

Trent Conservation Coalition

# Paleozoic Area WHPA and Vulnerability Assessment

Trent Conservation Coalition  
Nov. 3, 2009

# Presentation Objectives

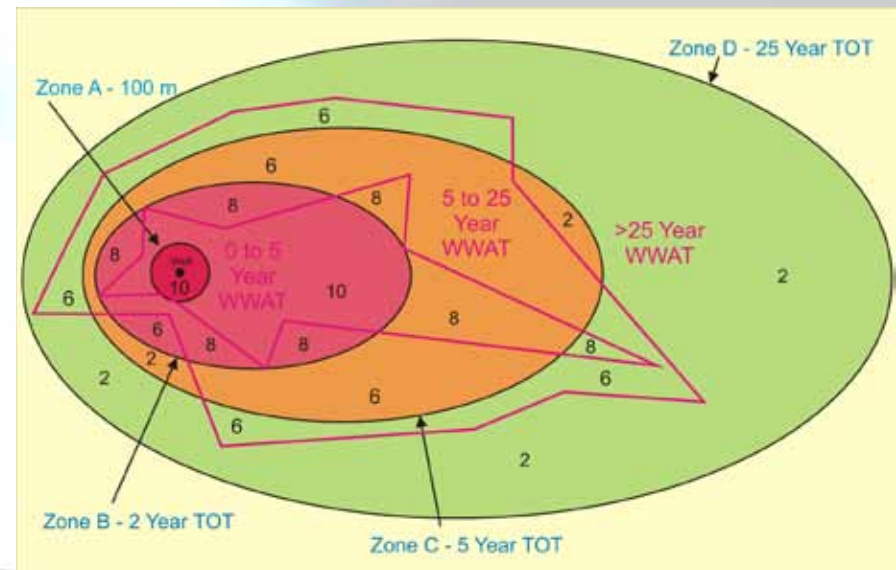
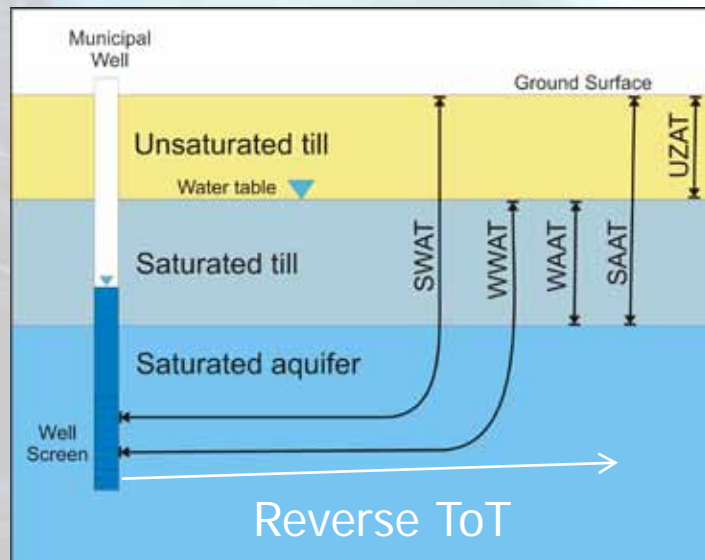
- n Provide a summary of the Wellhead Protection Area delineation and SWP Vulnerability Assessment for the following wellfields:
  - n Grafton
  - n Colborne
  - n Brighton
  - n Millbrook
  - n Crystal Springs
  - n Keene Heights
  - n Stirling

# Presentation Overview

- n Methodology
  - n MOE Methodology
  - n Modelling approach - overview
- n Study areas
- n Summary/Samples of results
  - n Sample cross sections
  - n Reverse tracking and WHPA zones
  - n Forward tracking and WWAT zones
- n Vulnerability Assessment Results
- n Conclusions

# MOE SWP Vulnerability Analysis

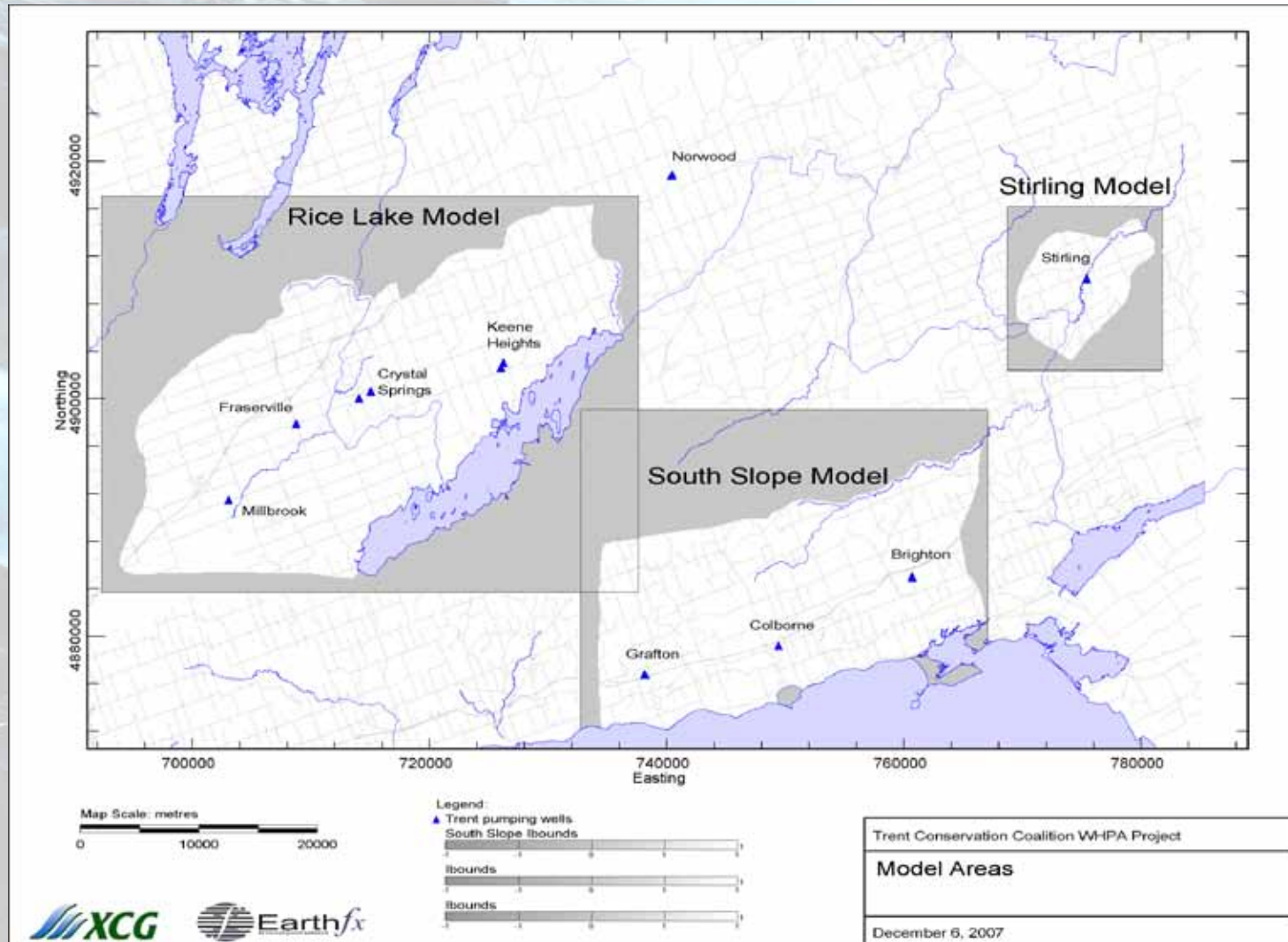
- ▶ Integrate WHPA and WWAT zones to determine Vulnerability scores for the combined zones
  - § Reverse (WHPA) Particle Tracking = determine overall well capture zone area
  - § Forward (WWAT) Particle Tracking = determine “windows” where contaminants might move quickly down to the aquifer



