

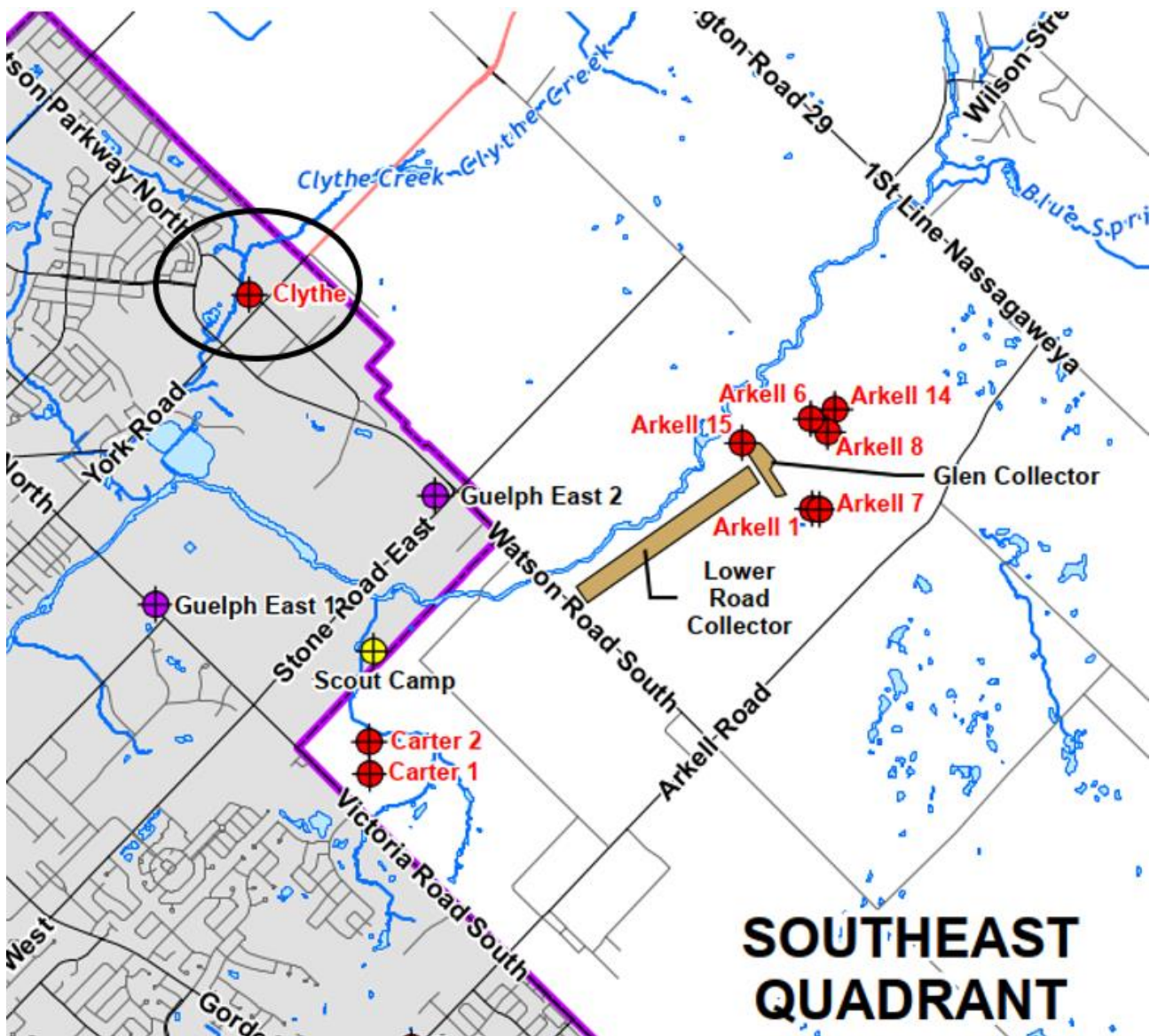
Appendix G

**Project Sheets for Preferred
Alternatives**



Alternative: Restoration of Existing Off-line Municipal Wells

Project Sheet: Restoration of Clythe Well

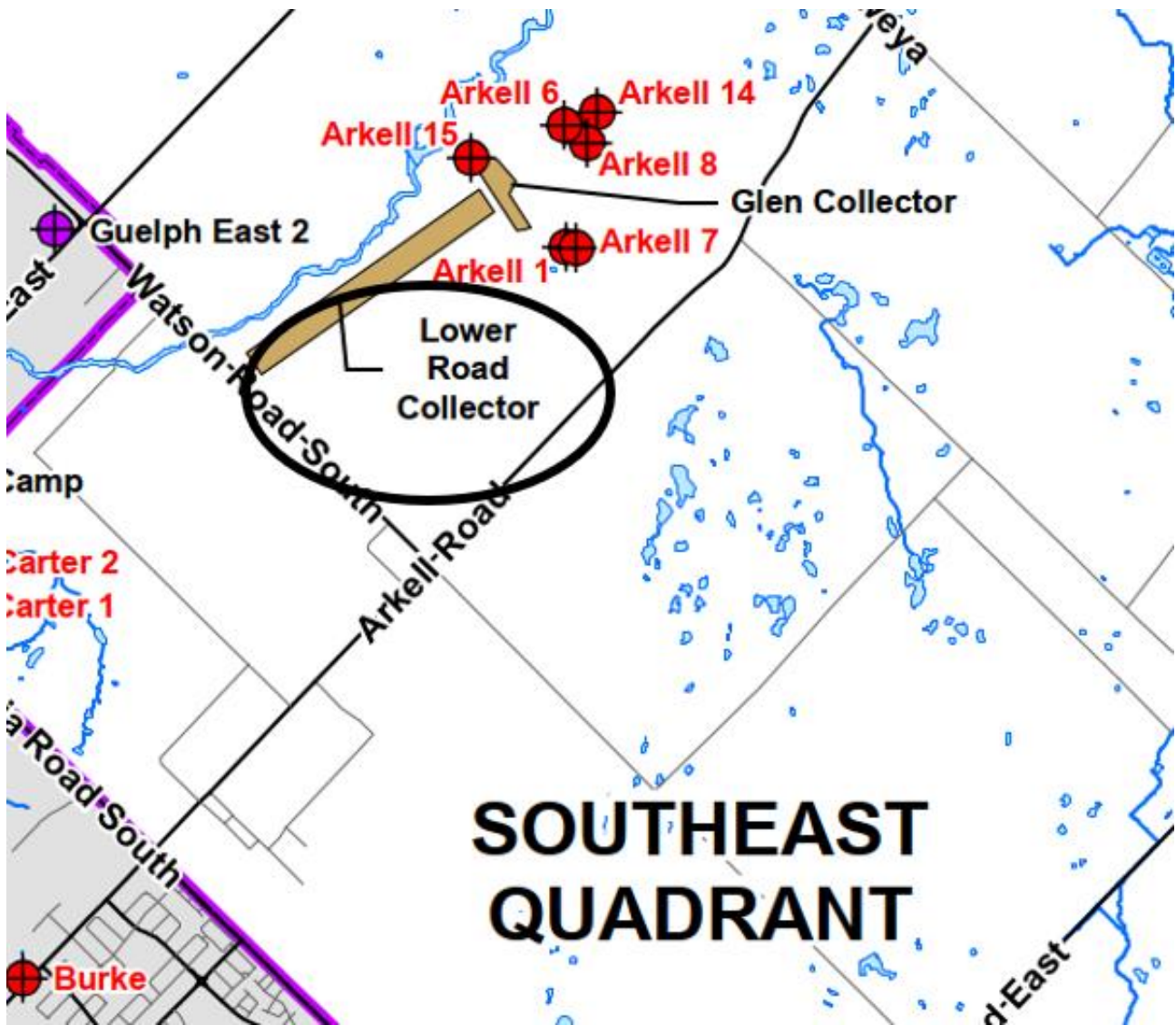


Project Component	Project Details
Location	■ Adjacent to Clythe Creek, near intersection of Highway 7 and Watson Road
Description	■ Drilled in 1976, has 305 mm dia. casing, offline since 1999
Permitted Pump Rate	■ 3,395 m ³ /d
Sustainable Capacity	■ 1,180 m ³ /d per modelling assessment (considered to be a conservative value); field testing has shown 3,370 to be locally sustainable

Project Component	Project Details
Existing Approvals	<ul style="list-style-type: none"> ■ Permit To Take Water (PTTW)
Required Approvals	<ul style="list-style-type: none"> ■ Amendment to City Drinking Water License (DWL)
Water Quality Issues	<ul style="list-style-type: none"> ■ Hydrogen sulfide, iron and manganese
Environmental Constraints	<ul style="list-style-type: none"> ■ Close to Clythe Creek and Clythe Creek Provincially Significant Wetland (PSW) ■ Potential impacts to features assessed as part of Ministry of the Environment, Conservation and Parks (MECP) PTTW approval process ■ City collecting additional data to build on understanding of the potential for interaction between the well and natural environment
Past Studies/Work	<ul style="list-style-type: none"> ■ Rehabilitation and Performance Assessment in 2008 ■ Schedule B Class Environmental Assessment (EA) for Water Treatment Plant (WTP) completed in 2018 (identified strategy for water quality treatment requirements) ■ Land acquisition of property across road to accommodate new WTP
Required Studies	<ul style="list-style-type: none"> ■ Additional monitoring data noted above
Required Infrastructure	<ul style="list-style-type: none"> ■ Water Treatment System ■ Well house upgrades
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$6,781,000 (for WTP with design capacity of 3,370 m³/d)
Cost per m³/day	<ul style="list-style-type: none"> ■ \$2,012 (at 3,370 m³/d; field tested rate)
Annual Operations & Maintenance (O&M) Cost	<ul style="list-style-type: none"> ■ \$100,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.56/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Two year design and construction period

