MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

b. EGLE & USGS Comments on Cass County Pilot Study

Water Use Advisory Council

August 18, 2020

Study Purposes

(August 2016 Work Plan)

1. Collect hydrogeologic data to be used in the SSR process.
2. Create groundwater models for use in the SSR process.
3. Evaluation of field methods, analyses, and modeling for technology transfer to other areas in the State.

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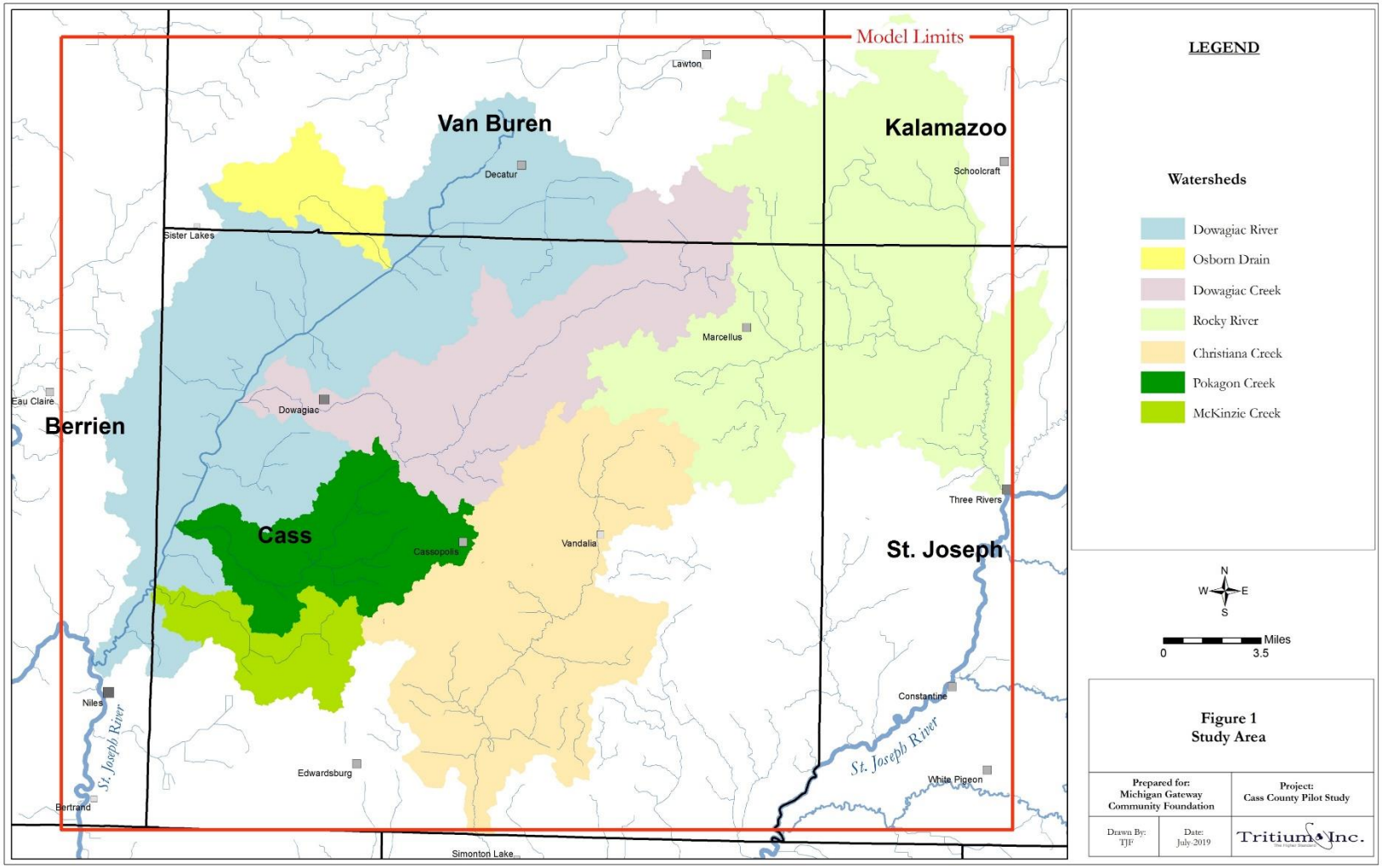
Model Limits
Van Buren
Kalamazoo
Berrien
Cass
St. Joseph
Lawton
Decatur
Schoolcraft
Sister Lakes
Marcellus
Eau Claire
Dowagiac
Three Rivers
Vandalia
Cassopolis
Niles
St. Joseph River
Constantine
Edwardsburg
White Pigeon
Bertrand
Simonton Lake
LEGEND
Watersheds
Dowagiac River
Osborn Drain
Dowagiac Creek
Rocky River
Christiana Creek
Pokagon Creek
McKinzie Creek
N
W
E
S
Miles
0
3.5
Figure 1
Study Area
Prepared for:
Michigan Gateway
Community Foundation
Project:
Cass County Pilot Study
Drawn By:
TJF
Date:
July 2019
Tritium Inc.