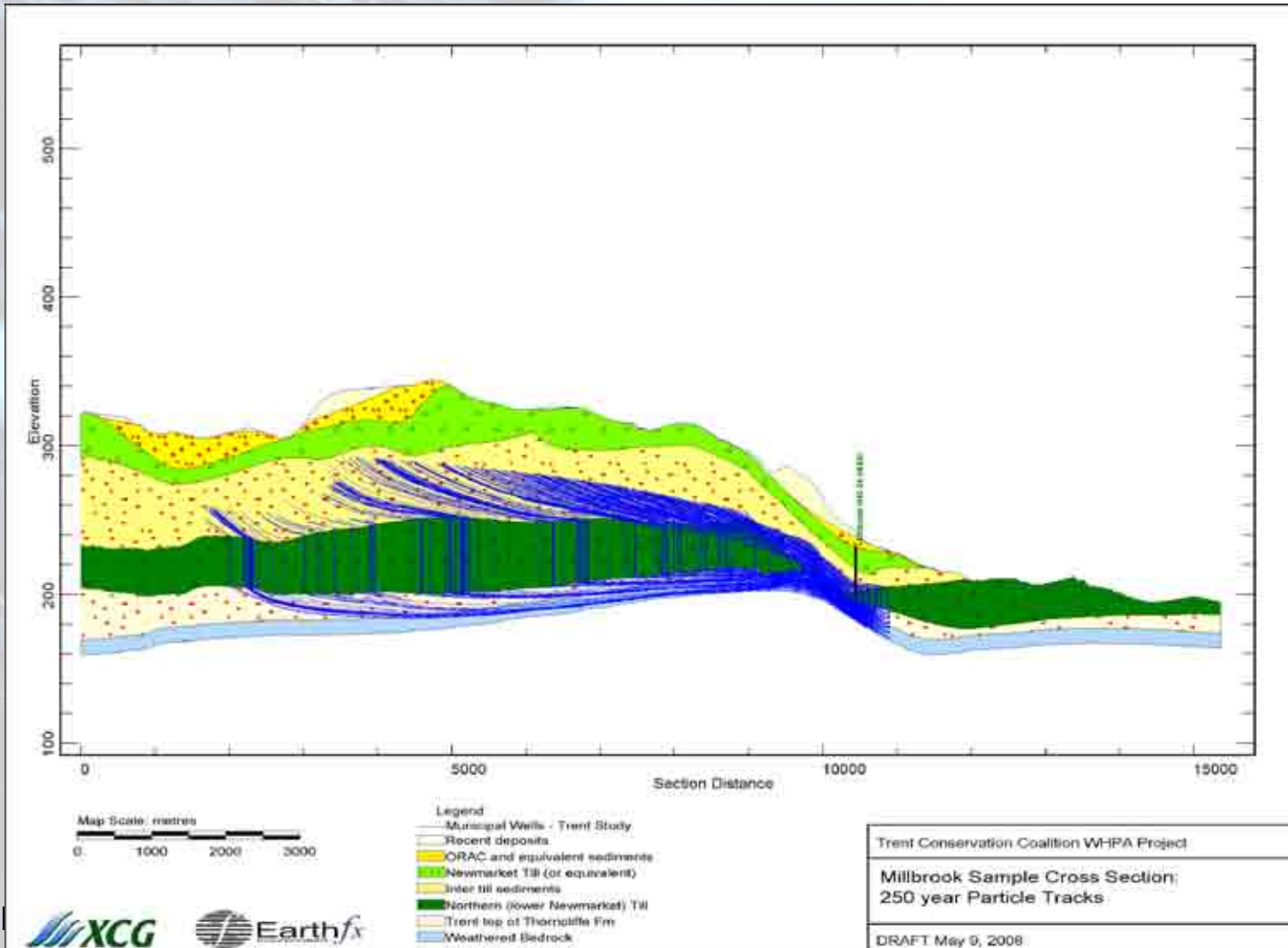
# Technical Approach

- ▶ Data Compilation
  - § Compilation of borehole logs and engineering reports
- ▶ Hydrostratigraphic model layer development
  - § Interpretation of borehole geological data
  - § Review of over 8000 boreholes completed
- ▶ GW Modelling Approach: USGS MODFLOW
  - § Estimate GW Recharge estimate based on surficial geology
  - § Regional calibration model MOE water levels and SW gauge data
  - § Local calibration refinement to wellfield pumping tests and drawdowns
  - § WHPA zones determined from reverse particle tracking
  - § WWAT times from forward particle tracking
- ▶ SWP Vulnerability Assessment
  - § WHPA and WWAT Zone scoring
  - § Integrated Vulnerability Scoring
  - § Output model results to threats assessment

