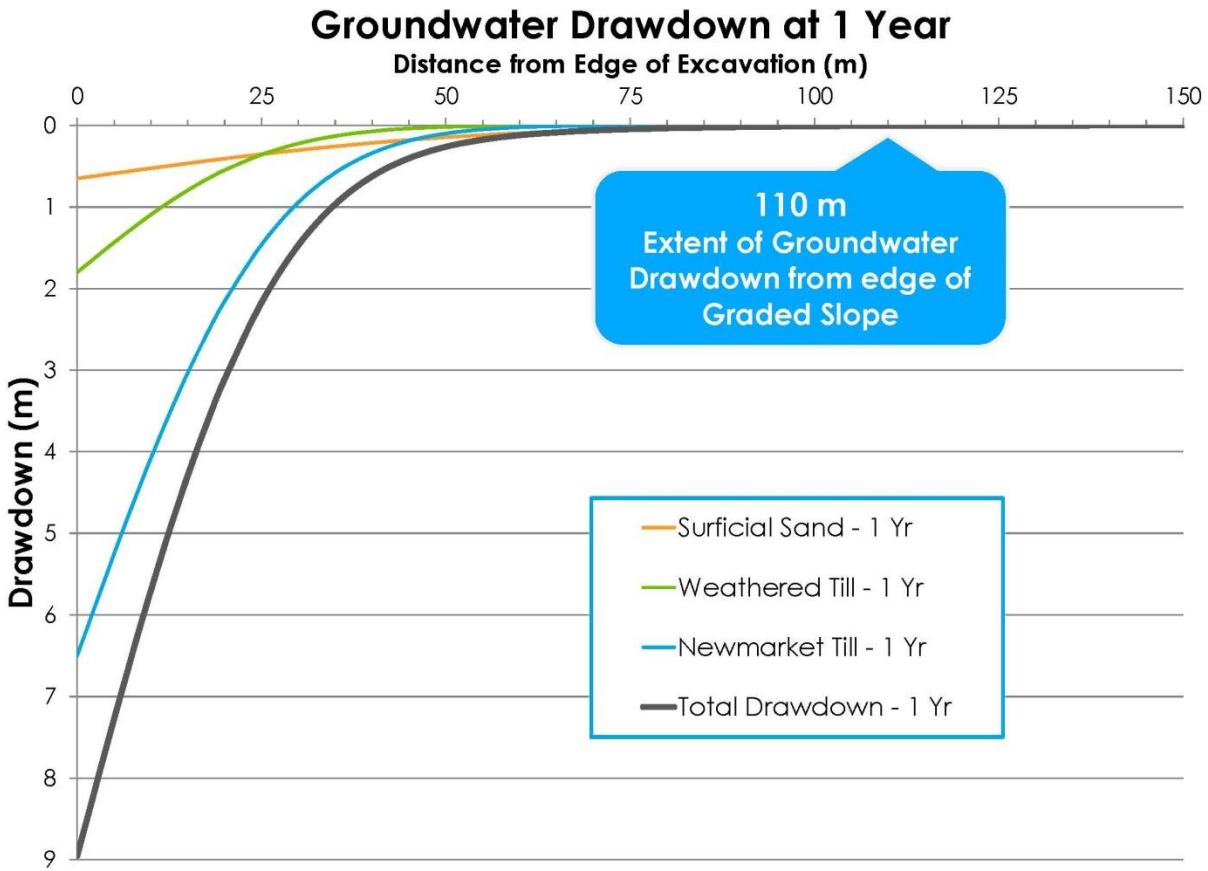
PTTW Monitoring

Water Level Monitoring

Actual vs. Permitted

- MW1-13
- MW6-14
- MW7-14

- Drawdown Effect Less Than Predicted



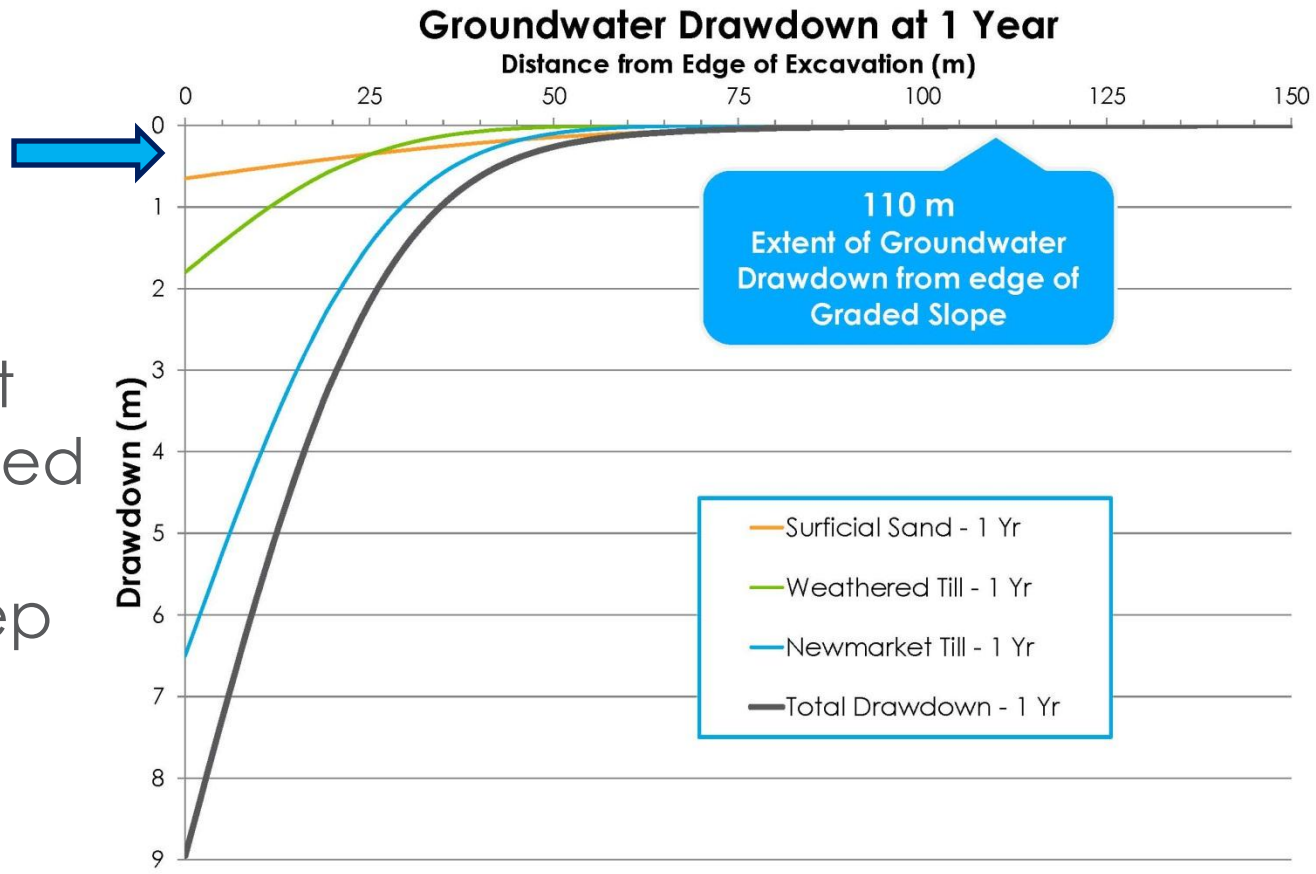
PTTW Monitoring

Water Level Monitoring

Actual vs. Permitted

- MW1-13
- MW6-14
- MW7-14

- Drawdown Effect Less Than Predicted on Shallow GW
- No Effect on Deep GW



Conclusions

Clarington TS

Pre-Station Construction

- Established Background Conditions

Construction Monitoring

- All Private Wells remain unaffected by Construction
- Water Levels respond to normal seasonal changes
- Water Quality remains unaffected by Construction

PTTW Monitoring

- Water Taking Well Below Permitted Amount
- Primarily from Rain Events