Alternative: Restoration of Existing Off-line Municipal Wells

Project Sheet: Restoration of Arkell Lower Road Collector System

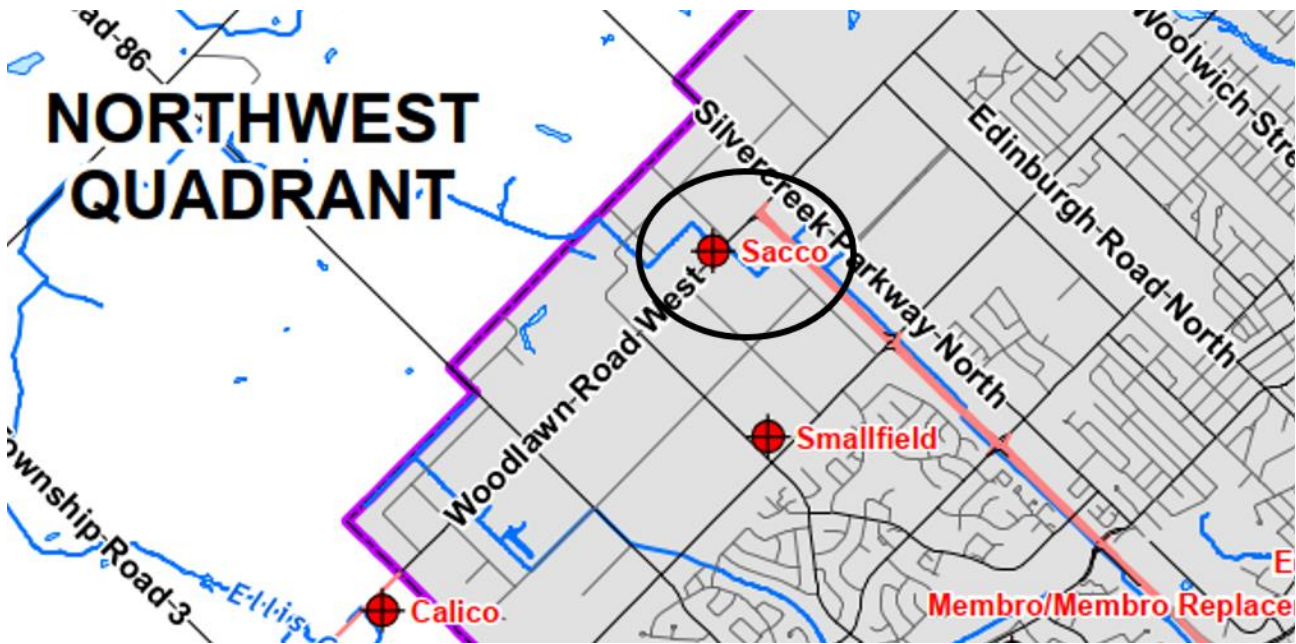


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Lower slope of the Eramosa valley wall (Arkell Spring Grounds), east of Watson Road
Description	<ul style="list-style-type: none"> ■ A collector system consisting of 30 manholes and 26 collection galleries, disconnected in 2000
Historical Production Rate	<ul style="list-style-type: none"> ■ 600 to 6,000 m³/d
Sustainable Capacity	<ul style="list-style-type: none"> ■ Modelling assessment indicates that collector replacement could add 4,000 m³/d to the combined minimum collector volume (i.e., total for Lower Road and existing Glen Collector)

Project Component	Project Details
Existing Approvals	<ul style="list-style-type: none"> ■ PTTW (under Arkell Springs Grounds Collector groundwater taking)
Required Approvals	<ul style="list-style-type: none"> ■ DWL amendment ■ Possible Class EA Schedule B, with consideration for potential environmental impacts ■ Source Protection Plan amendment (requirement TBD)
Water Quality Issues	<ul style="list-style-type: none"> ■ Elevated bacterial content; would be treated via Woods Ultraviolet (UV) system (review of updated Groundwater Under Direct Influence of Surface Water Terms of Reference [GUDI TOR] required, when available) ■ Separate connection to valve chamber with bypass when turbidity high (similar to Glen collector)
Environmental Constraints	<ul style="list-style-type: none"> ■ Near Eramosa River and Eramosa River Blue Springs Creek PSW – system previously permitted, no PTTW increase required, potential impacts assessed and permitted previously (updated ecological assessment required) ■ Near Arkell well field
Past Studies/Work	<ul style="list-style-type: none"> ■ Aquifer Performance Evaluation Southeast Quadrant, 1998 ■ Review of Collector Rehabilitation/Replacement Options, 2004 ■ 2014 WSMP Update
Required Studies	<ul style="list-style-type: none"> ■ Field investigation ■ Arkell artificial recharge system improvement study ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ New HDPE perforated pipe & associated infrastructure
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$13,874,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$3,469 (at 4,000 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$125,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.84/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Feasibility study (field and modelling investigation); artificial recharge system upgrades – estimated 4 year period ■ Class EA – estimated one to two years ■ Design and construction – estimated four years

Alternative: Restoration of Existing Off-line Municipal Wells

Project Sheet: Restoration of Sacco Well



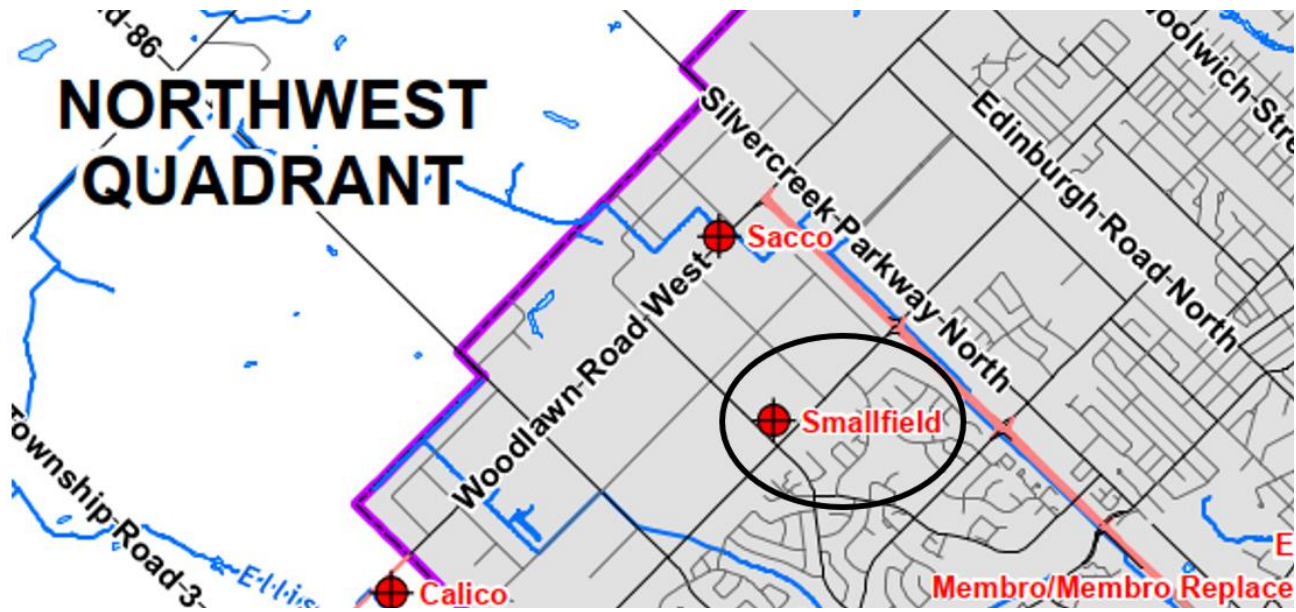
Project Component	Project Details
Location	■ 348 Woodlawn Road
Description	■ Drilled in 1952, has 300 mm dia. casing, inactive since 1991
Permitted Pumping Rate	■ 1,640 m ³ /d
Sustainable Capacity	■ 425 m ³ /d per modelling assessment (a portion of 1,275 m ³ /day available within the City's Northwest Quadrant [NWQ]); field testing has demonstrated local sustainability up to 1,150 m ³ /d
Existing Approvals	■ PTTW
Required Approvals	■ Class EA (Schedule B) ■ Amendment to City DWL
Water Quality Issues	■ Detectable levels of Trichloroethylene (TCE), Tetrachloroethylene (PCE) and 1,1-dichloroethylene below Ontario Drinking Water Quality Standards (ODWQS)
Environmental Constraints	■ Speed River catchment, close proximity to Ellis/ Chilligo Creek, near Marden South PSW Complex ■ Permitted source, potential impacts accounted for in assessment completed for PTTW application ■ Pumping could induce movement of contaminants within aquifer
Past Studies/Work	■ Rehabilitation and Performance Assessment in 2008 ■ Sacco Return to Service Options in 2014