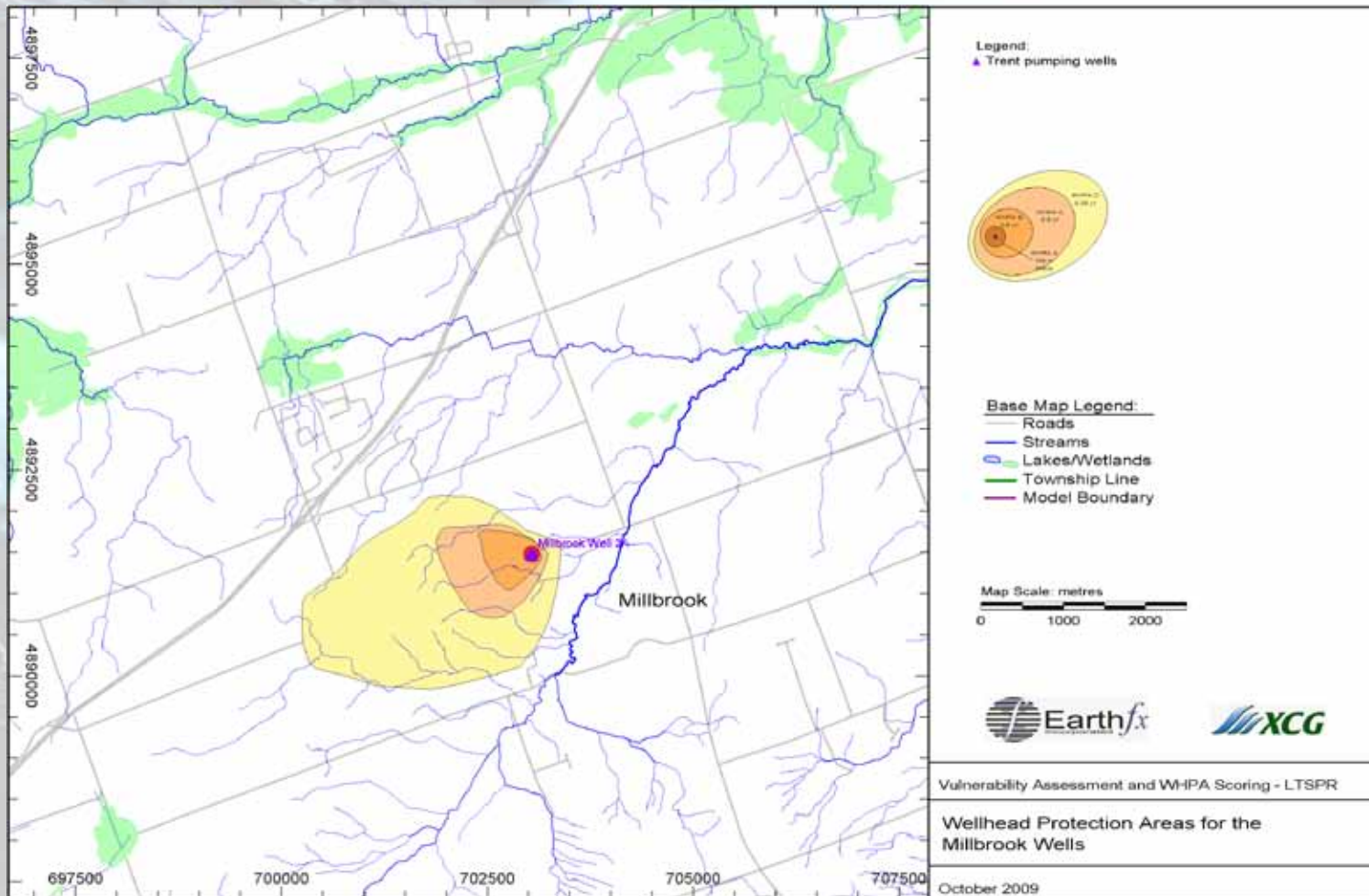
# Flow Model Study Areas: Rice Lake



# Millbrook 3D Flow Assessment Reverse Tracks on Geologic Cross Section

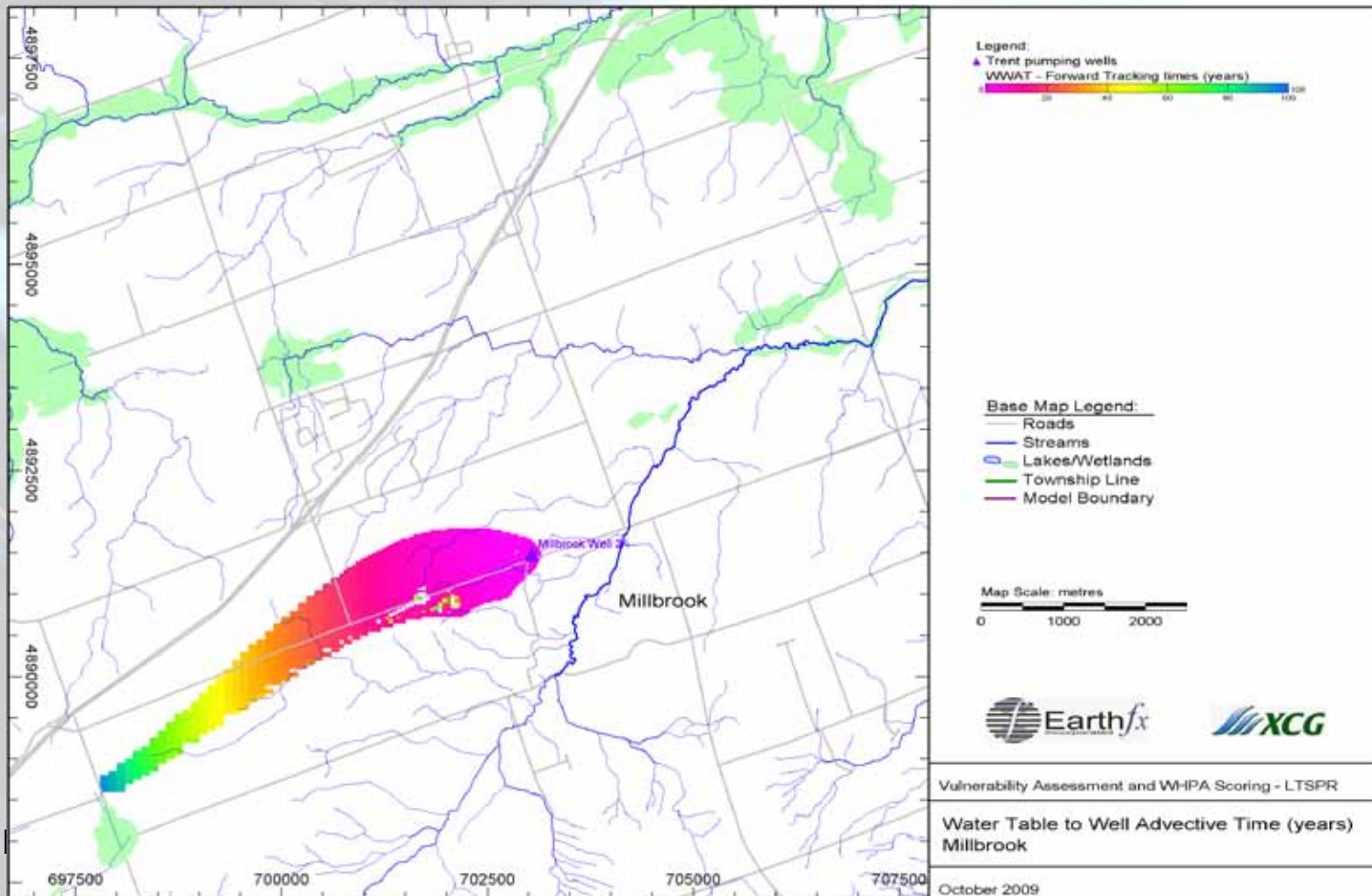


# Millbrook WHPA (Capture Zones)

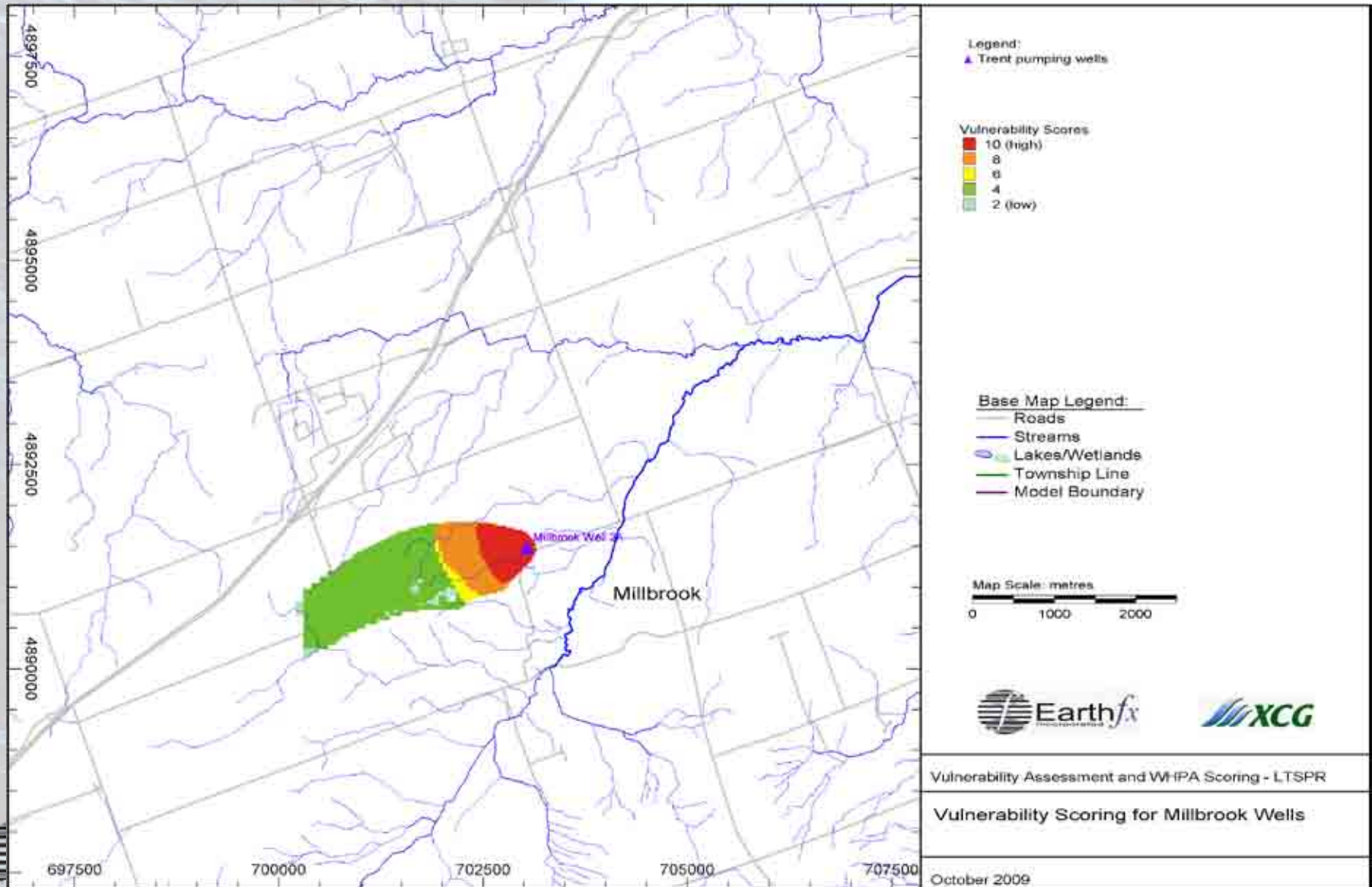


► Rice Lake Local Model

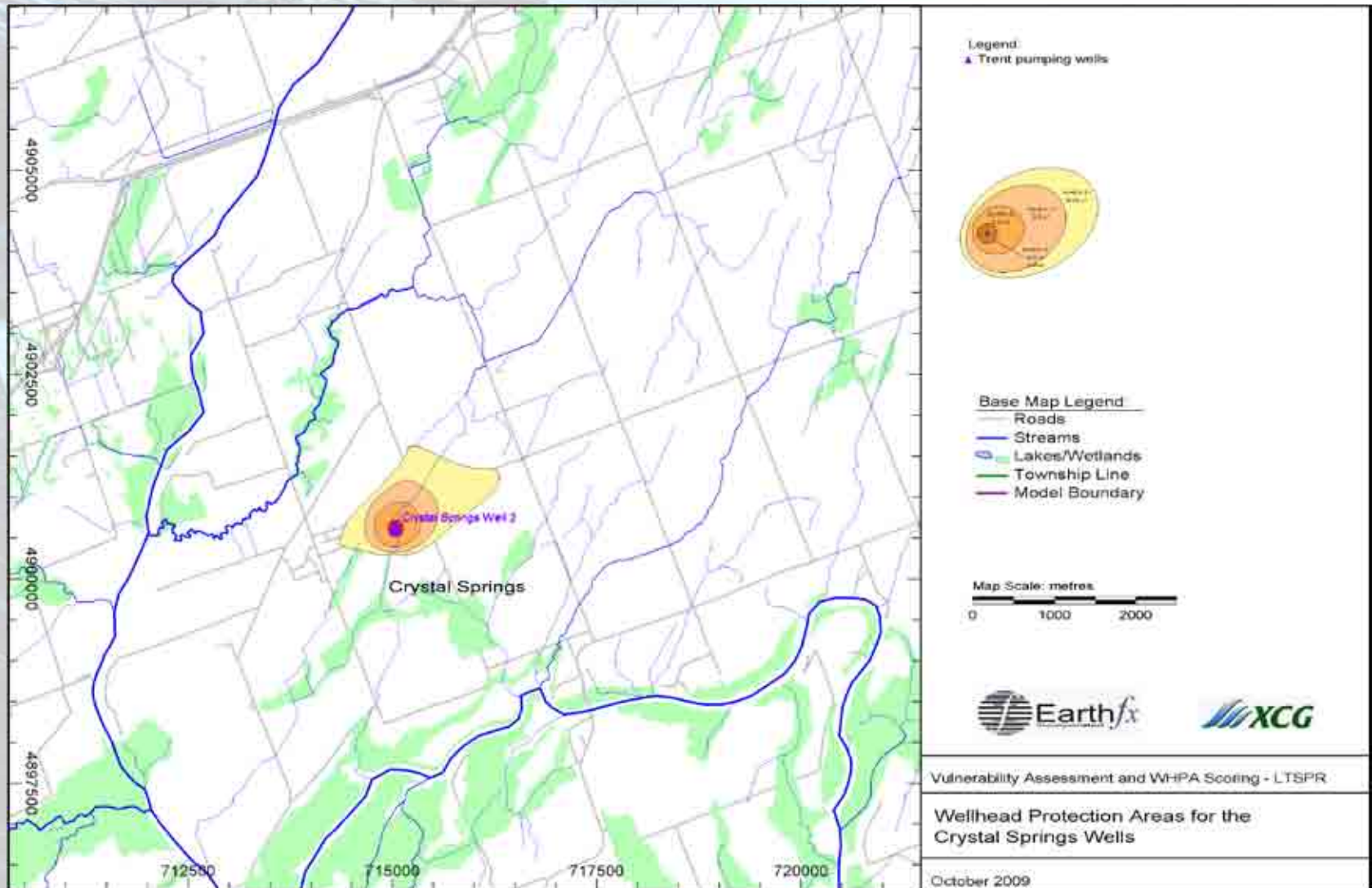
# Millbrook Water Table to Well Advective Travel Time (WWAT)



