

The LENK Group

Groundwater Monitoring Project

December 14, 2015



Todd Feenstra



Depleting the water

Lesley Stahl reports on disturbing new evidence that our planet's groundwater is being pumped out much faster than it can be replenished





California in overdraft

DRY WELLS AND SINKING GROUND AS STATE STRUGGLES WITH GROUNDWATER CRISIS

Story by Ian James | Photos and video by Steve Elfers

California in overdraft

Dry wells and sinking ground as state struggles with groundwater crisis

Story by Ian James | Photos and video by Steve Elfers



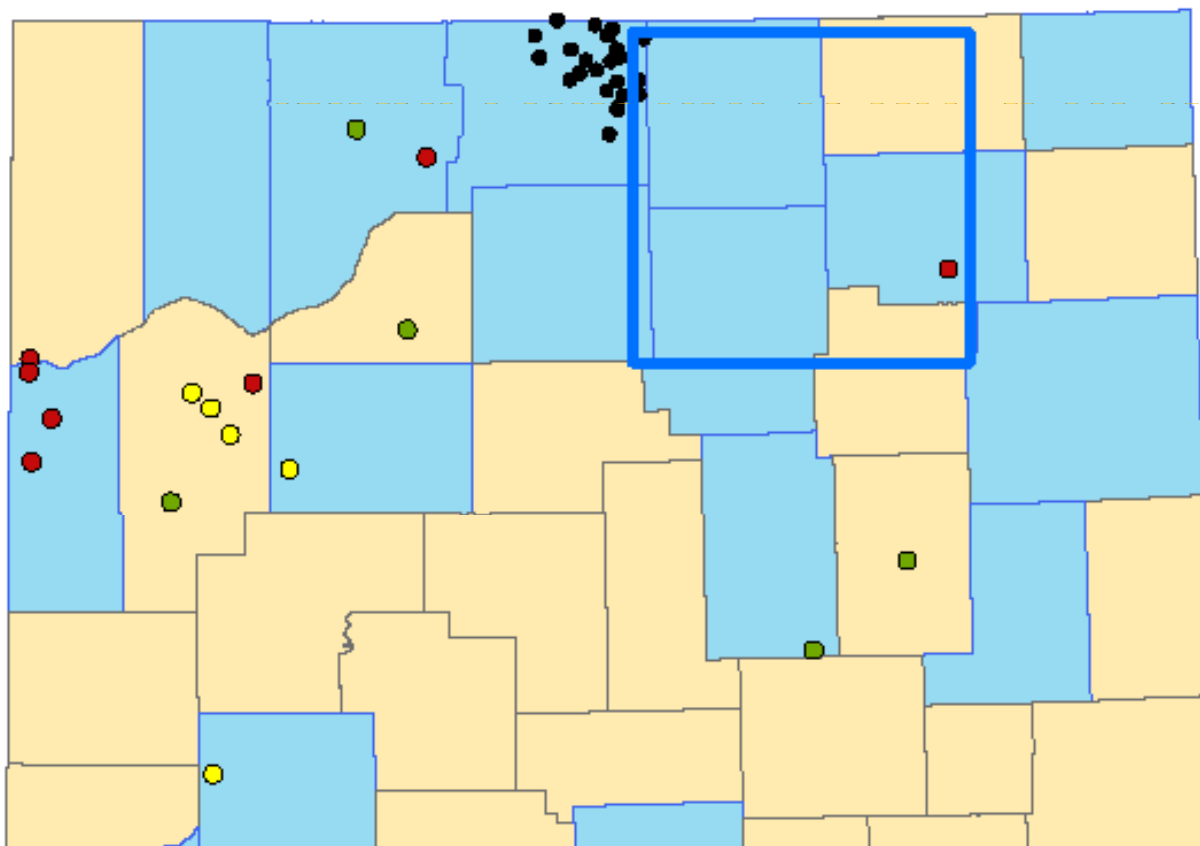
**Do These Reports Represent
Northern Indiana and
Southern Michigan?**

WATER AND ECONOMIC DEVELOPMENT IN INDIANA:

MODERNIZING THE STATE'S APPROACH TO A CRITICAL RESOURCE



August 2014



EXPLANATION

● USGS St Joseph Co Network

Discontinued Wells

Status

● 1 - Transferred to Property Owner

● 2 - Transferred to DNR

● 3 - Misc Transfer

■ Additional Monitoring Necessary

■ LENK study sites - Todd Feenstra,
Tritium, Inc.