Appendix G. Project Sheets for Preferred Alternatives

Project Component	Project Details
Required Studies	<ul style="list-style-type: none"> ■ MECP enforced contaminant source remediation ■ Water treatment study ■ GUDI assessment and well rehabilitation ■ Design and Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Submersible pump, electrical panel and raw watermain for transmission to Smallfield site for treatment ■ Water Treatment System (Smallfield site)
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$13,116,000 (combined cost for Sacco and Smallfield wells)
Cost per m³/day	<ul style="list-style-type: none"> ■ \$5,127 (at 1,150 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$99,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.24/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Timeline uncertain due to lack of active remediation or timeline to implement remediation

Alternative: Restoration of Existing Off-line Municipal Wells

Project Sheet: Restoration of Smallfield Well



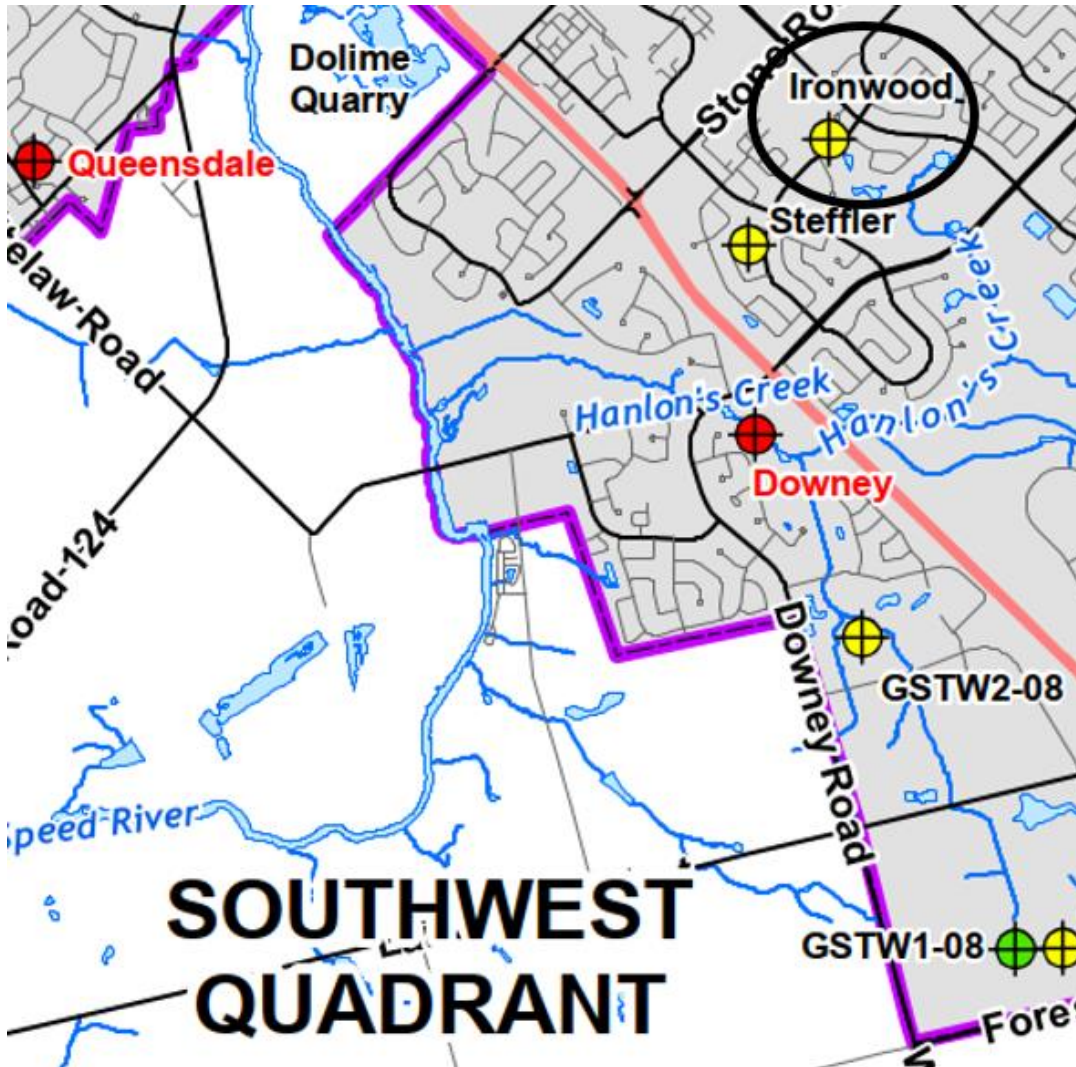
Project Component	Project Details
Location	<ul style="list-style-type: none"> 461 Speedvale Avenue
Description	<ul style="list-style-type: none"> Drilled in 1966, has 300 mm dia. casing, inactive since 1993
Permitted Pumping Rate	<ul style="list-style-type: none"> 1,964 m³/d
Sustainable Capacity	<ul style="list-style-type: none"> 425 m³/d per modelling assessment (a portion of 1,275 m³/day available within the City's NWQ); field testing has demonstrated local sustainability up to 1,408 m³/d
Existing Approvals	<ul style="list-style-type: none"> PTTW
Required Approvals	<ul style="list-style-type: none"> Amendment to City DWL Class EA (Schedule B)
Water Quality Issues	<ul style="list-style-type: none"> TCE concentration above ODWQS Maximum Acceptable Concentration (MAC) of 5 µg/L, PCE, 1,1-dichloroethylene and 1,4-dioxane below MAC, detectable levels of 1,1,1-Trichloroethane/ dioxin and furans, chloride above ODWQS Aesthetic Objective of 250 mg/L. High concentrations of similar contaminants are known to exist in groundwater on adjacent properties.
Environmental Constraints	<ul style="list-style-type: none"> Speed River catchment, close proximity to Ellis/ Chilligo Creek, near Marden South PSW Complex Permitted source, potential impacts accounted for in assessment completed for PTTW application

Appendix G. Project Sheets for Preferred Alternatives

Project Component	Project Details
	<ul style="list-style-type: none"> ■ Pumping would induce movement of contaminants within aquifer
Past Studies/Work	<ul style="list-style-type: none"> ■ Rehabilitation and Performance Assessment in 2008 ■ Sacco Return to Service Options in 2014
Required Studies	<ul style="list-style-type: none"> ■ MECP enforced contaminant source remediation ■ Performance Test ■ Treatment Studies ■ Class EA; Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Well house upgrade ■ Water Treatment System
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$13,116,000 (combined cost for Sacco and Smallfield wells)
Cost per m³/day	<ul style="list-style-type: none"> ■ \$5,127 (at 1,408 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$99,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.24/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Timeline uncertain due to lack of active remediation or timeline to implement remediation