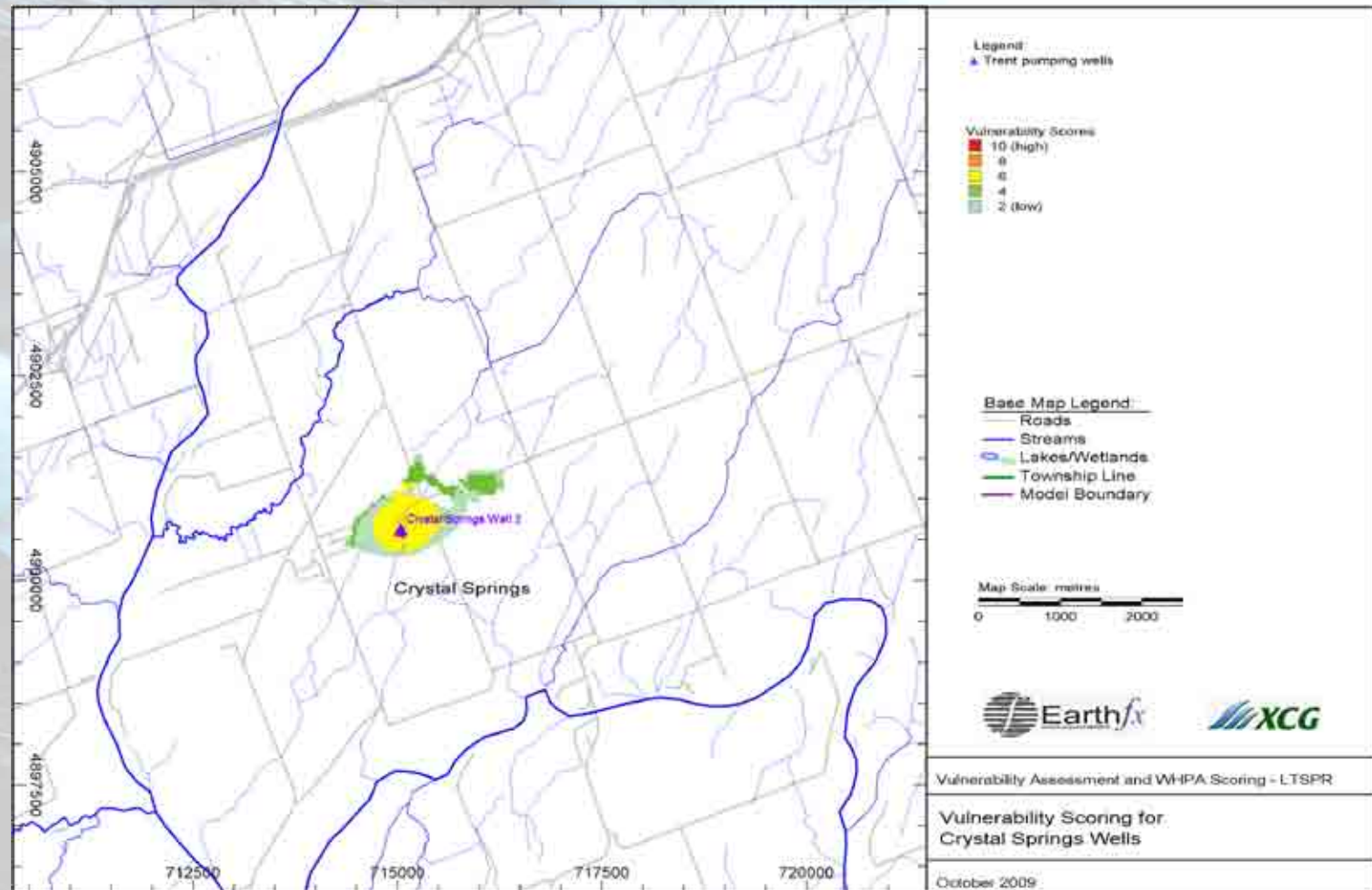
# Millbrook Vulnerability Assessment Scores