DEFINE THE RESOURCE

DATA

ANALYSES

MODELS



FARMERS' ADVANCE
A GANNETT COMPANY

South Bend
TRIBUNE

The voice that connects us.

**The
Elkhart
Truth**
elkharttruth.com

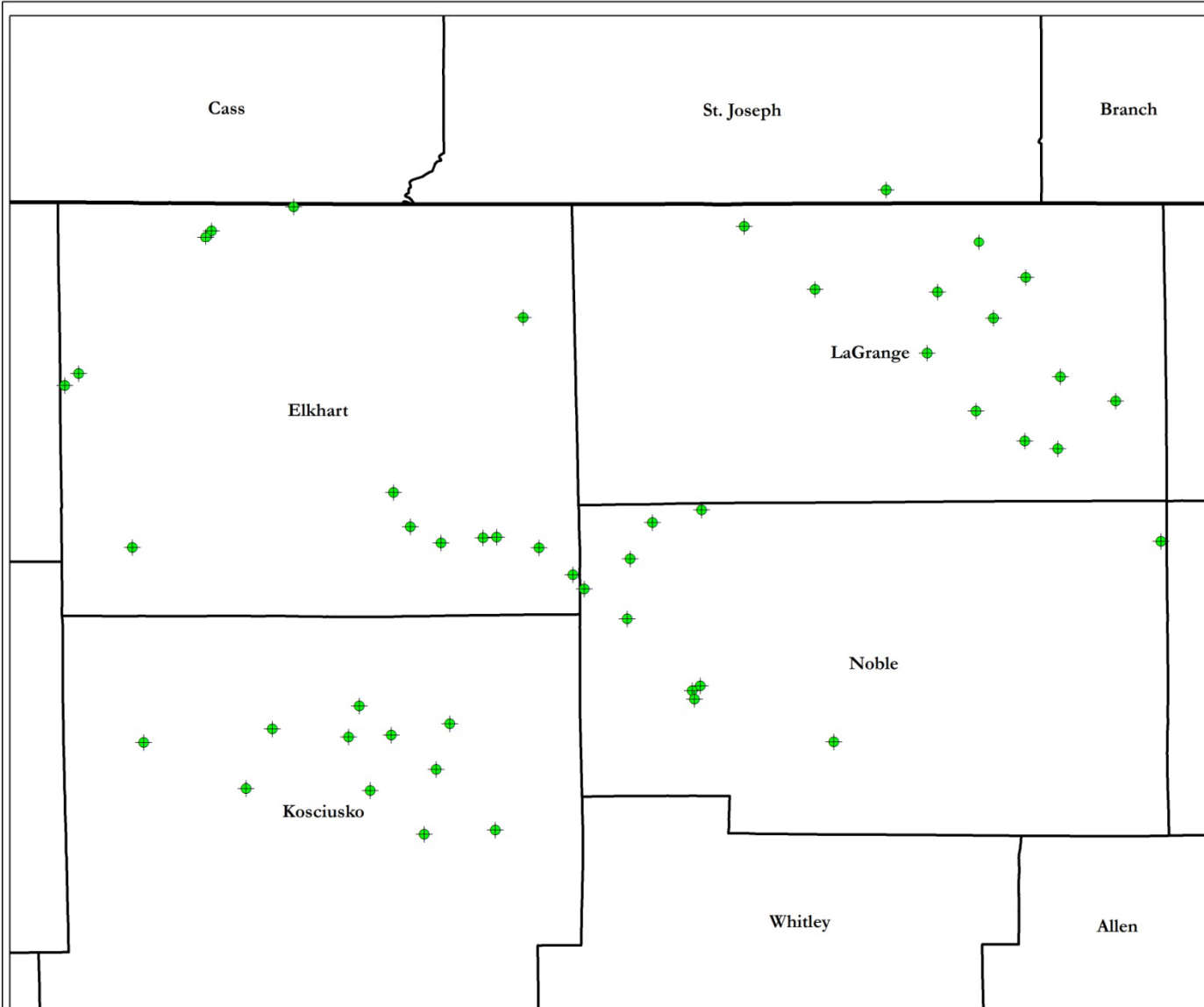
groundwater

Two Part Solution

1. Annual Monitoring Reports for Individual Farms
2. Regional Model(s) for All the Participating Farms

Annual Monitoring Reports

1. Monitoring Wells
2. Data Collection