Alternative: Develop Existing Municipal Test Wells

Project Sheet: Development of Ironwood Well

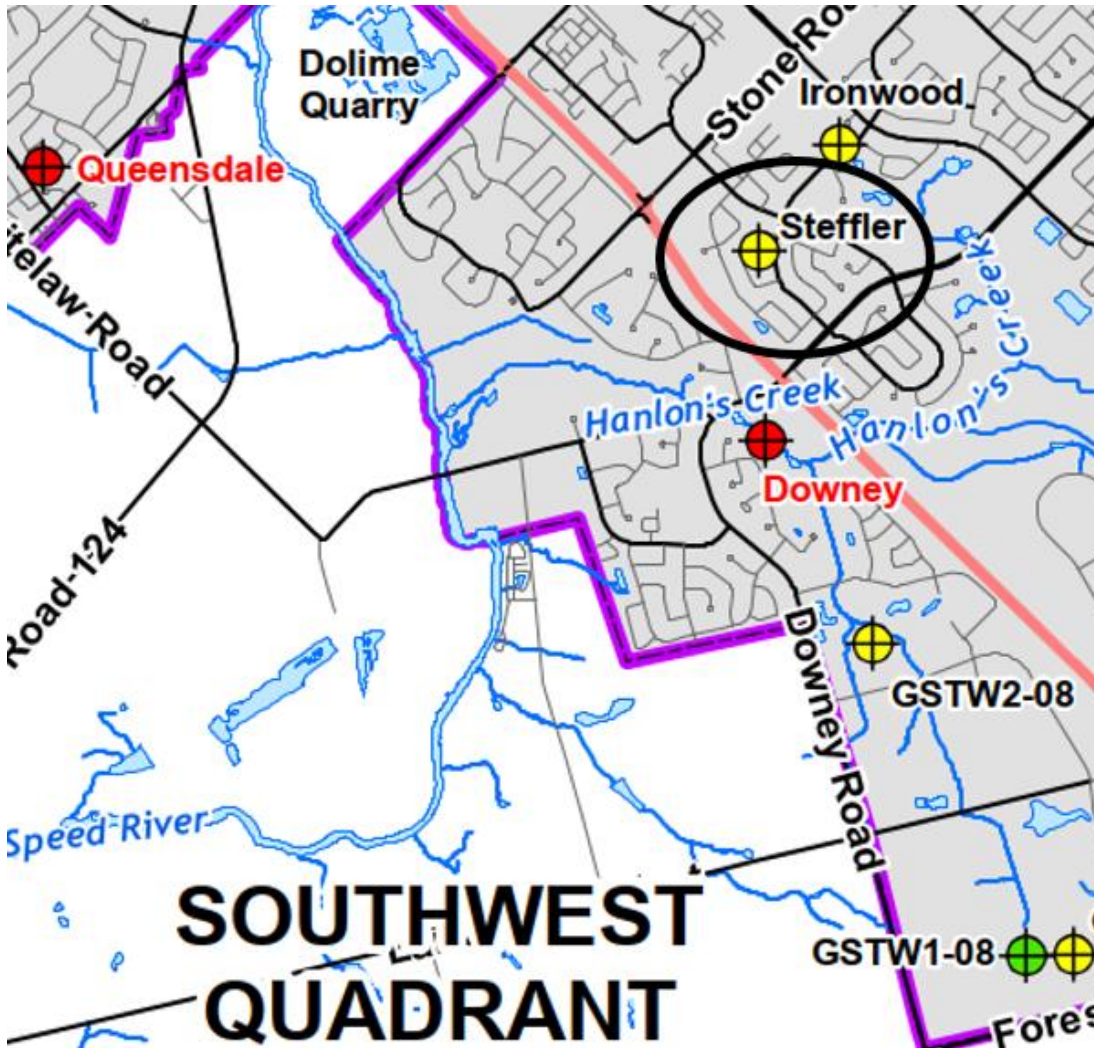


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Edinborough Road South & Ironwood Road; in University Village municipal park
Description	<ul style="list-style-type: none"> ■ Constructed in 2008, has 400 mm dia. casing
Sustainable Capacity	<ul style="list-style-type: none"> ■ 2,250 m³/d per modelling assessment; a portion of 4,500 m³/day available within the City's Southwest Quadrant (SWQ) with active quarry dewatering; it is anticipated that either the Ironwood or Steffler well would be developed; capacity of Ironwood well estimated to be 8,000 m³/day in 2008 SWQ Class EA
Existing Approvals	<ul style="list-style-type: none"> ■ None

Project Component	Project Details
Required Approvals	<ul style="list-style-type: none"> ■ PTTW ■ Amendment to City DWL ■ Class EA (initiated in 2021) ■ Source Protection Plan amendment ■ Municipal approvals
Water Quality Issues	<ul style="list-style-type: none"> ■ During pumping test (2008 Class EA), antimony reported above ODWQS, result assumed to be spurious - to be confirmed through EA
Environmental Constraints	<ul style="list-style-type: none"> ■ Modelling indicates that overall SWQ steady-state capacity can be increased by 4,500 m³/d; therefore additional capacity provides redundancy ■ Pumping may be limited to avoid impacts to Hanlon Creek baseflow; uncertainty related to potential baseflow impacts to Irish Creek ■ Southwest Guelph Water Supply Class EA (ongoing) to evaluate potential impacts to natural environment through Operational Testing Program
Past Studies/Work	<ul style="list-style-type: none"> ■ SWQ Class EA put on hold in 2010, included groundwater development study and 32 day constant rate pumping test; new EA initiated in 2021
Required Studies	<ul style="list-style-type: none"> ■ Complete Water Supply Class EA (ongoing) ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Connection to distribution system ■ Well house
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$5,125,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$640 (at 8,000 m³/day)
Annual O&M	<ul style="list-style-type: none"> ■ \$111,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.19/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Class EA (ongoing) – 5 years ■ Design and construction – estimated 2 years

Alternative: Develop Existing Municipal Test Wells

Project Sheet: Development of Steffler Well

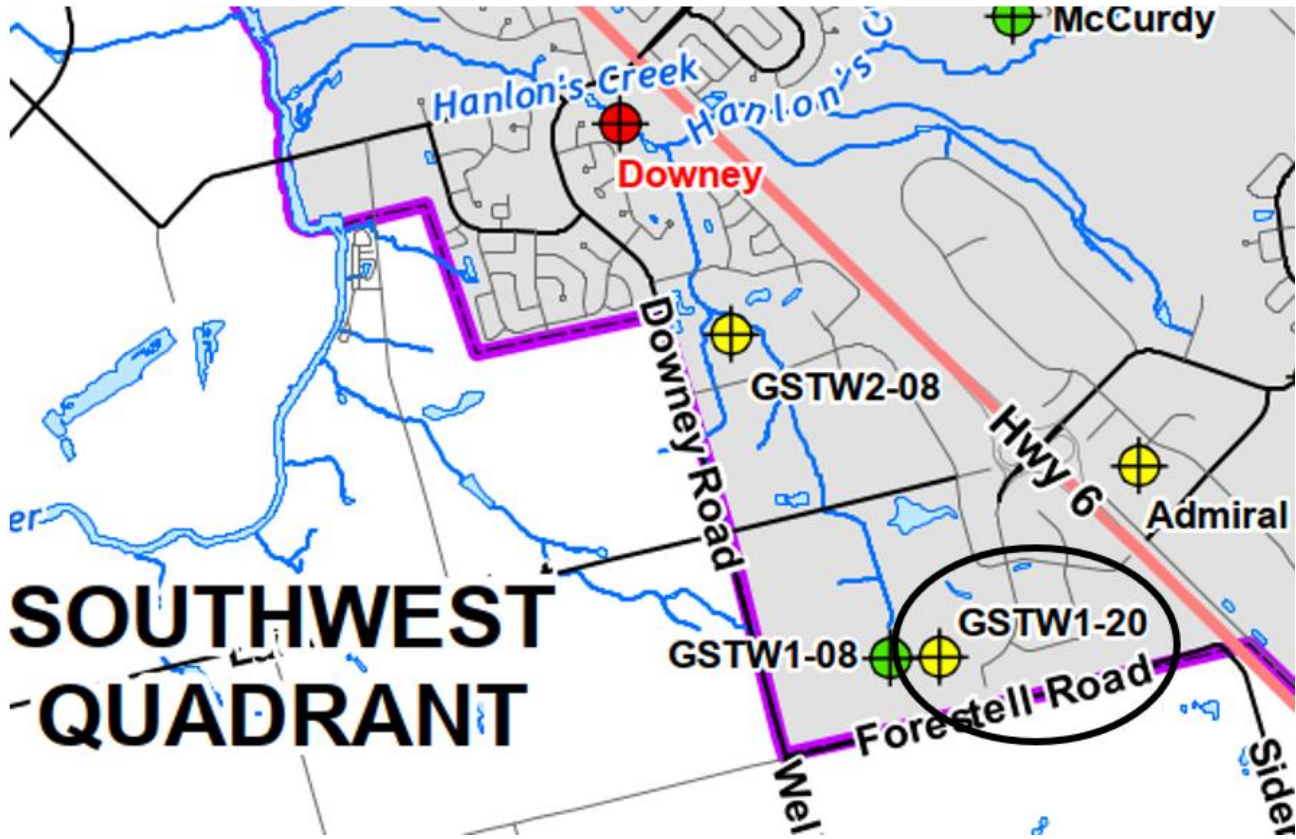


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ At Steffler Drive and Ironwood Road; in Steffler municipal park
Description	<ul style="list-style-type: none"> ■ Constructed in May 2008 with a 400 mm dia. casing
Sustainable Capacity	<ul style="list-style-type: none"> ■ 2,250 m³/d per modelling assessment; a portion of 4,500 m³/day available within the City's SWQ with active quarry dewatering; it is anticipated that either the Steffler or Ironwood well would be developed; capacity of Steffler well estimated to be 3,600 m³/day in 2008 SWQ Class EA
Existing Approvals	<ul style="list-style-type: none"> ■ None

Project Component	Project Details
Required Approvals	<ul style="list-style-type: none"> ■ PTTW ■ Source Protection Plan amendment ■ Amendment to City DWL ■ Class EA (initiated in 2021) ■ Municipal approvals
Water Quality Issues	<ul style="list-style-type: none"> ■ During pumping test (2008 Class EA), antimony reported above ODWQS, result assumed to be spurious to be confirmed through EA
Environmental Constraints	<ul style="list-style-type: none"> ■ Modelling indicates that overall SWQ steady-state capacity can be increased by 4,500 m³/d; therefore additional capacity provides redundancy ■ Pumping may be limited to avoid impacts to Hanlon Creek baseflow; uncertainty related to potential baseflow impacts to Irish Creek ■ Southwest Guelph Water Supply Class EA to evaluate potential impacts to natural environment through Operational Testing Program
Past Studies/Work	<ul style="list-style-type: none"> ■ Class EA put on hold in 2010, included groundwater development study and 32 day constant rate pumping test; new EA initiated in 2021
Required Studies	<ul style="list-style-type: none"> ■ Complete Water Supply Class EA (ongoing) ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Connection to distribution system ■ Well house
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$6,194,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$1,721 (at 3,600 m³/day)
Annual O&M	<ul style="list-style-type: none"> ■ \$106,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.47/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Class EA (ongoing) – 5 years ■ Design and construction – estimated 2 years

Alternative: Develop Existing Municipal Test Wells

Project Sheet: Development of Guelph South Test Well (GSTW1-20)