# Crystal Springs WHPA (Capture Zones)

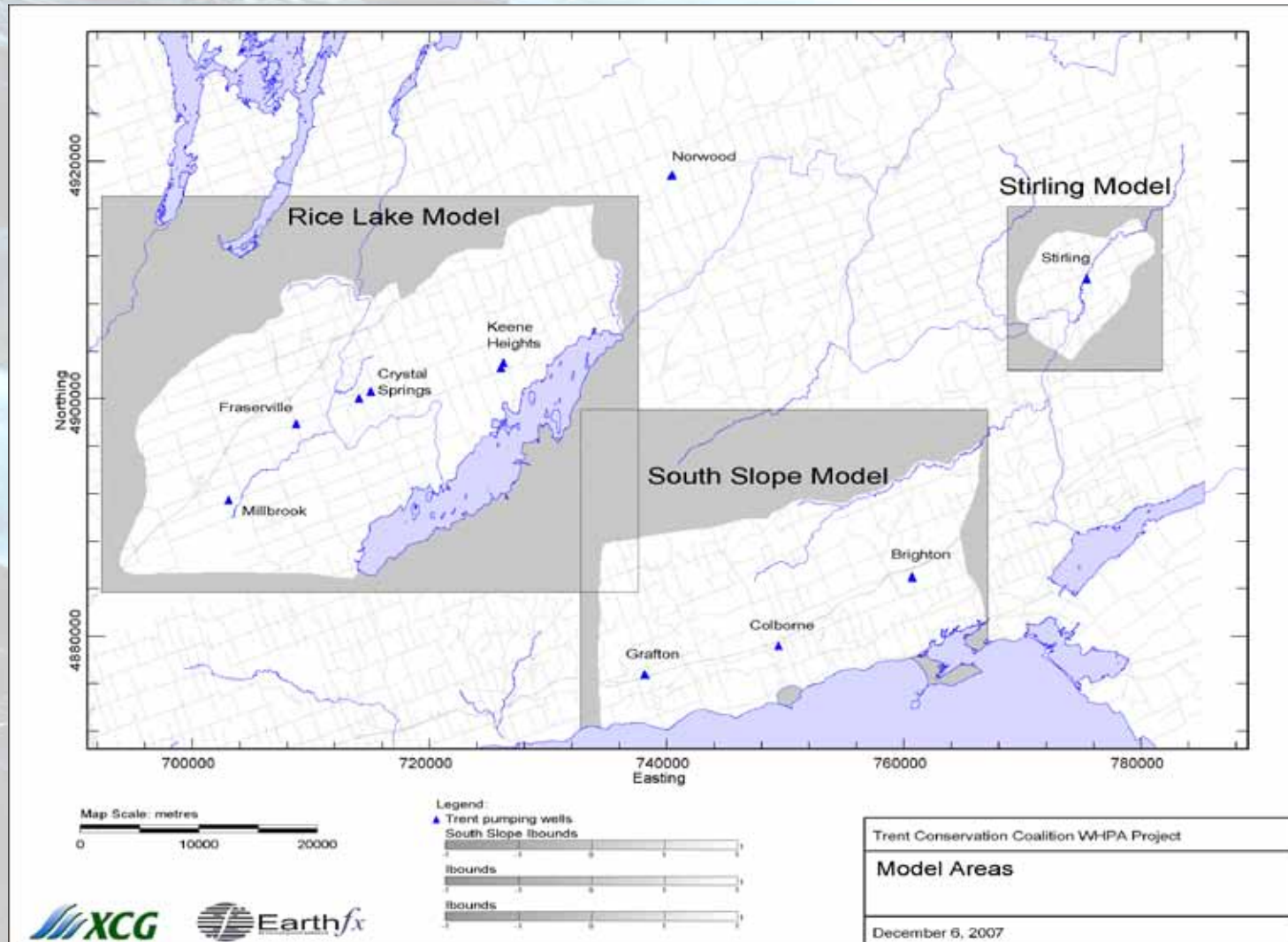


# Crystal Springs Final Vulnerability Scores

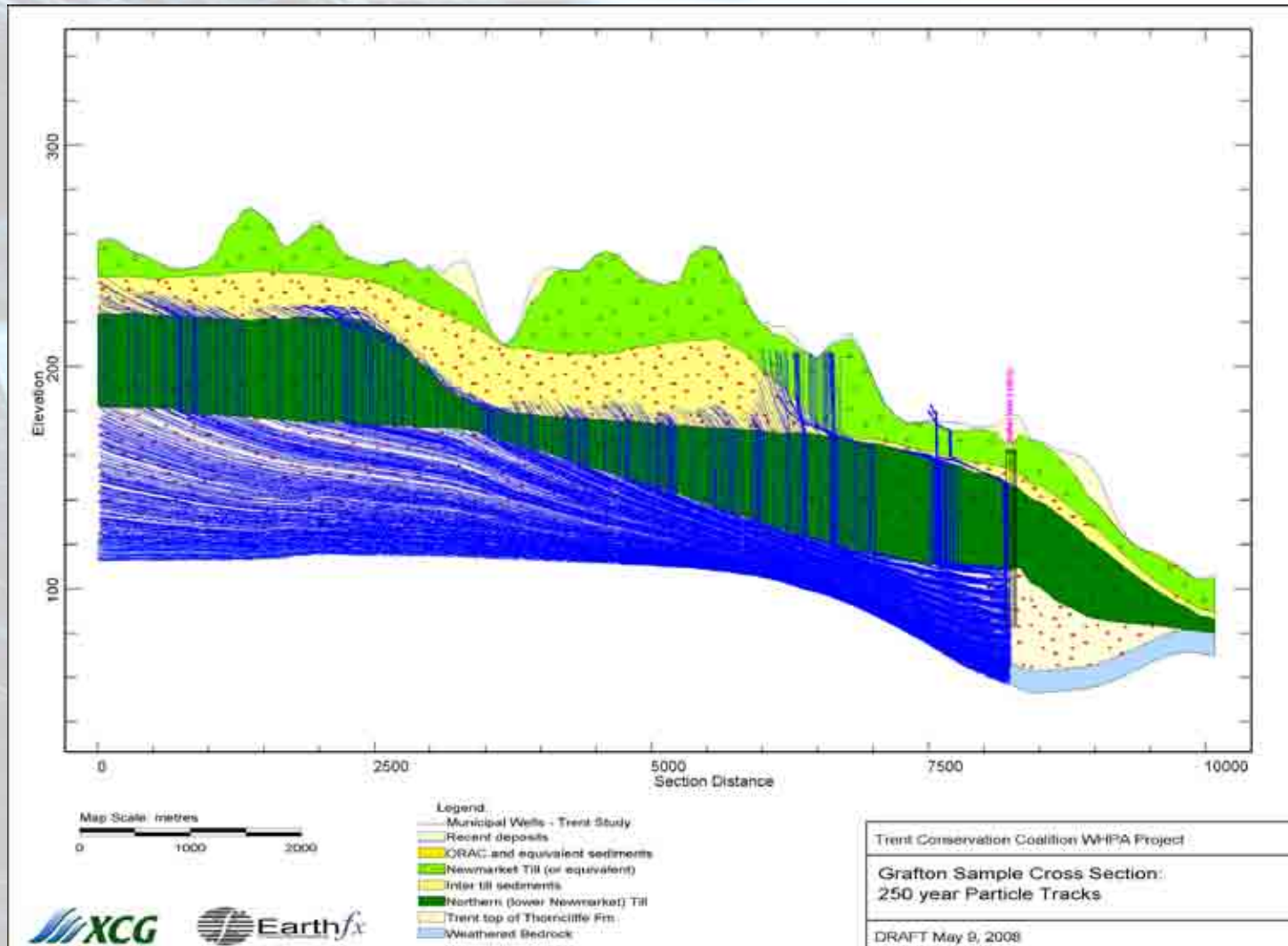


► Rice Lake Local Model

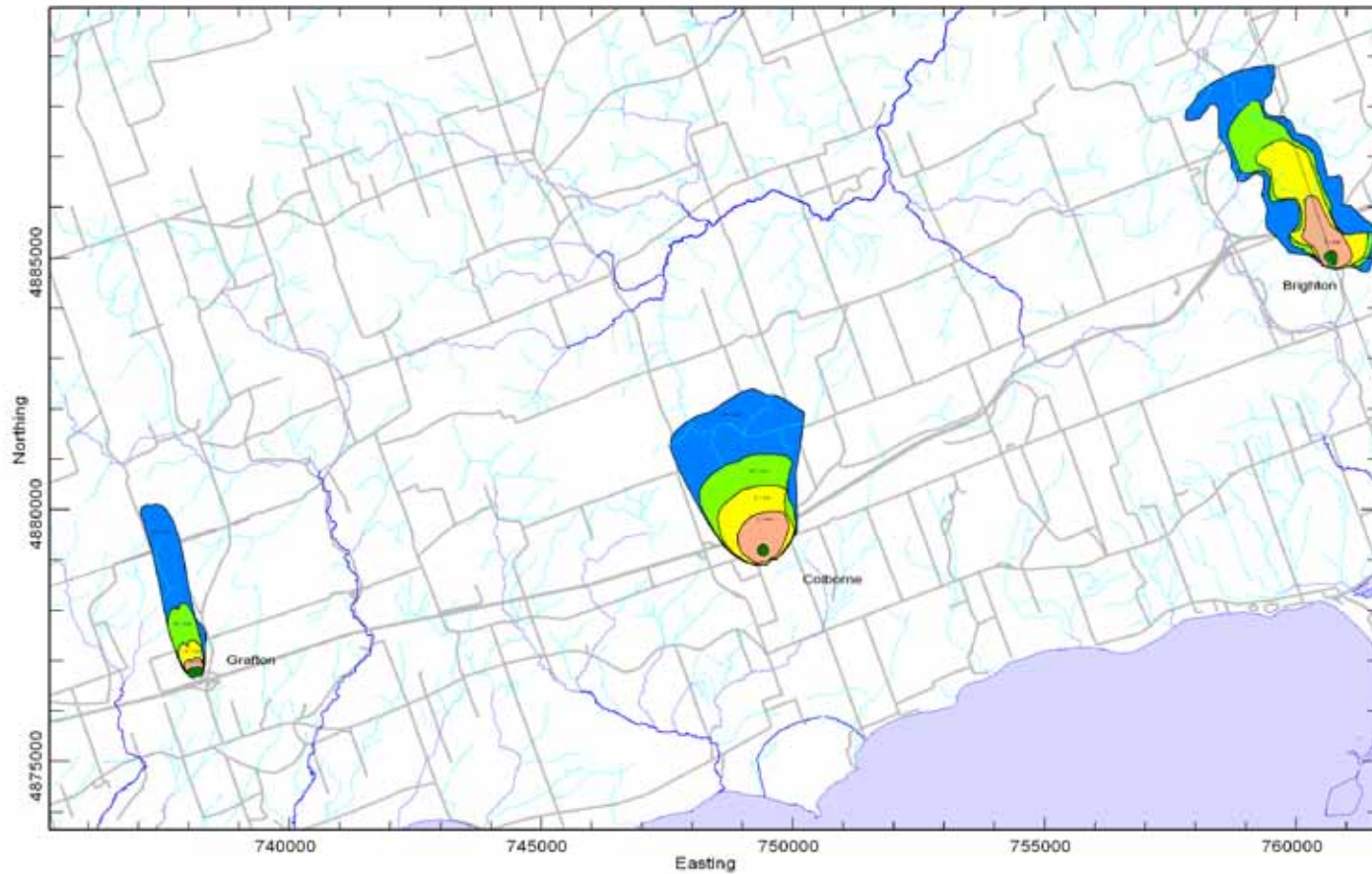
# South Slope Model Area



# Grafton 3D Flow Assessment Reverse Tracks on Section



# South Slope WHPA (Capture Zones)



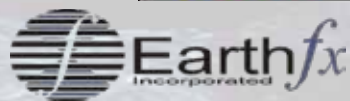
Map Scale: metres  
0 2000 4000

Legend:  
● Municipal Wells - Trent Study

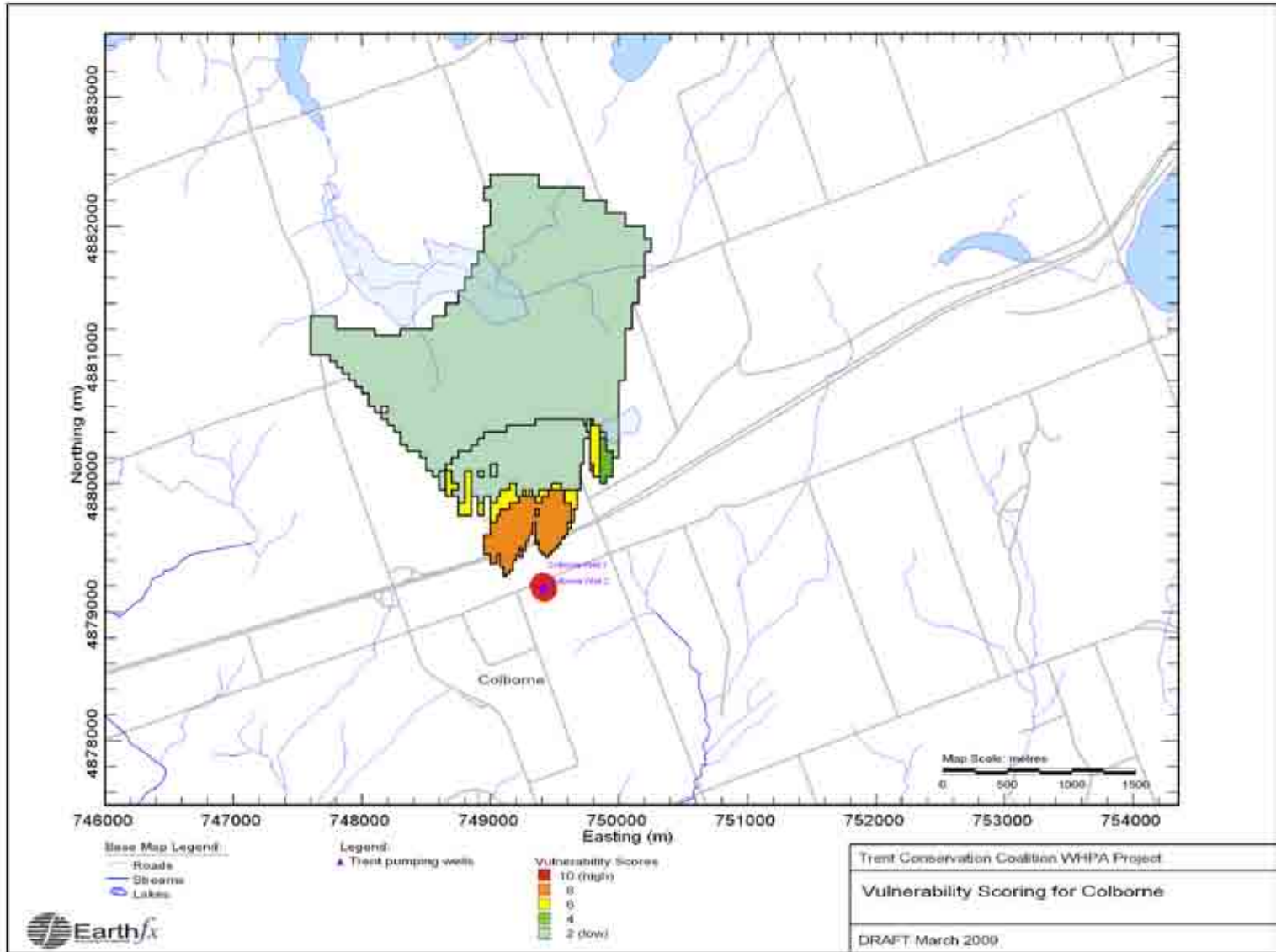


Wellhead Protection Areas

Trent Conservation Coalition WHPA Project
South Slope WHPA's
Final April, 2009



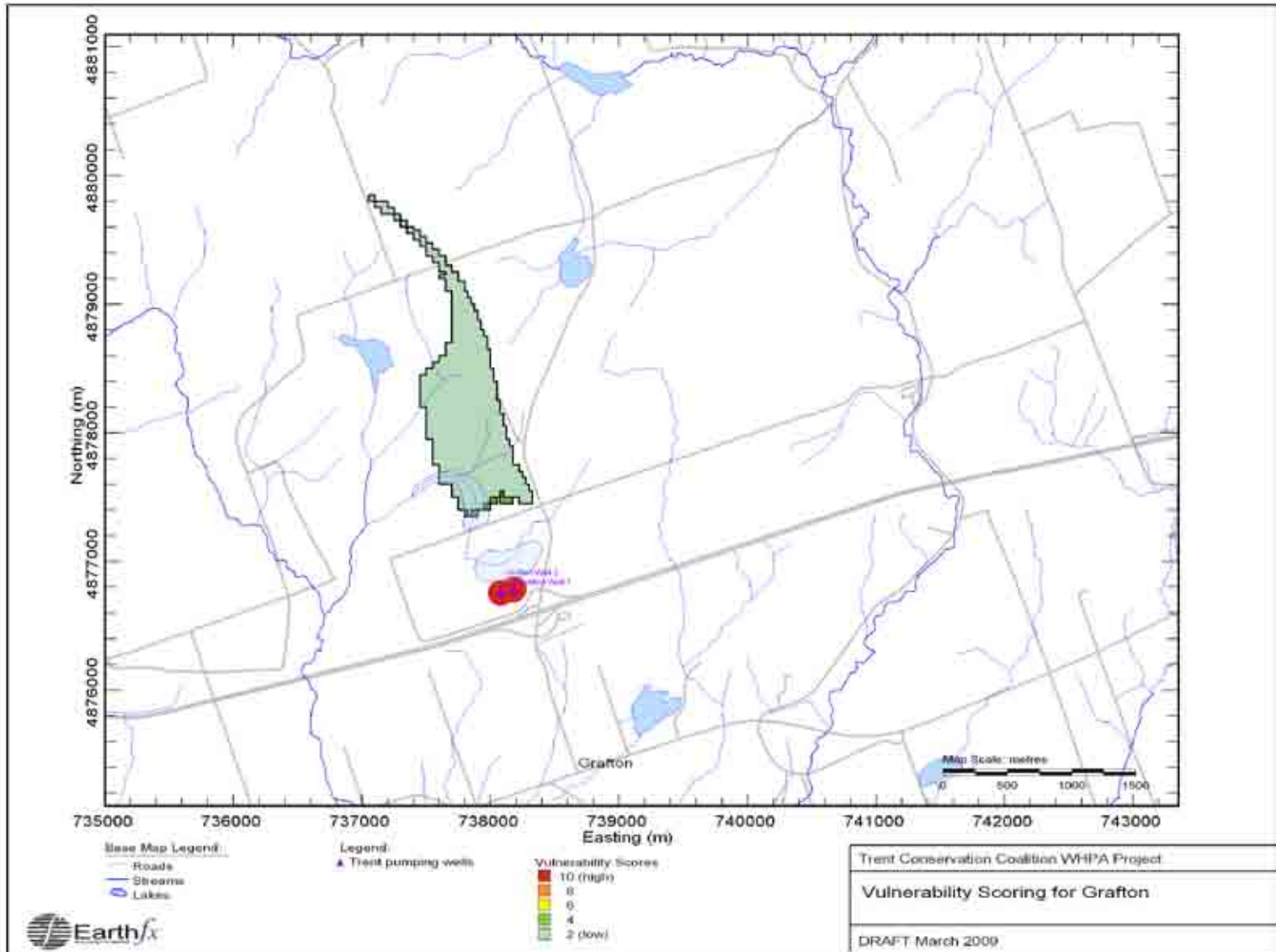
