Estimating Groundwater Availability at a Wisconsin State Fish Hatchery using Flow Models and an Aquifer Pumping Test

In Cooperation with:

the Fisheries Management Program of the Wisconsin Department of Natural Resources

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USGS report nearing release

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Study Area

Kettle Moraine Springs State Fish Hatchery
Motivation

- Recreational fishing is critical to Wisconsin’s economy
- $2.3 billion in economic benefits and $148 million in state and local tax revenues
- Fish stocking is a fisheries management tool
- *Comprehensive Study of Wisconsin’s Fish Propagation System* (WDNR Bureau of Fisheries Management)
- Most of the Department’s fish production facilities need extensive renovation to meet fish stocking goals
- Hatchery renovation and design
Geologic Setting

Modified from Luczaj, J. A. 2013
Model overview

Lake Michigan Basin
Lake Michigan Basin modified model

Pumping Test model

KMS model
Geologic Setting

Lake Michigan Basin

Lake Michigan Basin modified model

Modified from Luczaj, J. A. 2013

KMS model

Pumping Test model

USGS
Lake Michigan Basin model

- Layers
- Discretization
- Surfaces
- K
- Recharge
- Streams

Lake Michigan Basin regional model
Feinstein and others, 2010

KMS model
KMS model
KMS model

430 gpm
KMS model

480 gpm
KMS model

520 gpm
Geologic Setting

Luczaj, J. A. 2013

KMS model

Pumping Test model
Pumping Test model
Pumping Test model
Pumping Test model
Pumping Test model

a. Measured depth to water at PW1

b. Measured depth to water at MW

EXPLANATION
- Measured Depth to Water, below land surface datum (LSD)
Pumping Test model

EXPLANATION

- **Blue diamonds**: Drawdown Based on Measured Depth to Water
- **Red line**: Drawdown Simulated with Pumping Test Model Following PEST Calibration

**Graphs:**

- **b. Drawdown in PW1**
  - Drawdown, in feet

- **a. Drawdown in MW**
  - Drawdown, in feet
Pumping Test model
Pumping Test model

800 gpm
Pumping Test model
Pumping Test model

EXPLANATION

- Drawdown in PW1
- Drawdown in PW2
- Drawdown in PW3

900 gpm
Geologic Setting

Lake Michigan Basin modified model

KMS model

Pumping Test model

Luczaj, J. A. 2013
Lake Michigan Basin modified model
Lake Michigan Basin modified model
Lake Michigan Basin modified model

800 gpm

EXPLANATION
- Silurian dolomite aquifer – LMB modified model layer 12
- Maquoketa shale confining unit – LMB modified model layer 13
- St. Peter sandstone aquifer – LMB modified model layer 19

16.9 ft of drawdown
Lake Michigan Basin modified model

900 gpm
Groundwater Resource

Silurian aquifer system
430 to 520 gpm

Cambrian Ordovician aquifer system
800 to 900 gpm
Citations