Purpose 1 Accomplished

- Groundwater elevation data
- Aquifer pumping test data
- Stream flow data
- Stream stage data
- Streambed conductance data

Problems with Groundwater Models

- Identified by USGS' & EGLE WRD's model reviews
- Models don't use same stream layers as WWAT, SSR, alternative analyses, & Part 327 permit reviews
  - Some management units are not given a stream segment
  - Distance between a proposed well & nearest stream is a crucial term in the Hunt 1999, Hunt 2003, & Ward & Lough 2011 models
- Flooded model cells
- Models poorly calibrated
- The contractor's October 15, 2019 response didn't substantively address comments

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Final Cass County Model Stream Comparison Showing Streams Included in the Model (Diagram A) and WWAT Streams and Watersheds (Diagram B)

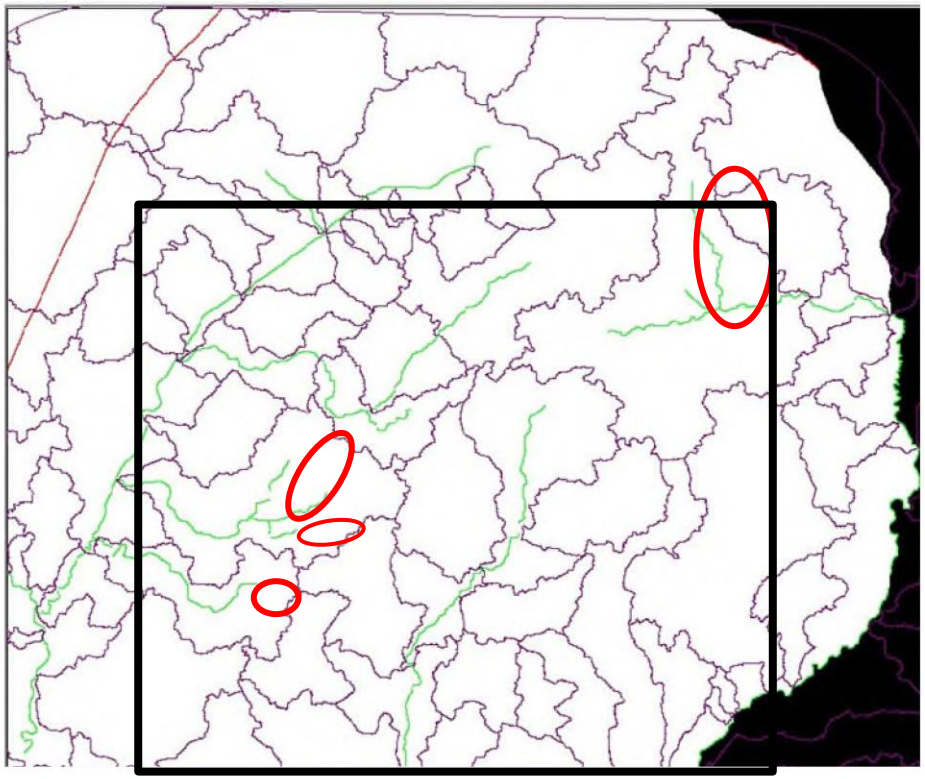

Diagram A. Final Groundwater Vistas Model showing additional streams included in the model with WWAT watersheds added for comparison