# Vulnerability Scoring: Colborne



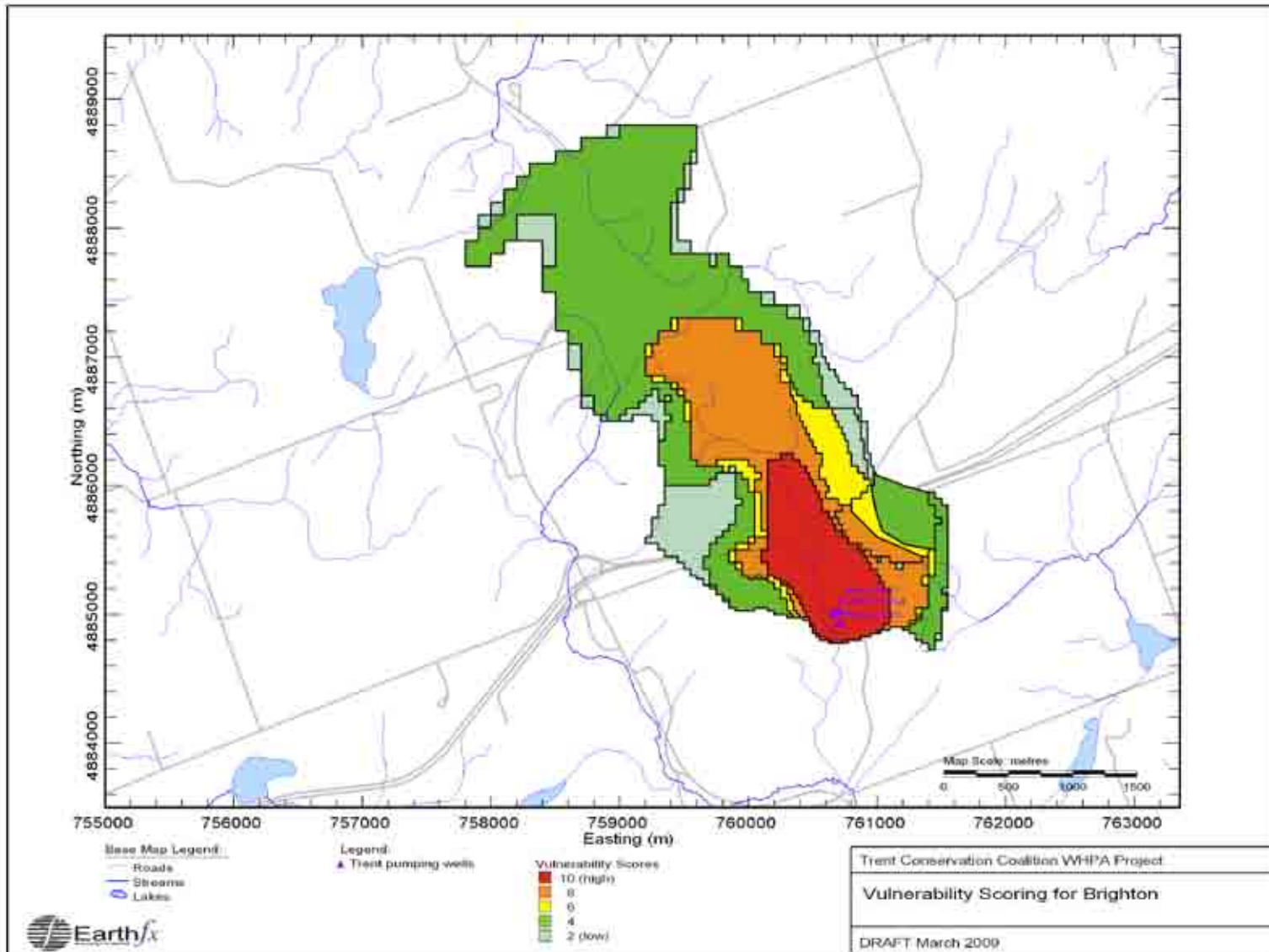
Earthfx



# Vulnerability Scoring: Grafton



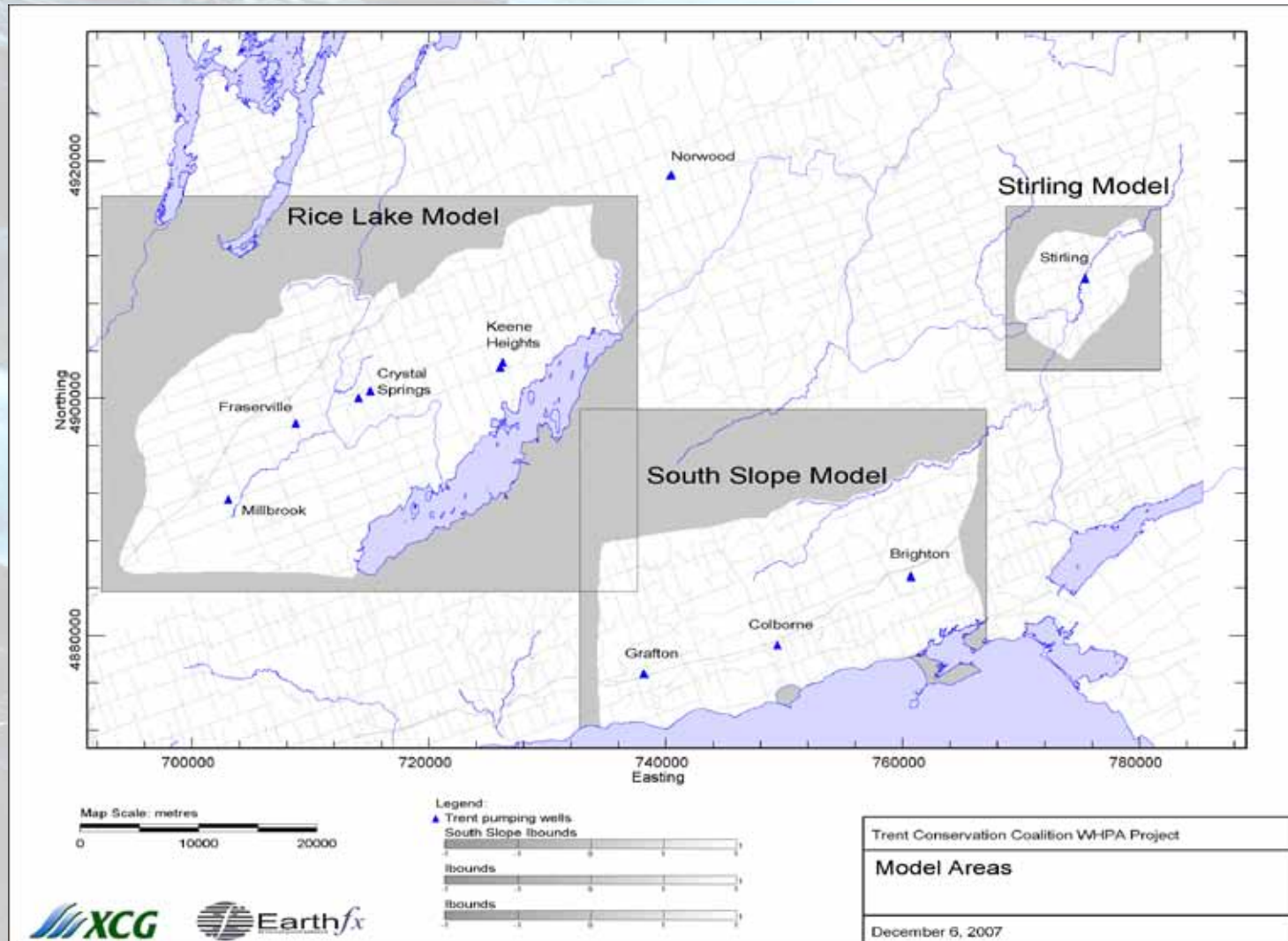
# Vulnerability Scoring: Brighton



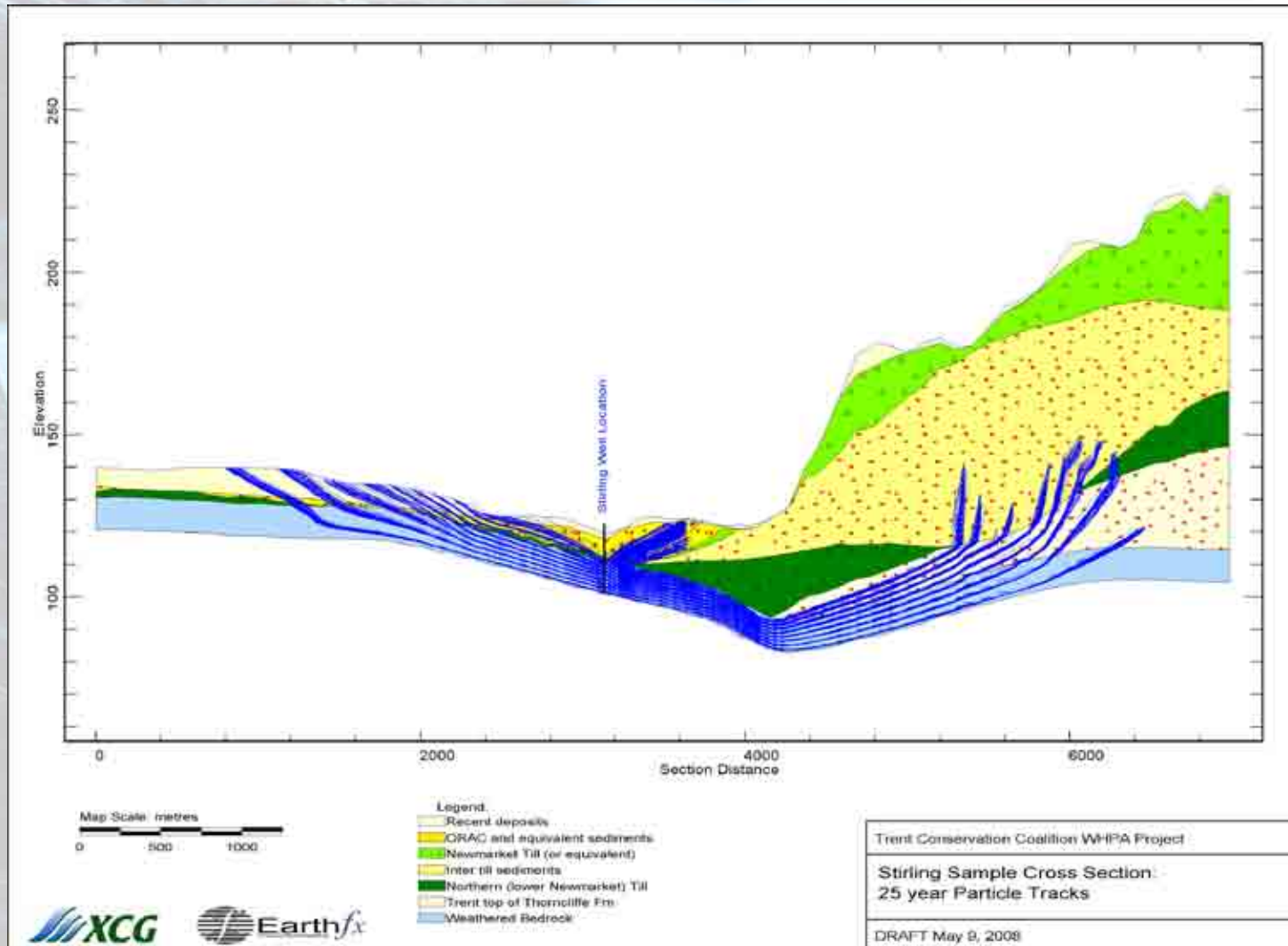
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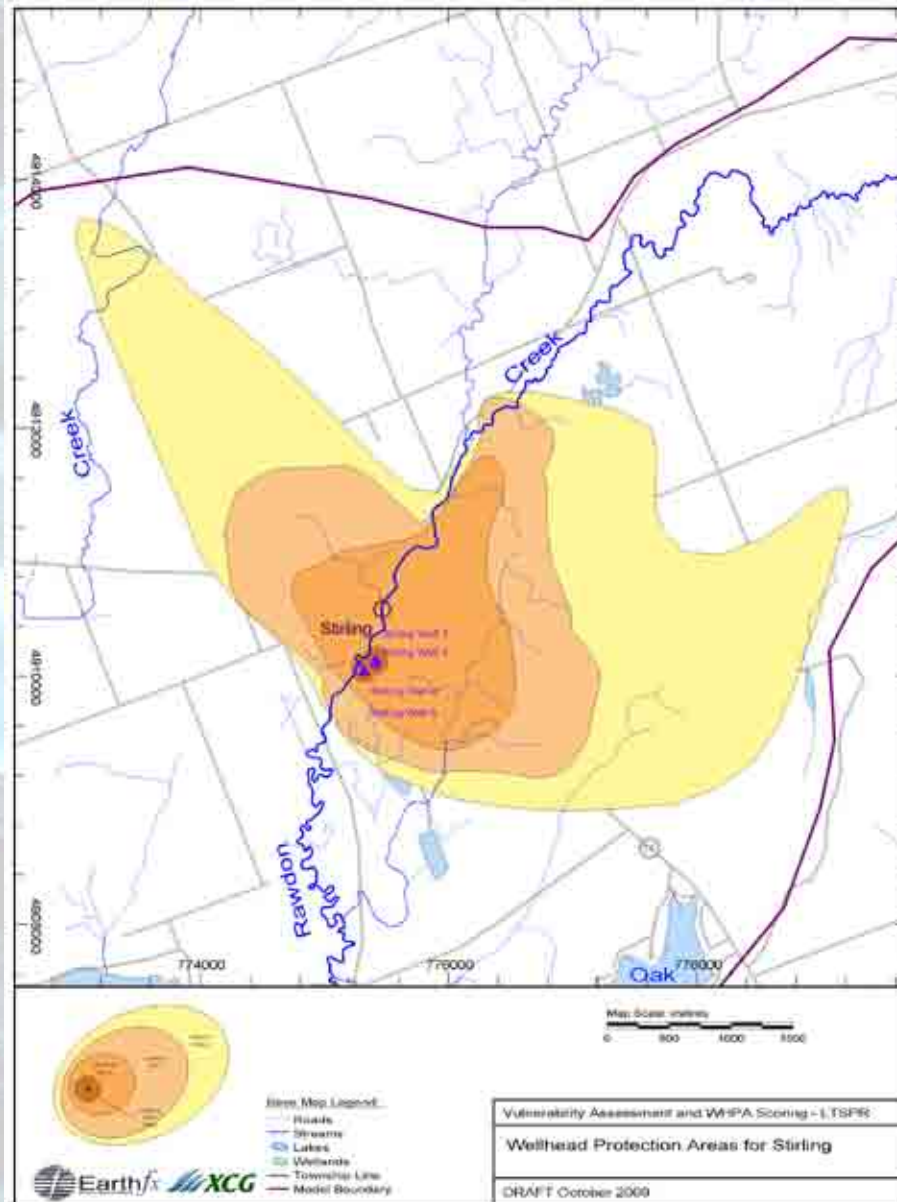
# Flow Model Area: Stirling