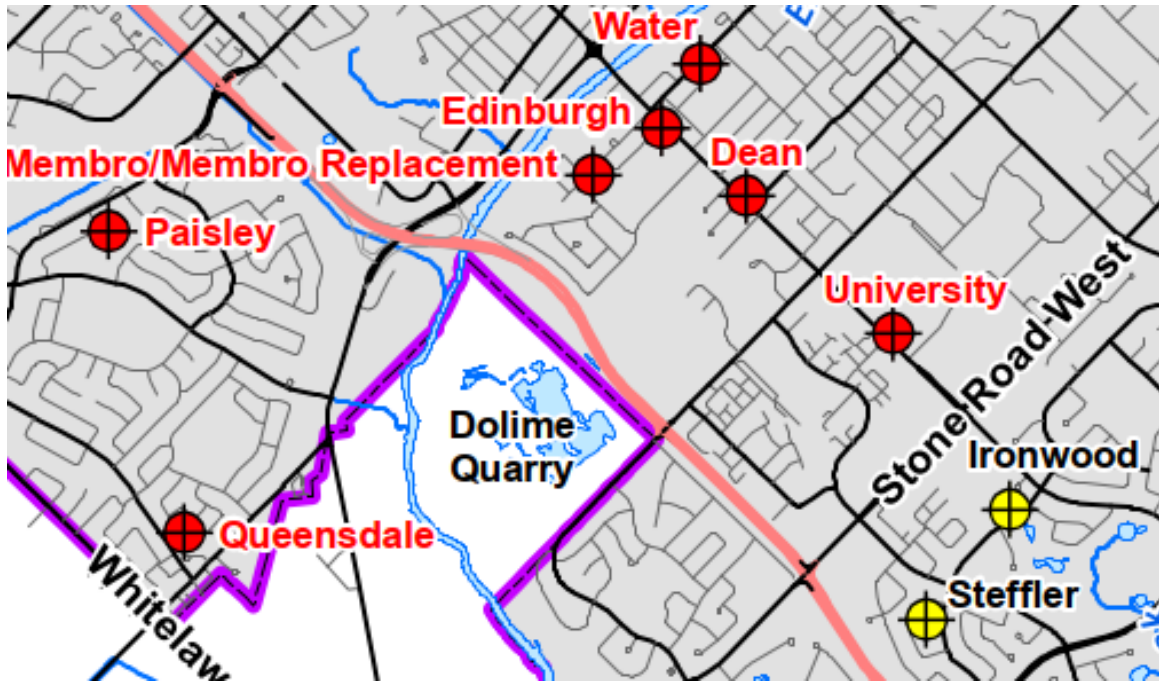


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Forestell Road; on municipal property
Description	<ul style="list-style-type: none"> ■ Constructed in 2020, has 356 mm dia. casing
Sustainable Capacity	<ul style="list-style-type: none"> ■ 2,250 m³/d per modelling assessment; a portion of 4,500 m³/day available within the City's SWQ with active quarry dewatering; field testing has demonstrated local sustainability up to 4,320 m³/d
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ PTTW ■ Source Protection Plan amendment ■ Amendment to City DWL ■ Class EA (initiated in 2021) ■ Municipal approvals
Water Quality Issues	<ul style="list-style-type: none"> ■ No issues, standard disinfection required

Project Component	Project Details
Environmental Constraints	<ul style="list-style-type: none"> ■ Modelling indicates that overall SWQ steady-state capacity can be increased by 4,500 m³/d; therefore additional well capacity provides redundancy ■ Pumping may be limited to avoid impacts to Hanlon Creek baseflow; uncertainty related to potential baseflow impacts to Irish Creek ■ Southwest Guelph Water Supply Class EA to evaluate potential impacts to natural environment through Operational Testing Program
Past Studies/Work	<ul style="list-style-type: none"> ■ Guelph South Groundwater Supply Investigation (on-going) included 30 day pumping test; new EA in 2021
Required Studies	<ul style="list-style-type: none"> ■ Complete Water Supply Class EA (ongoing) ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Connection to distribution system ■ Well house
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$4,800,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$1,111 (at 4,320 m³/day)
Annual O&M	<ul style="list-style-type: none"> ■ \$109,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.33/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Class EA (ongoing) – 5 years ■ Design and construction – estimated 2 years

Alternative: Develop Existing Municipal Test Wells

Project Sheet: Dolime Quarry Site Pumping Station and Water Treatment Plant

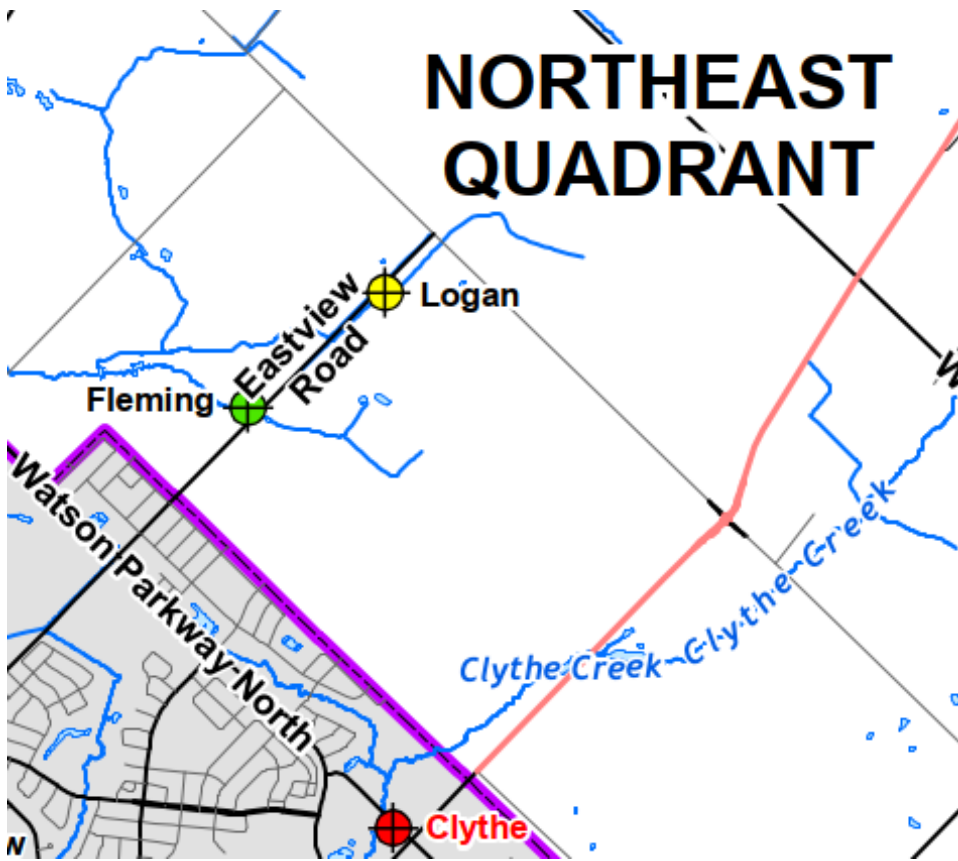


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Western portion of the City (currently within Guelph-Eramosa Township); to be moved into City, subject to provincial approval
Description	<ul style="list-style-type: none"> ■ Capture of groundwater under the proposed Pond Level Management (PLM) strategy (PLM is a required source protection measure for existing and future wells), water capture via existing production wells and municipal test wells and/or directly from quarry
Sustainable Capacity	<ul style="list-style-type: none"> ■ 1,000 – 3,000 m³/d
Existing Approvals	<ul style="list-style-type: none"> ■ Plan to bring Dolime property within the City boundary and pursue the PLM strategy has been approved by City Council, Wellington County Council and Guelph-Eramosa Township Council ■ Agreement in place with quarry owners (River Valley Developments)
Required Approvals	<ul style="list-style-type: none"> ■ Province of Ontario to review City request for boundary change (annexation) ■ Source Protection Plan amendment ■ Class EA – Schedule B or C (subject to: preferred strategy [groundwater capture surrounding quarry or pump direct from quarry pond], water quality testing and characterization of source against GUDI TOR)

Project Component	Project Details
	<ul style="list-style-type: none"> ■ Municipal – City ■ MECP - PTTW; Environmental Compliance Approval (ECA)/ DWL ■ Grand River Conservation Authority (GRCA)
Water Quality Issues	<ul style="list-style-type: none"> ■ Limited data are available; water quality assumed to be similar to Gasport Formation groundwater
Environmental Constraints	<ul style="list-style-type: none"> ■ Existing taking, effect on groundwater levels known; WWTP ECA evaluates required dilution for plant discharge assuming no discharge from quarry (i.e., discharge from the site is not a necessary component of the river dilution capacity)
Past Studies/Work	<ul style="list-style-type: none"> ■ Extensive previous work completed at Dolime Quarry by City and quarry owners ■ Technical work completed to assess quarry risk to water resource
Required Studies	<ul style="list-style-type: none"> ■ Water quality analysis, treatment study ■ Operational Testing Program to evaluate PLM strategy ■ Class EA (initiated in 2021; per above EA schedule to be confirmed); PTTW (transfer dewatering operations to the City) ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Land acquisition (per agreement with quarry owners) ■ Permanent pumping station for PLM strategy ■ River discharge outfall ■ Water treatment system and associated infrastructure (for direct supply from quarry) ■ Connection to distribution system
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$18,976,440 (for quarry pond supply); \$3,300,000 for pumping station
Cost per m³/day	<ul style="list-style-type: none"> ■ \$6,325 (at 3,000 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$521,000 (for quarry pond supply)
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.71/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Class EA (ongoing) – 5 years ■ Design and construction (pumping station) – estimated 2 years ■ Design and construction (pumping station) – estimated 4 years