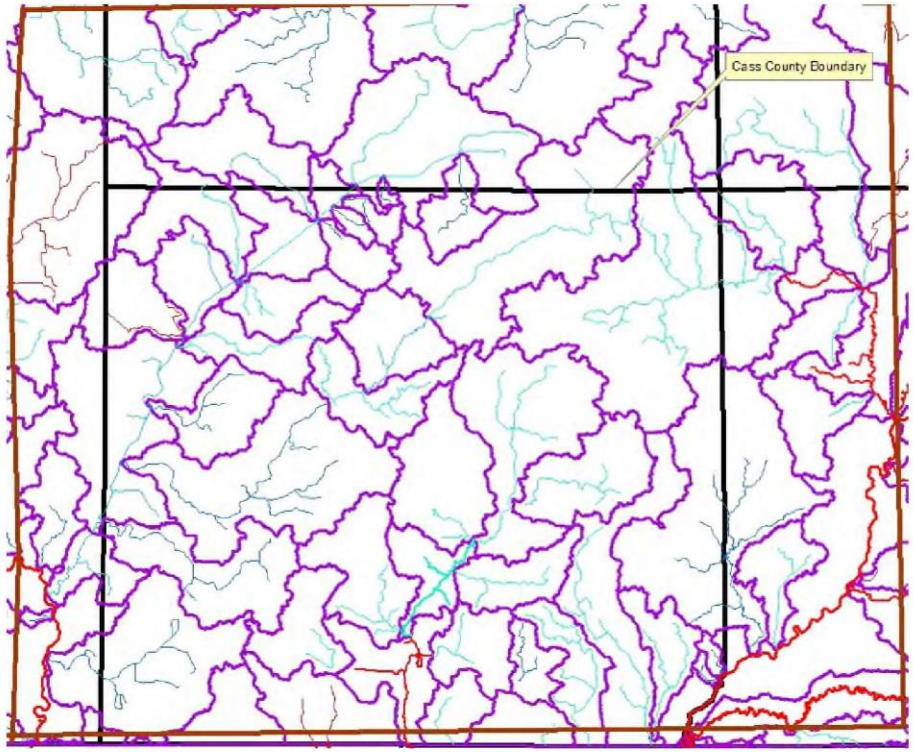

Diagram B. ArcGIS map showing WWAT model streams and watersheds

Distance Between Well & Stream

- The distance from a proposed well to the nearest stream segment is a common term in the Hunt 1999, Hunt 2003, and Ward & Lough 2011 groundwater models
- The missing stream segments in the Cass County model can lead to underestimation of stream flow depletion because the distance between the well and the nearest stream is too large
- The missing stream segments in the Cass County model can lead to overestimation of stream flow depletion at a nearby included stream because other adjacent stream segments are not included in the model

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Comparison of Mapped Surface Water Features in the Cass County Area with the Cass County Groundwater Model

