Central Indiana Water Study

Kick-off Meeting

April 29, 2019
An Overview of Indiana’s SWWF Registration and Water Use Reporting Program

IFA Central Indiana Water Study Kick-off Meeting
April 29, 2019
IC 14-25-7: Water Resources Management Act

- Enacted in 1983
- Requires registration of all SWWF (gw & sw)
- Facility defined as greater than 100,000 GPD capability
- Capability is aggregate of all wells & intakes
- Annual water use reporting required
- Approximately 4100 SWWFs currently registered
## 2017 Indiana Registered SWWFs

<table>
<thead>
<tr>
<th>Water Use Code</th>
<th>Number of Facilities</th>
<th>Number of Wells</th>
<th>Number of Intakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP</td>
<td>92</td>
<td>259</td>
<td>95</td>
</tr>
<tr>
<td>IN</td>
<td>378</td>
<td>688</td>
<td>291</td>
</tr>
<tr>
<td>IR</td>
<td>2767</td>
<td>3786</td>
<td>805</td>
</tr>
<tr>
<td>MI</td>
<td>135</td>
<td>234</td>
<td>51</td>
</tr>
<tr>
<td>PS</td>
<td>706</td>
<td>2182</td>
<td>64</td>
</tr>
<tr>
<td>RU</td>
<td>58</td>
<td>145</td>
<td>12</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4136</td>
<td>7294</td>
<td>1318</td>
</tr>
</tbody>
</table>
## 2017 State Totals

<table>
<thead>
<tr>
<th></th>
<th>Withdrawals (BG)</th>
<th>Capacity (MGD)</th>
<th>Withdrawals vs Capacity</th>
<th>Current Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Intakes</td>
<td>2033</td>
<td>17610</td>
<td>31.6%</td>
<td>1318</td>
</tr>
<tr>
<td>Wells</td>
<td>222</td>
<td>6035</td>
<td>10%</td>
<td>7294</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>2255</td>
<td>23645</td>
<td>26.1%</td>
<td>8612</td>
</tr>
<tr>
<td>Facilities</td>
<td></td>
<td></td>
<td></td>
<td>4136</td>
</tr>
</tbody>
</table>
Total Annual Withdrawals 1985-2017

- Total
- SW
- GW
Total Annual Withdrawals - Central IN Region
1985-2017
2017 Withdrawals by MWU Code-
Central IN Region

Total Withdrawals (BG)
Total Annual Withdrawals- Central IN Region
Public Supply 1985-2017

Total Withdrawals (BG)
Withdrawals by MWU Code 2012-2017
Central IN Region
For More Information Regarding Indiana’s SWWF Registration and Water Use Program

Allison Mann
almann@dnr.in.gov
Climate Trends, Extremes, and Variability in Central Indiana

Beth Hall
Director, Indiana State Climate Office
Purdue University
April 2019
Indiana Climate Divisions
Average Annual Temperature

Annual Average Temperature - Central Indiana

Temperature (°F)

1895-2015
IN05 Annual Temperature based on 1895–2017

Midwestern Regional Climate Center

Average Annual Temperature

Temperature (°F)


- Temperature
- Average: 51.37°F
- Trend: 0.62 °F/century
Extreme Heat

Number of Days With High Temperature Above 95°F

- **Observed**
- **Medium Emissions**
- **High Emissions**

**St. Joseph County, Indiana**

- Historical: 3
- 2020s: 10
- 2050s: 20
- 2080s: 61

**Vanderburgh County, Indiana**

- Historical: 10
- 2020s: 31
- 2050s: 47
- 2080s: 97

**Marion County, Indiana**

- Historical: 4
- 2020s: 15
- 2050s: 27
- 2080s: 38

"Historical" is an average for the period 1915 to 2013. "2020s" represents the average 30-year future period 2011 to 2040. "2050s" represents the average 30-year period 2041 to 2070. "2080s" represents the 30-year period 2071 to 2100.
Average Accumulated Precipitation

Annual Precipitation for Central Indiana
Average Accumulated Precipitation

Shaded areas indicate range of uncertainty
Average Accumulated Precipitation

Annual Precipitation for Central Indiana
Number of days that exceed the 1900-2016 period’s 99\textsuperscript{th} percentile. Trend is 0.2 days/decade. Source: MRCC
Average Accumulated Precipitation

**Rain vs Snow**

Percent of precipitation falling as snow (Nov - Mar)