# Stirling 3D Flow Assessment 25 year Reverse Tracks on Section



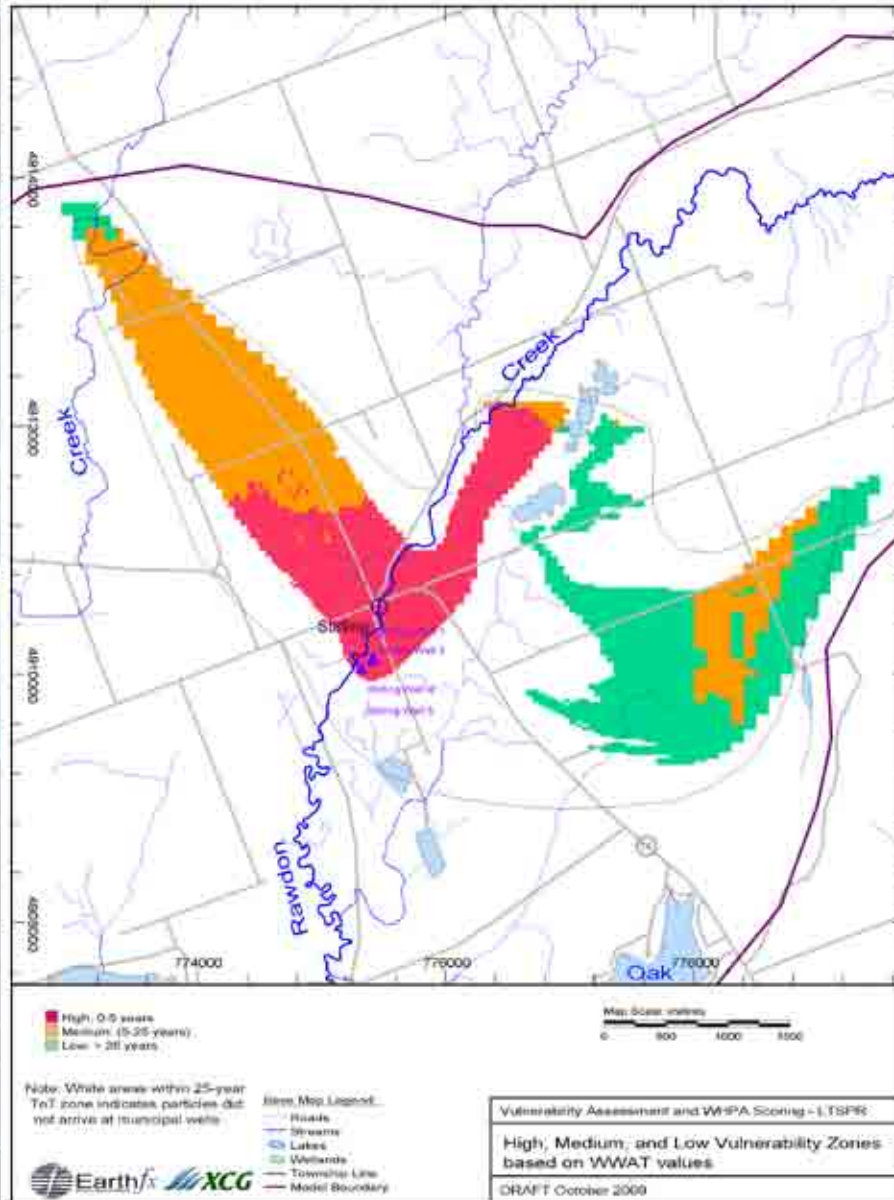
# Stirling WHPA (Capture Zones)



► Stirling Local Model



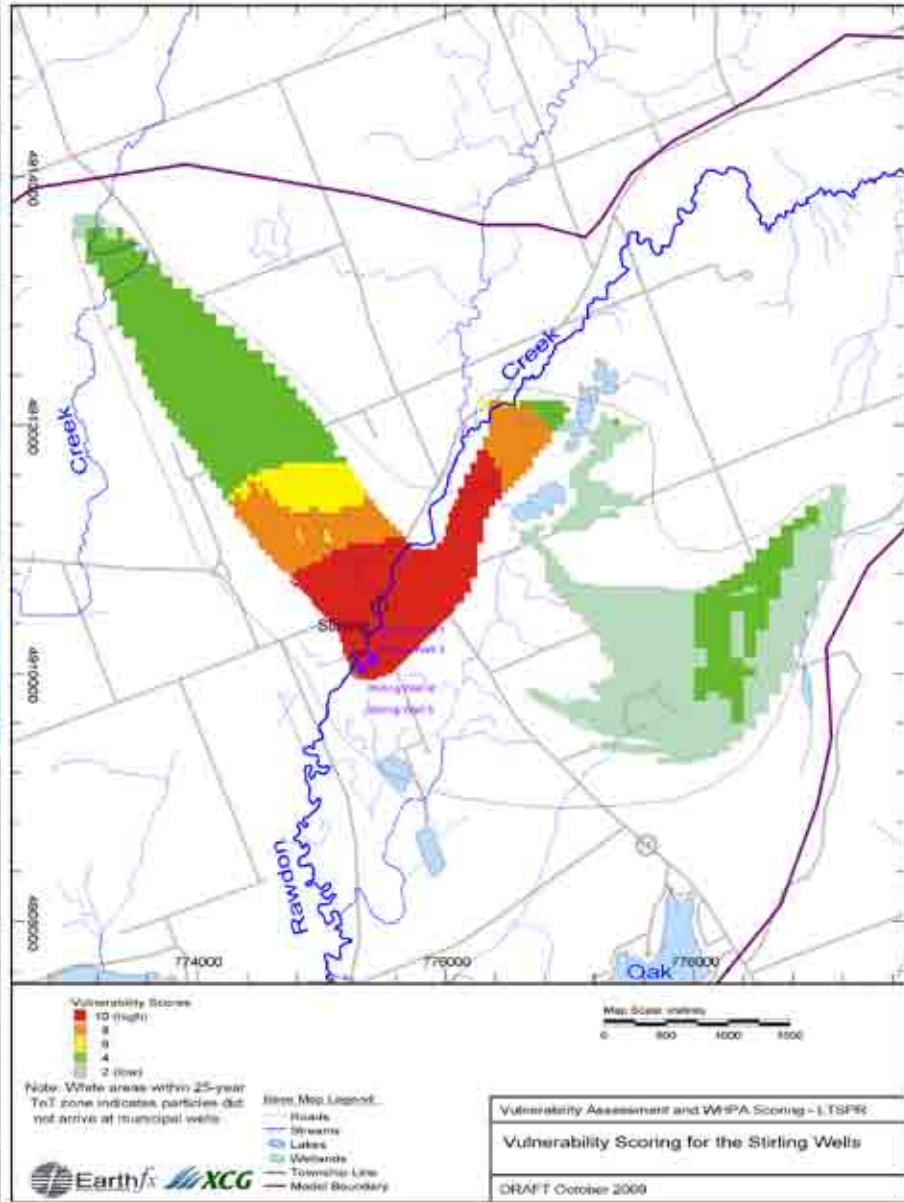
# Stirling Forward Tracking WWAT Zones



► Stirling Local Model



# Stirling Final Vulnerability Scoring



► Stirling Local Model



# Conclusions

- n GW model simulations have been used to delineate well capture zones, vertical susceptibility to contamination and overall MOE vulnerability scores
- n Vulnerability scores and zones have been used in subsequent contaminant threat assessment (by XCG)
- n Detailed results provided in three reports, one for each model study area