Alternative: Develop Existing Municipal Test Wells

Project Sheet: Develop well in the area of Logan and Fleming Test Wells

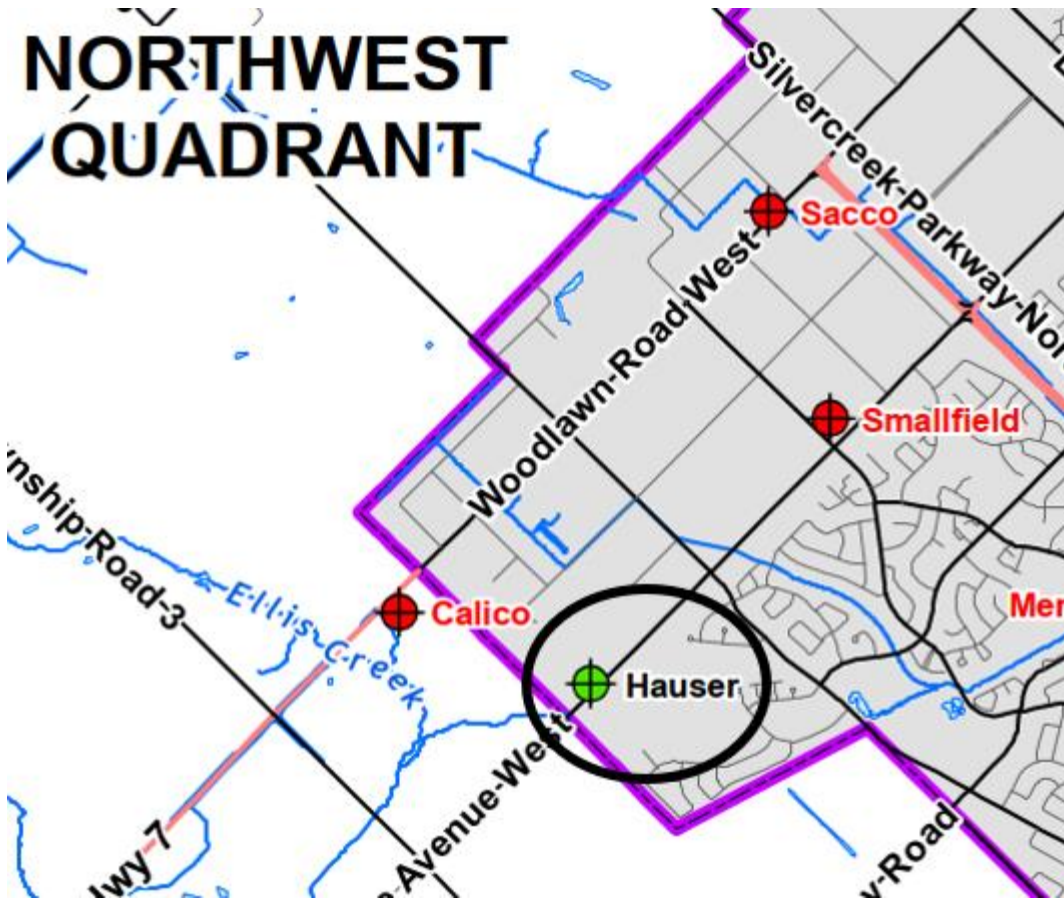


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Township of Guelph-Eramosa ■ Eastview Rd, east of Watson Road
Description	<ul style="list-style-type: none"> ■ Logan Test Well - drilled in 1966, has 300 mm dia. Casing (to be reconstructed by City in 2021/2022) ■ Fleming Test Well – drilled in 1996, has 300 mm dia. casing (has been converted to multi-level monitoring well)
Sustainable Capacity	<ul style="list-style-type: none"> ■ 4,180 m³/d per modelling results
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ PTTW ■ Source Protection Plan amendment ■ Amendment to City DWL ■ Class EA ■ Municipal – Township of Guelph-Eramosa ■ GRCA

Project Component	Project Details
Water Quality Issues	<ul style="list-style-type: none"> ■ High quality groundwater within deep aquifer to be targeted ■ Fe reported at 0.27 mg/L (below ODWQS)
Environmental Constraints	<ul style="list-style-type: none"> ■ Test wells are located near Guelph Northeast PSW Complex ■ Well modifications required (being completed in 2021/2022) ■ Associated investigations will assess confined nature of aquifer ■ Potential impacts to municipal/ private wells due to rural location
Past Studies/Work	<ul style="list-style-type: none"> ■ Logan Well Assessment, 2020 ■ Part of Guelph Monitoring System Project, 2009
Required Studies	<ul style="list-style-type: none"> ■ Well reconstruction and testing (including assessment of interaction with private wells and natural environment) ■ Water quality analysis ■ Class EA; PTTW ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Connection to distribution system ■ Well house ■ Assumes City proceeds with developing Logan site; land acquisition may be required to develop Fleming site
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$10,103,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$2,150 (at 4,180 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$126,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.55/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Feasibility study (field and modelling investigation) – estimated 2 year period ■ Class EA – estimated one to two years ■ Design and construction – estimated four years

Alternative: Develop Municipal Test Wells

Project Sheet: Develop Hauser Well

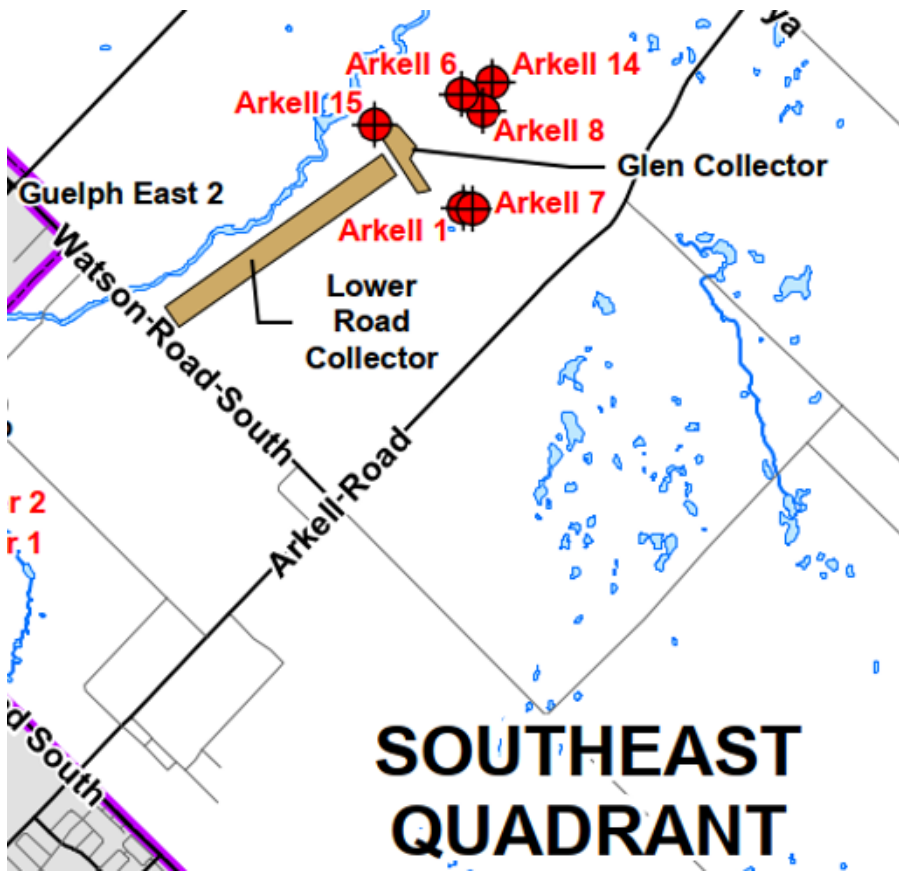


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ On Speedvale Avenue West, near western City limit
Description	<ul style="list-style-type: none"> ■ Drilled in 1966, has 300 mm dia. casing (has been converted to multi-level monitoring well)
Sustainable Capacity	<ul style="list-style-type: none"> ■ 425 m³/d per modelling assessment; a portion of 1,275 m³/d available within the City's NWQ; local sustainable capacity estimated at 900 m³/day in previous testing
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ PTTW ■ Source Protection Plan amendment ■ Amendment to City DWL ■ Class EA ■ Municipal – City of Guelph
Water Quality Issues	<ul style="list-style-type: none"> ■ Water quality info is not available; known issues in NWQ (e.g., Smallfield well)

Project Component	Project Details
Environmental Constraints	<ul style="list-style-type: none"> ■ Close proximity to Ellis/ Chilligo Creek ■ Near Ellis Creek Provincially Significant Wetland Complex
Past Studies/Work	<ul style="list-style-type: none"> ■ Step Test, 1994
Required Studies	<ul style="list-style-type: none"> ■ NWQ water quality assessment (modelling study with potential field component) ■ Well installation and testing ■ Water quality analysis ■ Class EA and PTTW ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ New well ■ Connection to distribution system ■ Well house
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$5,832,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$6,480 (at 900 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$96,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.86/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ NWQ water quality assessment (modelling study with potential field component) – estimated one to two year period ■ Class EA – estimated one to two years ■ Design and construction – estimated four years