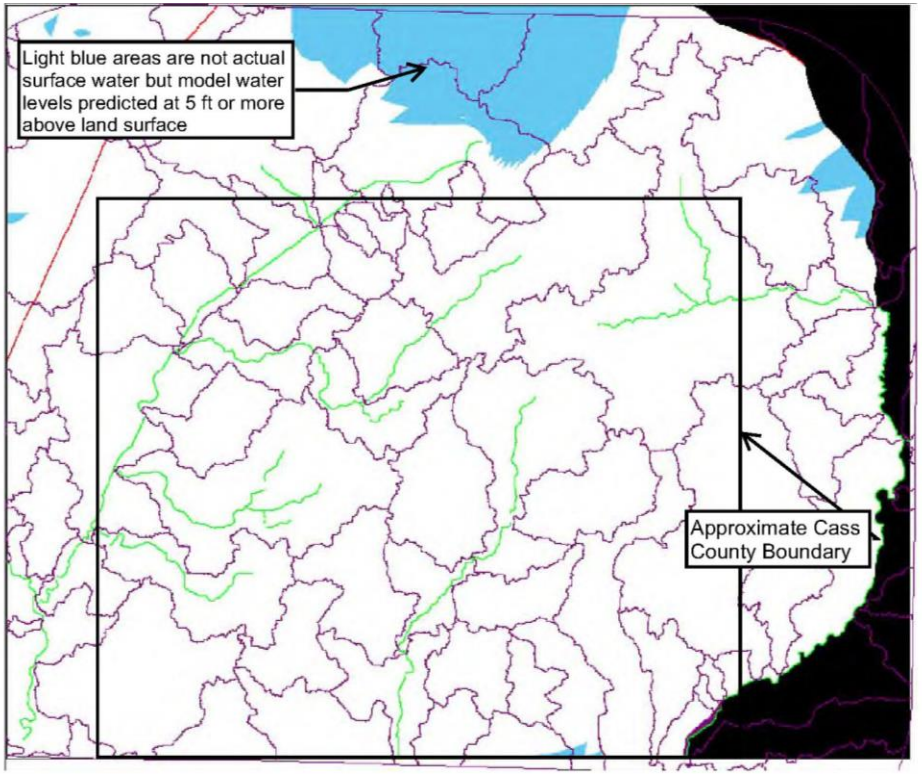


Diagram A. Final Groundwater Vistas Model streams and WWAT watersheds