- **Observed**
- **Medium Emissions**
- **High Emissions**

**St. Joseph County, Indiana**

<table>
<thead>
<tr>
<th>Year</th>
<th>Historical</th>
<th>2020s</th>
<th>2050s</th>
<th>2080s</th>
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<tbody>
<tr>
<td></td>
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<td>39</td>
<td>32</td>
<td>25</td>
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**Vanderburgh County, Indiana**

<table>
<thead>
<tr>
<th>Year</th>
<th>Historical</th>
<th>2020s</th>
<th>2050s</th>
<th>2080s</th>
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<tr>
<td></td>
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<td>11</td>
<td>8</td>
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</table>

**Marion County, Indiana**

<table>
<thead>
<tr>
<th>Year</th>
<th>Historical</th>
<th>2020s</th>
<th>2050s</th>
<th>2080s</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td>22</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

"Historical" is an average for the period 1911 to 2013. "2020s" represents the average 30-year future period 2011 to 2040. "2050s" represents the average 30-year period 2041 to 2070. "2080s" represents the 30-year period 2071 to 2100.
Indiana Groundwater Monitoring: What is our current status and where do we lack monitoring?

David Lampe, Randy Bayless, Jeff Frey
U.S. Geological Survey, Ohio-Kentucky-Indiana Water Science Center (OKI WSC)

U.S. Department of the Interior
U.S. Geological Survey
Determining the amount of water in streams or lakes is easy.
Determining the amount of water in aquifers is more difficult

- Groundwater level data and physical characteristics of the system are used to estimate the amount of water stored in the aquifer.
Wells can tell us groundwater levels: they have decreased dramatically over time.
Types of Groundwater Data

- **Periodic Data:**
  - Occasional water level measurements

- **Continuous Data:**
  - Data recorded locally and downloaded periodically

- **Real-Time Data:**
  - Same as continuous, but data automatically on our website within a few hours
Current Indiana Groundwater Wells

- **103 Continuously recording GW observation wells**
  - 37 are near Real-Time

- **Sub networks**
  - Volunteer Monitoring Network
  - Climate Response Network
  - Periodic networks
    - Three county scale networks

- **National Water-Quality Assessment Program**

[Map of Indiana with groundwater observation wells marked]
Continuous groundwater monitoring can show seasonal changes.
Stream water levels are representative of groundwater conditions during base flows.

Central Indiana IFA Pilot Project

Existing USGS streamgages: 60
How do we know the depth and extent of an aquifer?

Groundwater level and physical characteristics data will tell us the water levels of the aquifer but how do we know the extent of the aquifer?
Aquifers are not homogenous
There are several ways to estimate aquifer capacity

- **Existing Data:**
  - IDNR well log data base
  - Previously published studies of groundwater systems
  - Previous mapping studies

- **Collect New Data:**
  - Drill new wells in areas lacking data
  - Use noninvasive geophysical techniques to penetrate subsurface and determine material properties
  - Use statistics to estimate aquifer properties based on existing datasets
There are several ways to estimate aquifer capacity (cont.)

- Well drillers logs dataset
  - Penetrates the entire thickness of the unconsolidated deposits
  - Identifies depth of the aquifer
  - Well drillers log dataset needs updating
  - Critical for the modeling component

Yellow areas lack data
Combining reservoir water levels and storage capacity information allows for the estimation of available water.

Eagle Creek, Morse and Geist Reservoirs are key to monitoring and modeling efforts.
How do we know when our Indiana water supply is under pressure: **Drought Warning Sites**

- Useful for drought forecasting, predicting water demands, irrigation timing
- Includes Real-Time:
  - Air Temperature and humidity
  - Wind speed
  - Rainfall
  - Soil Moisture
  - Parameters to calculate Potential Evapotranspiration
  - Groundwater Level

Boone 17 – Pilot site

https://waterdata.usgs.gov/in/nwis/uv?site_no=400532086183901
Bringing together groundwater and surface water: GW/SW Interaction Sites

- Useful for understanding recharge/discharge conditions

School Branch
Bringing together groundwater and surface water: GW/SW Interaction Sites

USGS data Sept. 2015 thru Nov. 2016 (some data are provisional)
Plans for improving the Groundwater monitoring in Indiana

- Augment the existing well networks
  - Increase the number of real-time wells
  - Add wells in needed unmonitored areas
  - Add wells that don’t reflect production in key areas

- Create a web-based “Dashboard”
  - Track water levels in key areas
  - Drought Indices

- Identify all the key data needed for modeling
  - Use the pilot studies to help refine these needs
Thank you!