Alternative: New Groundwater Supply

Project Sheet: Arkell Collectors System with ASR Wells



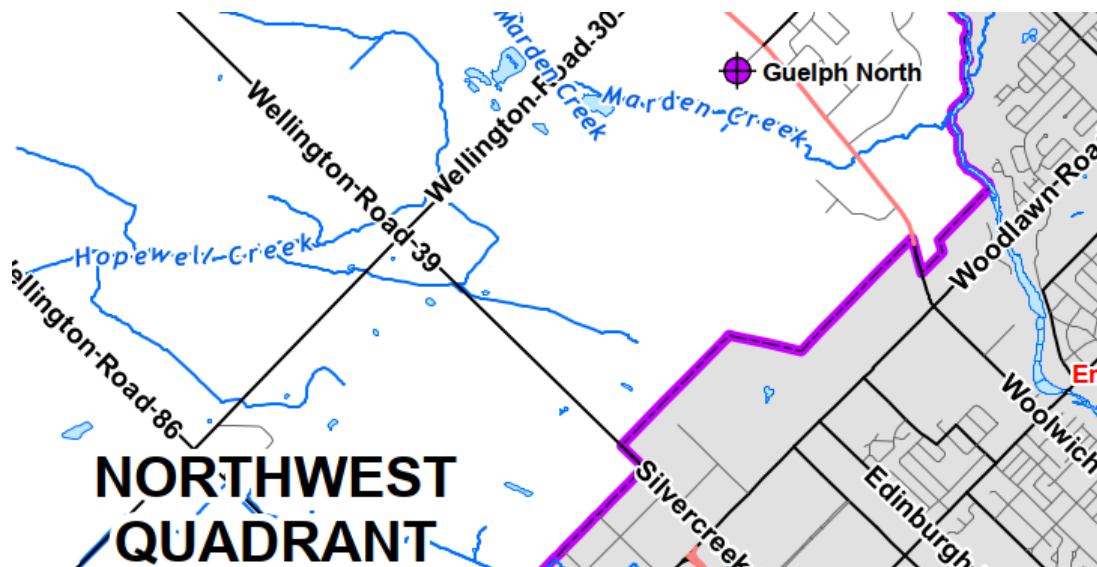
SOUTHEAST QUADRANT

Project Component	Project Details
Location	<ul style="list-style-type: none"> Arkell Collector Systems excess flow & ASR wells within City
Description	<ul style="list-style-type: none"> Transfer excess seasonal collector volumes to ASR wells
Capture Rate (m³/mo.)	<ul style="list-style-type: none"> 451,000 m³/mo. from April to June
Distribution Rate (m³/d)	<ul style="list-style-type: none"> 1,170 m³/d per modelling assessment; additional capacity potentially available through optimization
Existing Approvals	<ul style="list-style-type: none"> PTTW (under Arkell Spring Grounds Collector groundwater taking)
Required Approvals	<ul style="list-style-type: none"> Class EA (for ASR wells) Municipal – City PTTW (for ASR wells) ECA Source Protection Plan amendment DWL amendment GRCA (for any wells in a regulated area)

Project Component	Project Details
Water Quality Issues	<ul style="list-style-type: none"> ■ Requires dechlorination prior to injection; disinfection upon recovery prior to distribution
Environmental Constraints	<ul style="list-style-type: none"> ■ Potential impacts of Arkell Collectors previously evaluated in assessment for existing PTTW approval ■ Environmental conditions at locations of ASR would be evaluated through Class EA; with optimization, impacts not anticipated
Past Studies/Work	<ul style="list-style-type: none"> ■ Aquifer Performance Evaluation Southeast Quadrant, 1998 ■ Review of Collector Rehabilitation/Replacement Options, 2004 ■ 2014 WSMP Update
Required Studies	<ul style="list-style-type: none"> ■ Feasibility/ Optimization Studies (field and modelling components) ■ Well installation and testing ■ Water quality analysis ■ Class EA and PTTW ■ Design & construction
Required Infrastructure	<ul style="list-style-type: none"> ■ ASR wells with dechlorination and disinfection ■ Connection to distribution water main
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$25,284,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$21,610 (at 1,170 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$99,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$4.79/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Feasibility/ Optimization Studies (field and modelling components) – estimated one to two years ■ Land acquisition, following above study ■ Class EA – estimated one to two years ■ Design and construction – estimated four to five years

Alternative: Install New Wells Outside City Boundary

Project Sheet: Guelph North

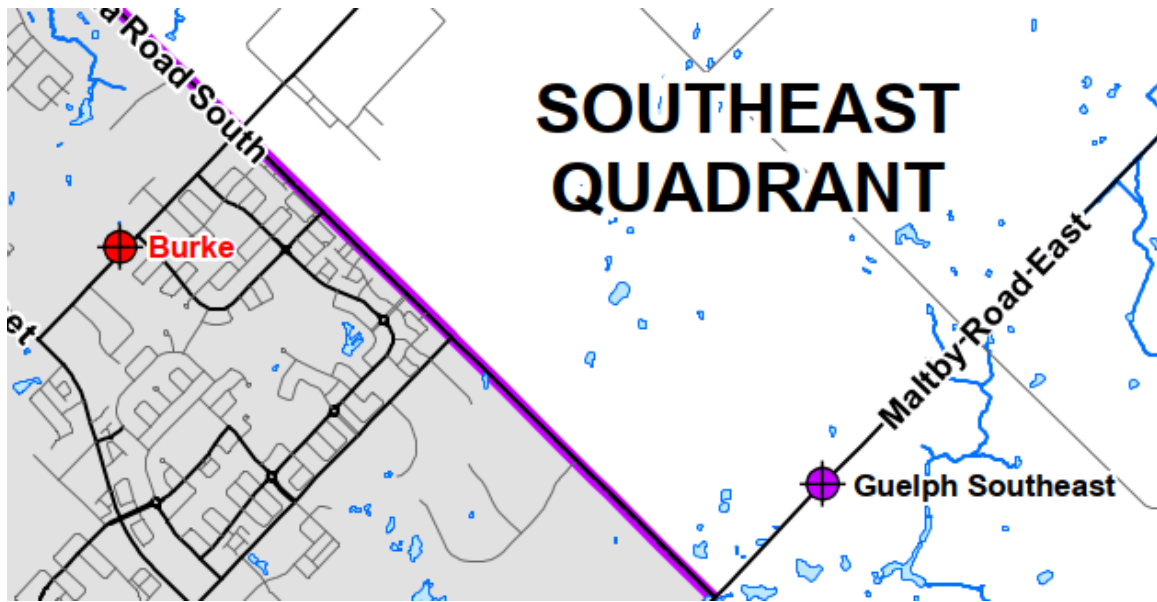


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Township of Guelph-Eramosa ■ North of the City, the western limit of Conservation Road (this is the approximate modelled location; City does not own land in area)
Description	<ul style="list-style-type: none"> ■ Recommended test well area outside the City based on groundwater modelling analysis
Sustainable Capacity	<ul style="list-style-type: none"> ■ 2,935 m³/d per modelling assessment
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ Municipal: Township of Guelph-Eramosa ■ PTTW ■ Class EA ■ ECA ■ Source Protection Plan amendment ■ DWL amendment ■ GRCA (depending on proximity to regulated area)
Water Quality Issues	<ul style="list-style-type: none"> ■ Water quality information not available; assume Fe & Mn treatment, disinfection
Environmental Constraints	<ul style="list-style-type: none"> ■ Marden Creek - moderate reduction in baseflows per modelling assessment ■ Near the Marden South PSW Complex ■ Potential impacts to municipal/ private wells anticipated due to rural location

Project Component	Project Details
Past Studies/Work	<ul style="list-style-type: none"> ■ Tier Three Risk Assessment
Required Studies	<ul style="list-style-type: none"> ■ Groundwater supply development study ■ Well installation and testing ■ Water quality analysis ■ Class EA and PTTW ■ Design & Construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Land acquisition ■ New well house and associated infrastructure ■ Connection to distribution system
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$12,841,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$4,375 (at 2,935 m³/d)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$111,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.11/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Groundwater supply development study – estimated one to two years ■ Land acquisition, following above study ■ Class EA – estimated one to two years ■ Design and construction – estimated four years

Alternative: Install New Wells Outside City Boundary

Project Sheet: Guelph Southeast

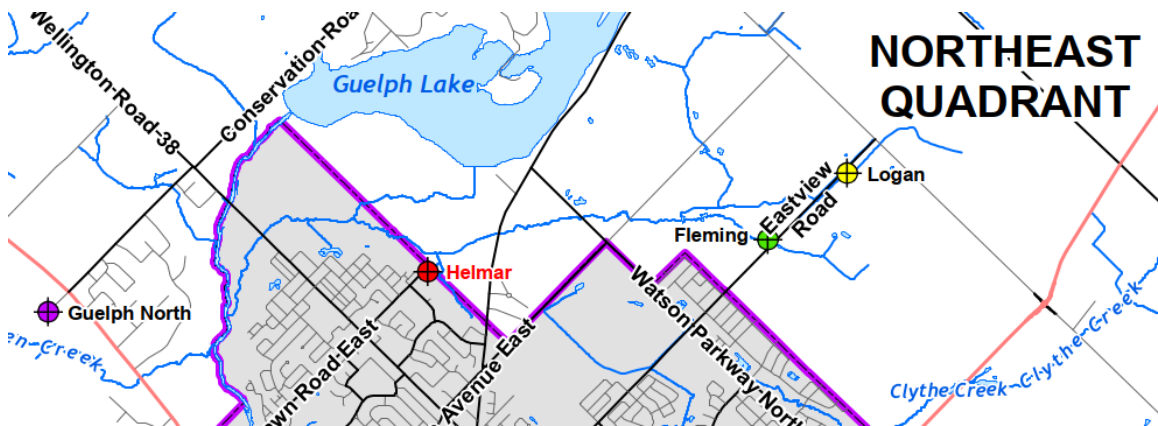


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ Township of Puslinch, Southeast of the City, within the Mill Creek catchment area, East of Victoria Rd, on Maltby Rd
Description	<ul style="list-style-type: none"> ■ Recommended test well location based on groundwater modelling analysis
Sustainable Capacity	<ul style="list-style-type: none"> ■ 1,600 m³/d per modelling assessment
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ Municipal: Township of Puslinch ■ PTTW ■ Class EA ■ ECA ■ Source Protection Plan amendment ■ DWL amendment ■ GRCA (depending on proximity to regulated area)
Water Quality Issues	<ul style="list-style-type: none"> ■ Water quality information not available; assume Fe & Mn treatment, disinfection
Environmental Constraints	<ul style="list-style-type: none"> ■ Modelling assessment indicates minimal impact to Mill Creek; less than 5% reduction in baseflow ■ Potential impacts to municipal/ private wells due to rural location ■ Area near Arkell Bog and Mill Creek Puslinch PSW Complexes
Past Studies/Work	<ul style="list-style-type: none"> ■ Tier Three Study