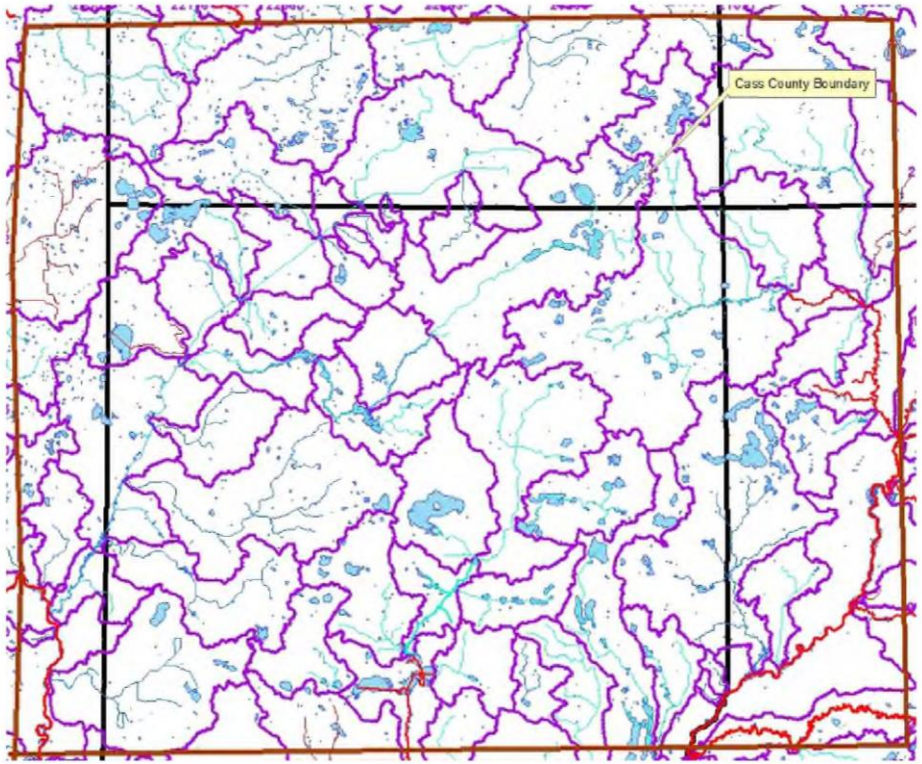
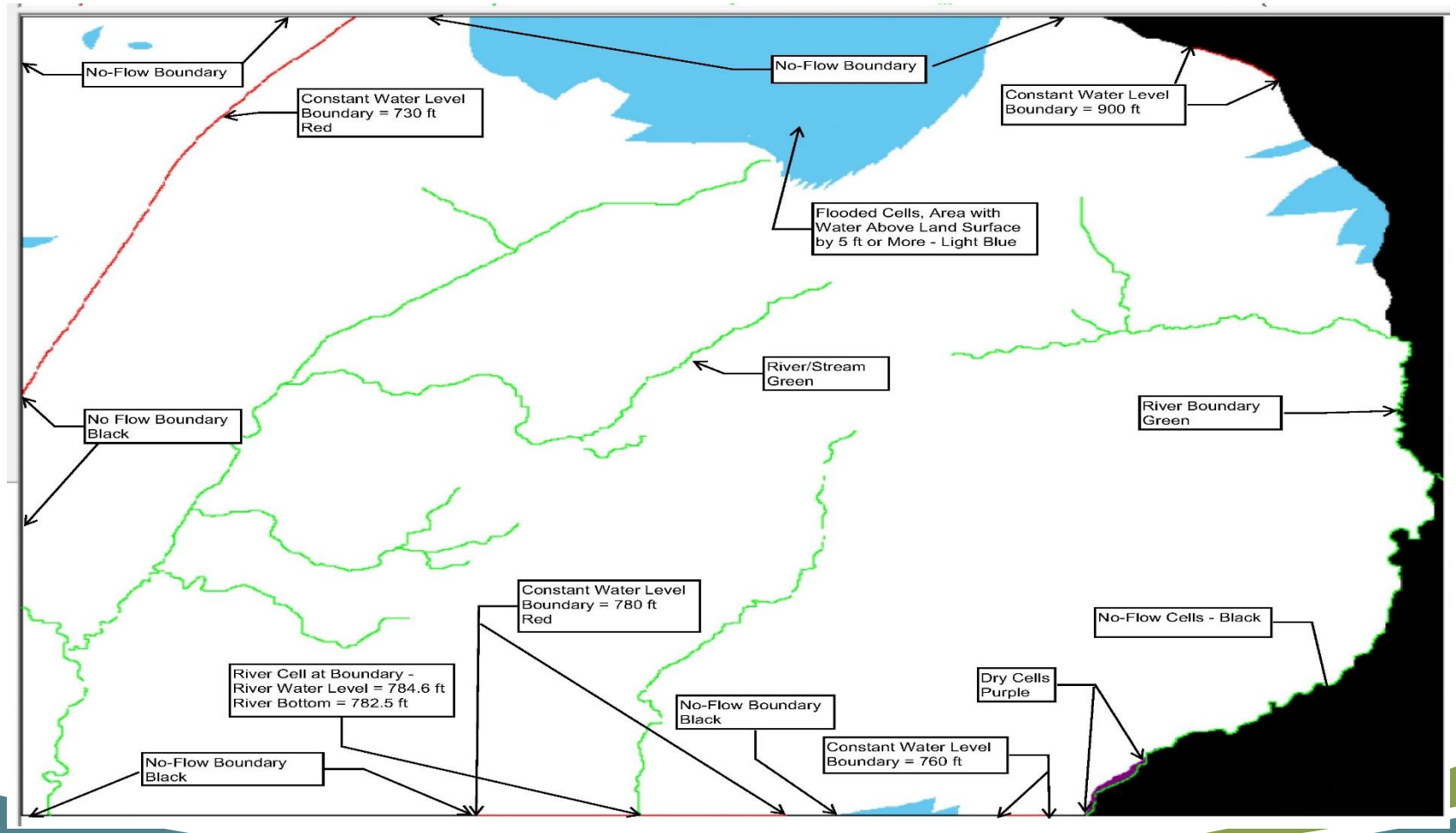
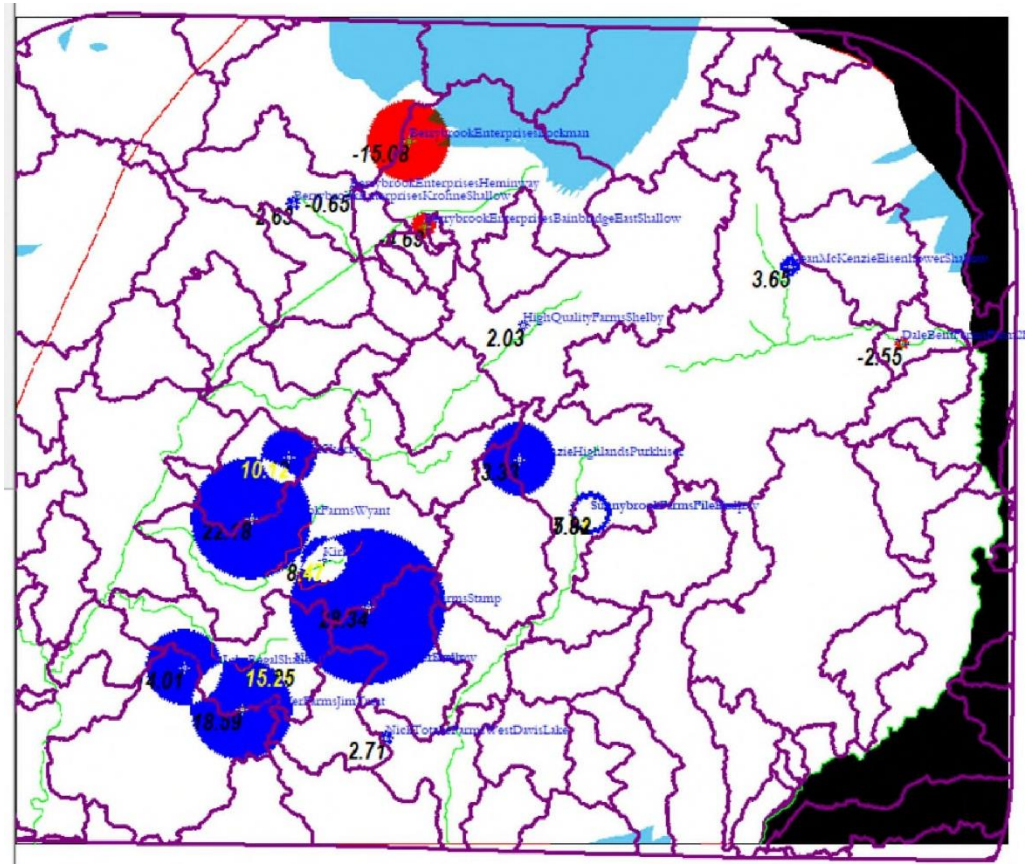