David Lampe
- Indianapolis, IN
- (317) 600-2742
- dclampe@usgs.gov
Recommendations for Increased Monitoring of Indiana’s Water Resource

- “Evaluate the adequacy of existing monitoring”

- “Create a robust system for monitoring water resources”
  - *Modernizing the State’s Approach to a Critical Resource; Indiana Chamber (2014)*

- “Utilities believe that the state should invest in water resource data collection and analysis”
  - *Evaluation of Water Utility Planning in Indiana; Indiana Finance Authority (2015)*
Central Indiana Water Study

Indiana Finance Authority (IFA)
April 29, 2019
Regional Water Studies: where and how to continue?

- Which part of the state?
  - Existing group of engaged utilities considering supply & demand issues
- What study area boundaries to use?
  - Central Indiana Drinking Water Collaborative
- What to study?
  - Central Indiana Drinking Water Collaborative
  - IDNR
  - IDEM
  - USGS
2019 Central Indiana Water Study

• Phase I – Regional Water Demand
• Phase II – Regional Water Supply
• Phase III – Water Availability Modeling and Optimization
• Phase IV – Infrastructure and Cost Analysis
• Phase V – Public Education and Outreach
Phase I – Regional Water Demand

- **Tasks:**
  - Determine baseline use
  - Consider all sectors: residential, commercial, industrial, and agricultural
  - Forecast water demand in the study area out to the year 2070
  - Evaluate multiple overlapping growth and drought scenarios
    - Standard summer
    - Drought of Record
    - Future climate change scenarios
    - Water conservation
    - Lawn irrigation

- RFP on hold
Phase II – Regional Water Supply

- USGS

Tasks:
- Identify and collect data necessary to have a better understanding of groundwater and surface water supplies in central Indiana, including aquifer levels and stream flows
- Install/update monitoring wells
- Install stream gauges
- Upgrade weather stations
- Other analyzes
Phase III – Water Availability Modeling and Optimization

- Responses to RFP under review by IFA
- Tasks:
  - Construct a regional water model
  - Determine total water availability in the study area
  - Define areas of aquifer stress and potential limitations and/or surpluses under various operational and climate scenarios
  - Collect localized data needed to understand the effects of utility water withdrawal operations on groundwater and surface water systems
  - Tool that will allow utilities to add wells and change pumping rates for predictive purposes
Phase IV – Infrastructure and Cost Analysis

- RFP on IFA website (https://www.in.gov/ifa/3006.htm) due today!
- Tasks:
  - Evaluate potential infrastructure needed to address deficits forecasted in Phase III, including a cost benefit analysis, environmental siting, regulatory, and permitting conditions
  - Evaluate potential interconnections, and the technical, regulatory and operational issues that would need to be addressed
Phase V – Public Education and Outreach

- RFP on IFA website (https://www.in.gov/ifa/3006.htm)
- Tasks:
  - Identity topics that would aid the utilities in the study area to better communicate water supply and demand issues with the residents of Central Indiana
  - Work with utilities in the study area to develop a regional public education message regarding the water supply and demand issues
  - Develop needed public education materials
  - Develop outreach implementation plans that include timelines and estimated costs
## Central Indiana Water Study Timeline

<table>
<thead>
<tr>
<th>Phase</th>
<th>Topic</th>
<th>CY 2019</th>
<th>CY 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Regional Demand</td>
<td>Q1</td>
<td>Q3</td>
</tr>
<tr>
<td>Phase II</td>
<td>Regional Supply</td>
<td></td>
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<tr>
<td>Phase III</td>
<td>Water Availability Modeling and Optimization</td>
<td>Q1</td>
<td>Q3</td>
</tr>
<tr>
<td>Phase IV</td>
<td>Infrastructure and Cost Analysis</td>
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<tr>
<td>Phase V</td>
<td>Public Education and Outreach</td>
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<td>Q4</td>
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</tbody>
</table>
Central Indiana Water Study Advisory Committee

- IDNR
- IDEM
- Central Indiana Drinking Water Collaborative
- Indiana ACEC (American Council of Engineering Companies)
- Indiana University
Central Indiana Water Study: next steps

- Engage USGS/consultants and begin work – starting in May/June/July
- Post updates on website
  - Today’s agenda and presentations
- Give updates at the Central Indiana Drinking Water Collaborative’s meetings
- Conduct additional public meetings – starting this fall/winter
Questions? IFA website (https://www.in.gov/ifa/3006.htm)

Sarah Hudson, IFA Water Resources and Infrastructure Planning Program
sahudson@ifa.in.gov

Daniel Lundberg, IFA Water Resources and Infrastructure Planning Program (RFP responses)
dlundberg@ifa.in.gov

Joanie Jones, IFA Environmental Programs
(Central Indiana Water Study email list for updates)
joajones@ifa.in.gov