Project Component	Project Details
Required Studies	<ul style="list-style-type: none"> ■ Groundwater supply development study ■ Well installation and testing ■ Water quality analysis ■ Class EA and PTTW ■ Design & construction
Required Infrastructure	<ul style="list-style-type: none"> ■ Land acquisition ■ New well house and associated infrastructure ■ Connection to distribution system
Estimated Capital Cost	■ \$6,862,000
Cost per m3/day	■ \$4,289 (at 1,600 m ³ /d)
Annual O&M Cost	■ \$109,000
Life Cycle Cost	■ \$1.22/m ³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Groundwater supply development study – estimated one to two years ■ Land acquisition, following above study ■ Class EA – estimated one to two years ■ Design and construction – estimated four years

Alternative: Surface Water Supply

Project Sheet: Guelph Lake Water Treatment Plant

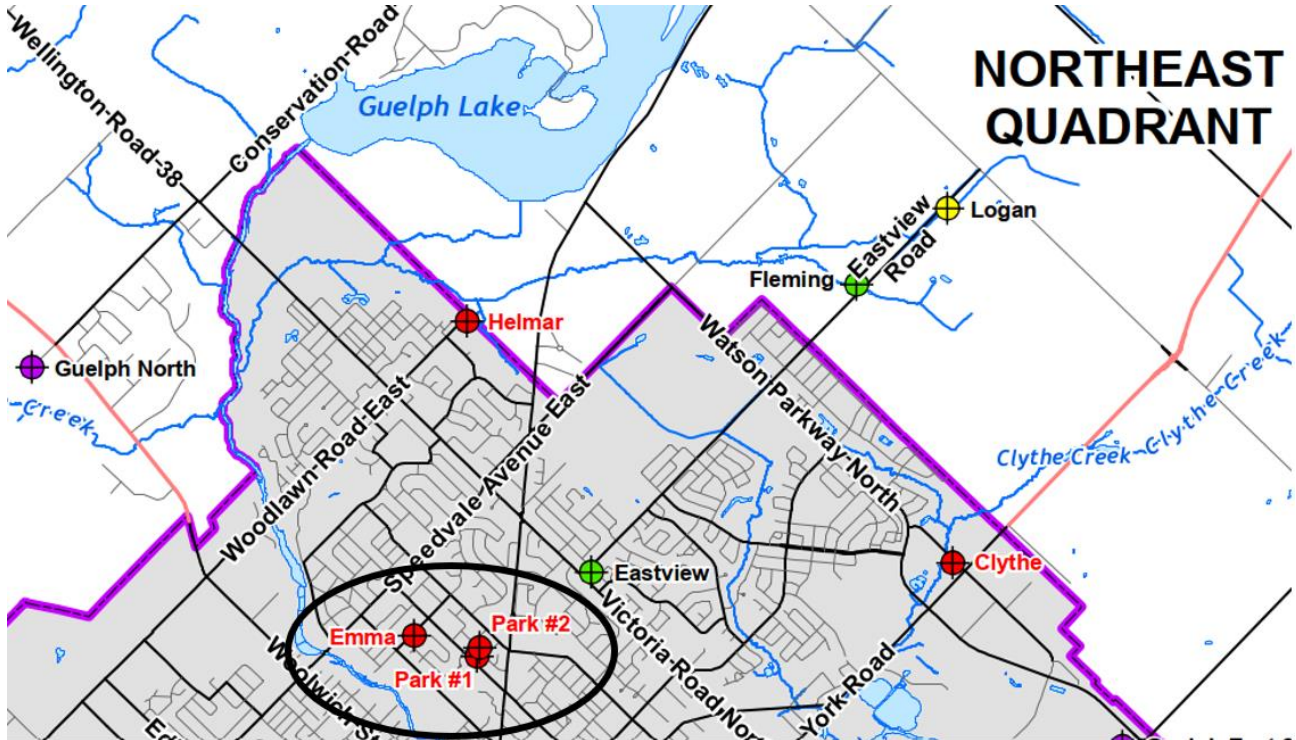


Project Component	Project Details
Location	<ul style="list-style-type: none"> ■ WTP at Guelph Lake or NE part of City
Description	<ul style="list-style-type: none"> ■ Surface WTP consisting of conventional/ advanced treatment and distribution pipeline
Capture Rate	<ul style="list-style-type: none"> ■ 12,960 m³/d (continuous annual base taking of 150 L/s)
Distribution Rate	<ul style="list-style-type: none"> ■ 12,300 m³/d
Existing Approvals	<ul style="list-style-type: none"> ■ None
Required Approvals	<ul style="list-style-type: none"> ■ Class EA – Schedule C ■ Municipal – City and Township ■ MNRF/ MECP - PTTW (Surface Water) ■ ECA ■ Source Protection Plan amendment ■ DWL amendment ■ GRCA
Water Quality Issues	<ul style="list-style-type: none"> ■ High turbidity, colour, odour
Environmental Constraints	<ul style="list-style-type: none"> ■ Area affected includes Guelph Lake and its associated wetland and aquatic features ■ GRCA analysis includes downstream minimum flow requirements, required storage within lake
Past Studies/Work	<ul style="list-style-type: none"> ■ GRCA review of water taking reliability
Required Studies	<ul style="list-style-type: none"> ■ Field investigations; environmental baseline/ impact ■ Feasibility Studies ■ Treatment study ■ Class EA – Schedule C ■ Property acquisition ■ Design & construction

Project Component	Project Details
Required Infrastructure	<ul style="list-style-type: none"> ■ Water intake structure ■ Surface water treatment plant & associated infrastructure ■ Connection to distribution water main
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$51,322,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$4,168 (at 12,960 m³/d)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$900,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$1.16/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Field investigations, feasibility study – one to two years ■ Land acquisition, following above study ■ Class EA – estimated two years ■ Design and construction – estimated four years

Alternative: Surface Water Supply & Aquifer Storage Recovery Wells

Project Sheet: Guelph Lake Water Treatment Plant with ASR Wells



Project Component	Project Details
Location	<ul style="list-style-type: none"> WTP at Guelph Lake/dam, ASR wells in NEQ in the vicinity of Park/Emma wells
Description	<ul style="list-style-type: none"> A surface water treatment plant consisting of conventional treatment and distribution pipelines, ASR wells
Intake Rate	<ul style="list-style-type: none"> 12,960 – 25,920 m³/d
Distribution Rate	<ul style="list-style-type: none"> Up to 25,825 m³/d
Existing Approvals	<ul style="list-style-type: none"> PTTW (SW PTTW would exist at time of ASR project)
Required Approvals	<ul style="list-style-type: none"> Class EA – Schedule C Municipal – City and Township PTTW (Surface Water/ Groundwater); ECA Source Protection Plan amendment DWL amendment GRCA
Water Quality Issues	<ul style="list-style-type: none"> High turbidity, colour, odour

Project Component	Project Details
Environmental Constraints	<ul style="list-style-type: none"> ■ Area affected includes Guelph Lake and its associated wetland and aquatic features ■ GRCA analysis includes downstream minimum flow requirements, required storage within lake
Past Studies/Work	<ul style="list-style-type: none"> ■ GRCA review of water taking reliability
Required Studies	<ul style="list-style-type: none"> ■ Field investigations; environmental baseline/ impact ■ Feasibility Studies ■ Treatment study ■ Class EA
Required Infrastructure	<ul style="list-style-type: none"> ■ Water intake structure ■ Surface water treatment plant & associated infrastructure ■ ASR wells ■ Connection to distribution water main
Estimated Capital Cost	<ul style="list-style-type: none"> ■ \$57,283,000
Cost per m³/day	<ul style="list-style-type: none"> ■ \$4,239 (cost for additional flow, total of 25,800 m³/day)
Annual O&M Cost	<ul style="list-style-type: none"> ■ \$1,290,000
Life Cycle Cost	<ul style="list-style-type: none"> ■ \$0.75/m³ of water produced
Implementation Timeline	<ul style="list-style-type: none"> ■ Field investigations, feasibility study (ASR optimization) – one to two years ■ Land acquisition for ASR wells, following above study ■ Class EA – estimated two years ■ Design and construction – estimated two to four years