Diagram B. ArcGIS map of surface water bodies, WWAT model streams and watersheds

Cass County Final Groundwater Model Boundary Conditions Defined for All Five Layers of the Model



Final Groundwater Model Residuals Between the Target Data and the Model Prediction Layer 1

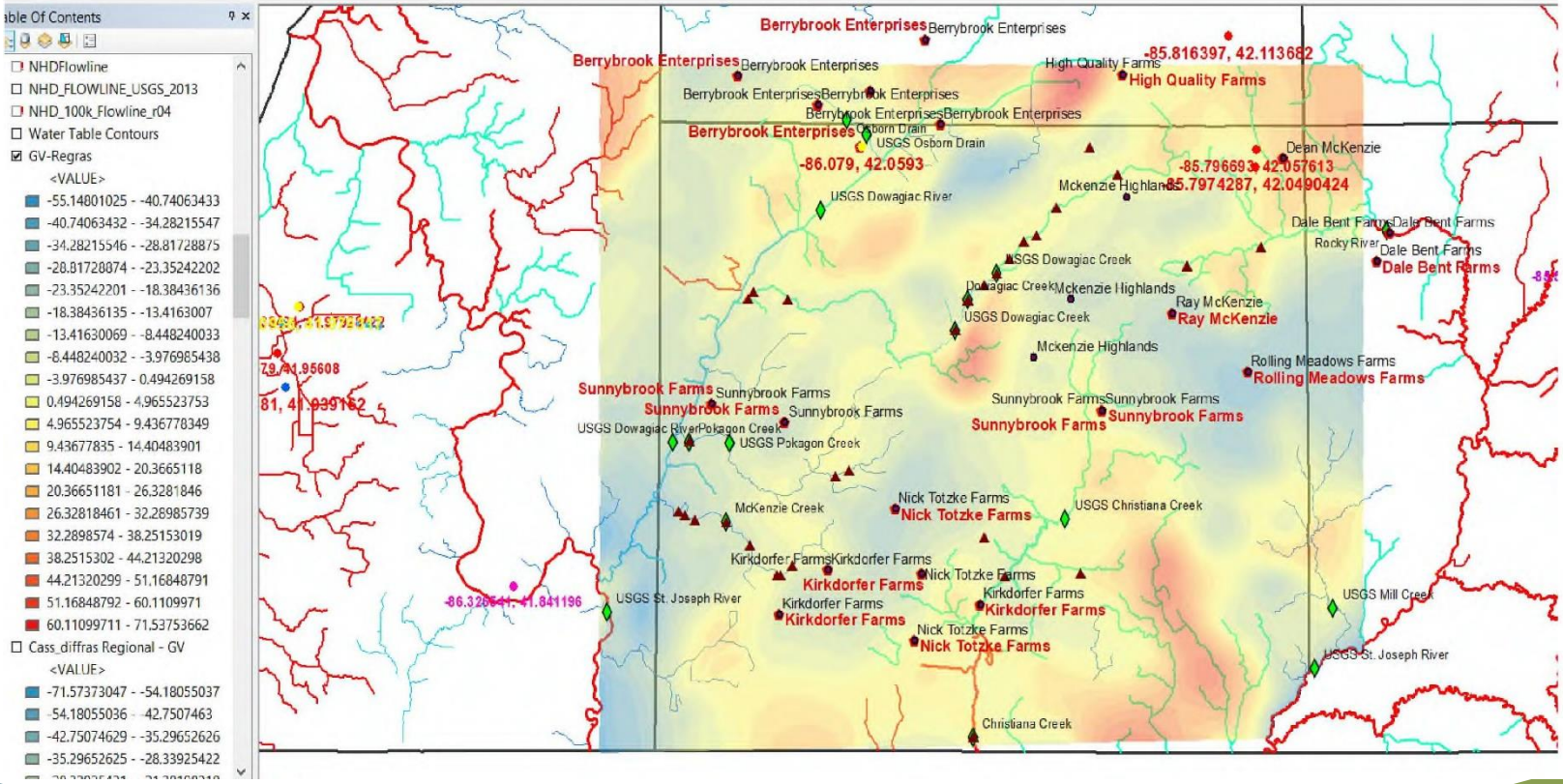


Red = Negative groundwater residuals indicate that the model is calculating water levels higher than the measured site values

Blue = Positive groundwater residuals indicate that the model is calculating water levels lower than the measured site values

Light Blue Areas = Model is calculating groundwater levels above land surface by 5 feet or more up to > 90 ft

Cass County Model Water Levels minus Updated Cass County Water Levels




Keeler
Decatur
51
152
M-51-N
N Front St
Dowagiac
62
Volinia
© 2018 Google
Google Earth
Imagery Date: 3/25/2019 42°03'04.66" N 86°04'20.10" W elev 743 ft eye alt 14.67 mi

CONTRACTOR'S RESPONSE TO MODEL REVIEWS

- Budget cuts limited the scope of the model to 5 WMAs specified
- Many of the missing stream segments in those 5 WMAs are non-perennial or are marsh/wetlands/lakes
- Adding the remaining missing segments & rerunning the model caused < 0.25% change in estimated streamflow depletions
- Flooded & dry cells don't matter because of their distance to the WMAs
- Statistical analysis shows the model is well calibrated

Purpose 2 Not Accomplished

- The Cass County models can't be used in place of the WWAT or for SSRs, alternative analyses, or Part 327 permit reviews.
- In the future, if the Cass County models are properly redesigned and calibrated, they may serve as a framework for nesting smaller sub-watershed or project specific models.

Purpose 3 Accomplished

- Comparison of mud rotary and hollow-stem auger drilling
- Evaluation of using irrigation wells and center-pivot irrigation systems for aquifer pumping tests
- Compared multiple methods of collecting streambed conductance data
- Compared multiple methods of collecting stream flow measurements

Conclusions

- Geology, groundwater, stream flow, and streambed conductance data will be used in future SSR, alternative analysis, and Part 327 permit application reviews
- The stream flow data can be incorporated into future stream index flow reviews
- The groundwater models aren't usable for the Water Use Program in place of the WWAT's groundwater model
- The comparisons of various data collection methods are useful for state and federal agencies, property owners, consultants, and other interested parties planning future data collection activities
- The Cass County Pilot Study is not a study "accepted by the department" as discussed in MCL 324.32706c (1)(a)(i)

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Next Steps?

- Redesign & recalibrate the groundwater model(s)
- The modeler should review EGLE's & USGS' model review comments
- The modeler should consult with EGLE & USGS modelers throughout the development and calibration of the conceptual and numerical models
- USGS installed stream gages in the Dowagiac Creek & Osborn Drain WMAs
- Other ideas?

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Options for Next Steps?

Option A: Data is incorporated into current system and made available for use as needed. No further model development.

Option B: Data is incorporated into current system and made available for use as needed. A new groundwater model is developed and calibrated with the information that could be used in the current platform.

Option C: The data is not used, and no further development of the model is pursued.

Option D: Other ideas?

Sideboards for consideration:

- Funding for the model development is not currently available in state government and would need to be pursued either through budgeting processes or through a granting entity.
- Any new modeling efforts should include a review of EGLE's & USGS' model review comments and the modeler should consult with EGLE & USGS modelers throughout the development and calibration of the conceptual and numerical models.

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Questions?

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EGLE Water Resources Division
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Cass County Summary Study

c. Models Committee Next Steps