3. Geologic Cross-sections
4. APTs
5. Interference Predictions



LEGEND

LENK Monitoring Wells

Roads_TIGER05_IN



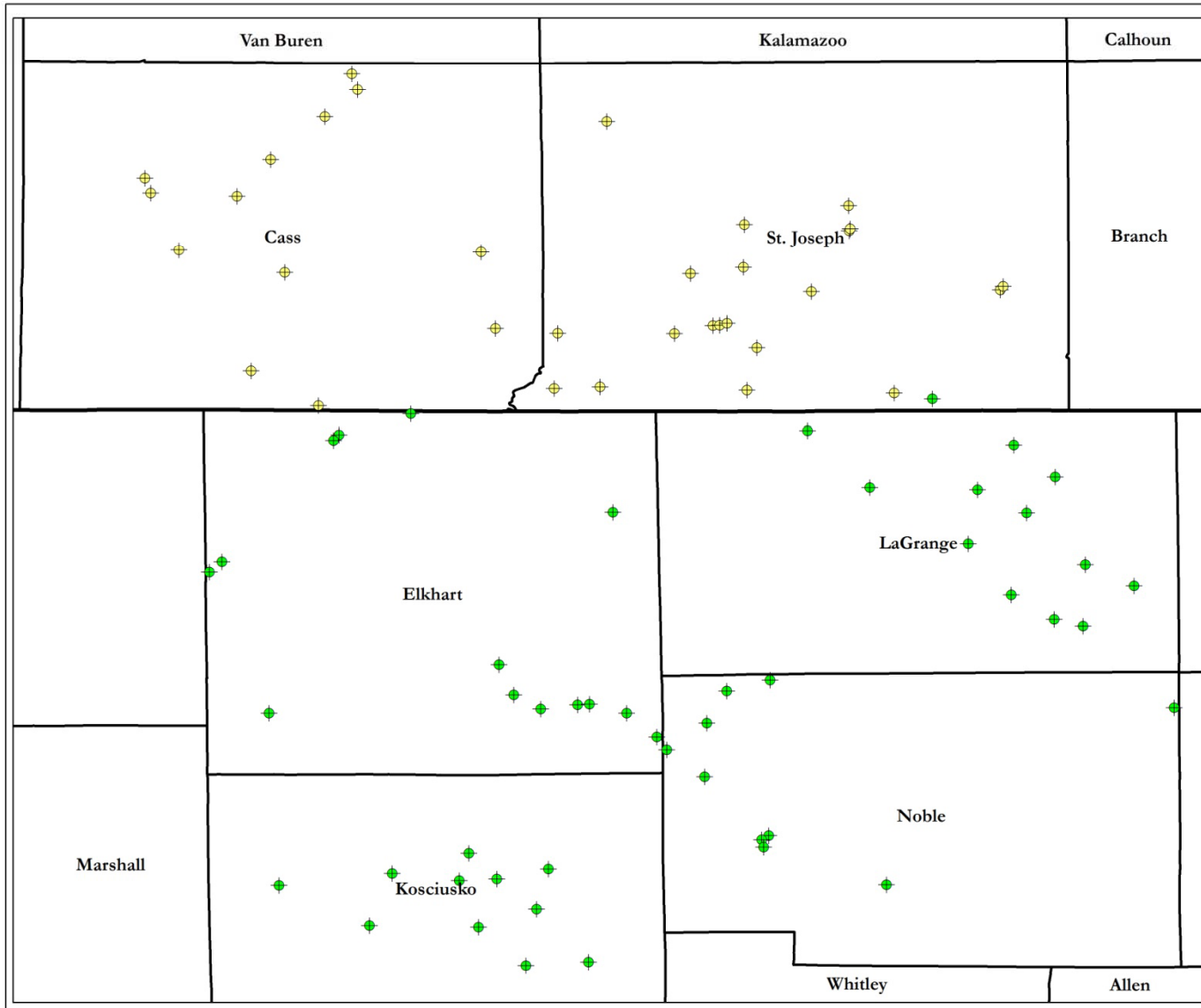
0 1.5 3 6 Miles



1:332,530

FIGURE 1
Study Area with Monitoring Wells

Prepared for: LENK Group		Project: LENK Model	
Drawn By: TJF	Date: Mar-2015		



LEGEND

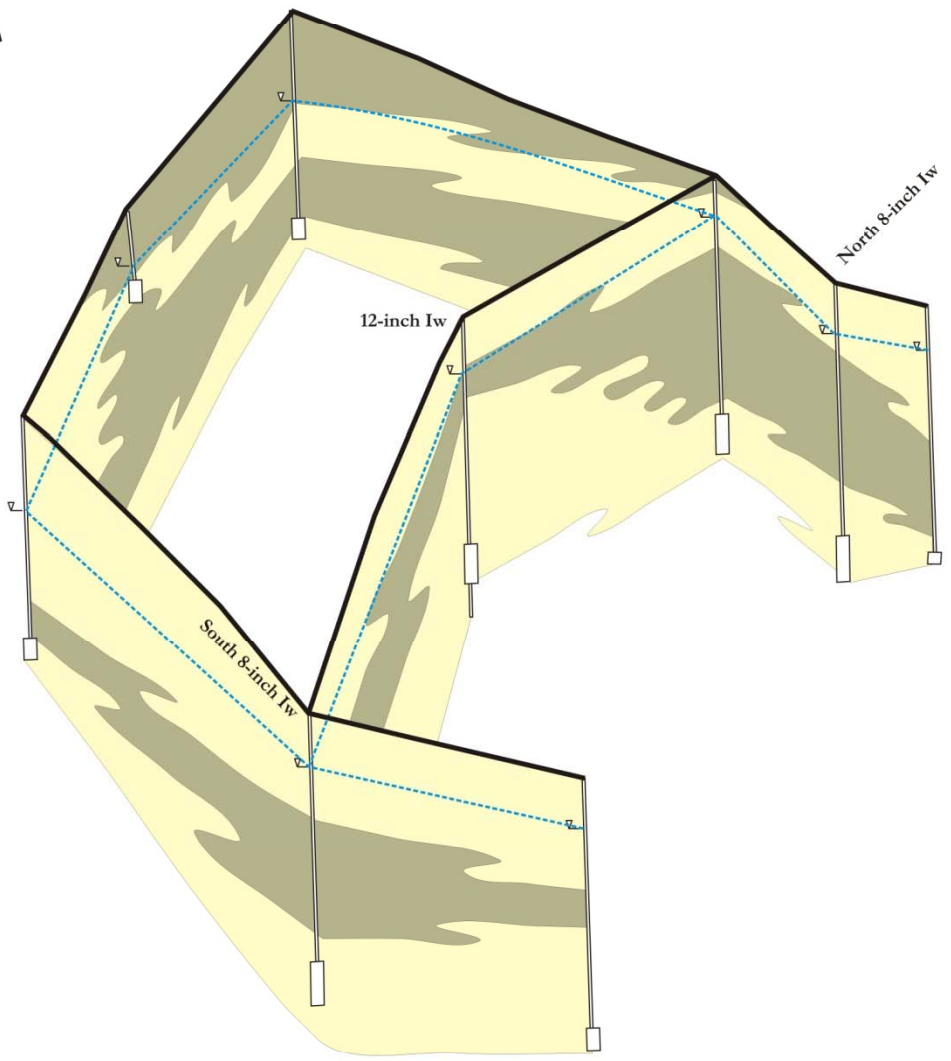
- ◆ LENK Monitoring Wells
- ◆ SMF Monitoring Wells
- Roads_TIGER05_IN

N
 W — E
 S

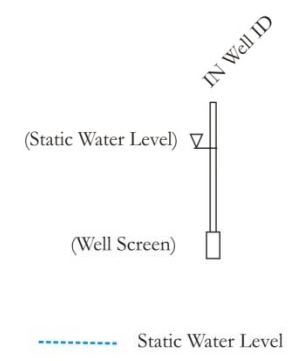
0 1.5 3 6 Miles
 1:375,049

FIGURE 1
Study Area with Monitoring Wells

Prepared for: LENK Group	Project: LENK Model	
Drawn By: TJF	Date: Mar-2015	Tritium Inc.



- Clay
- Sand and/or Gravel



Vertical Scale
1 inch = 60 feet

Horizontal Scale
1 inch = 1,000 feet

FIGURE 3
Geologic Cross-section

Project:
Annual Well Monitoring

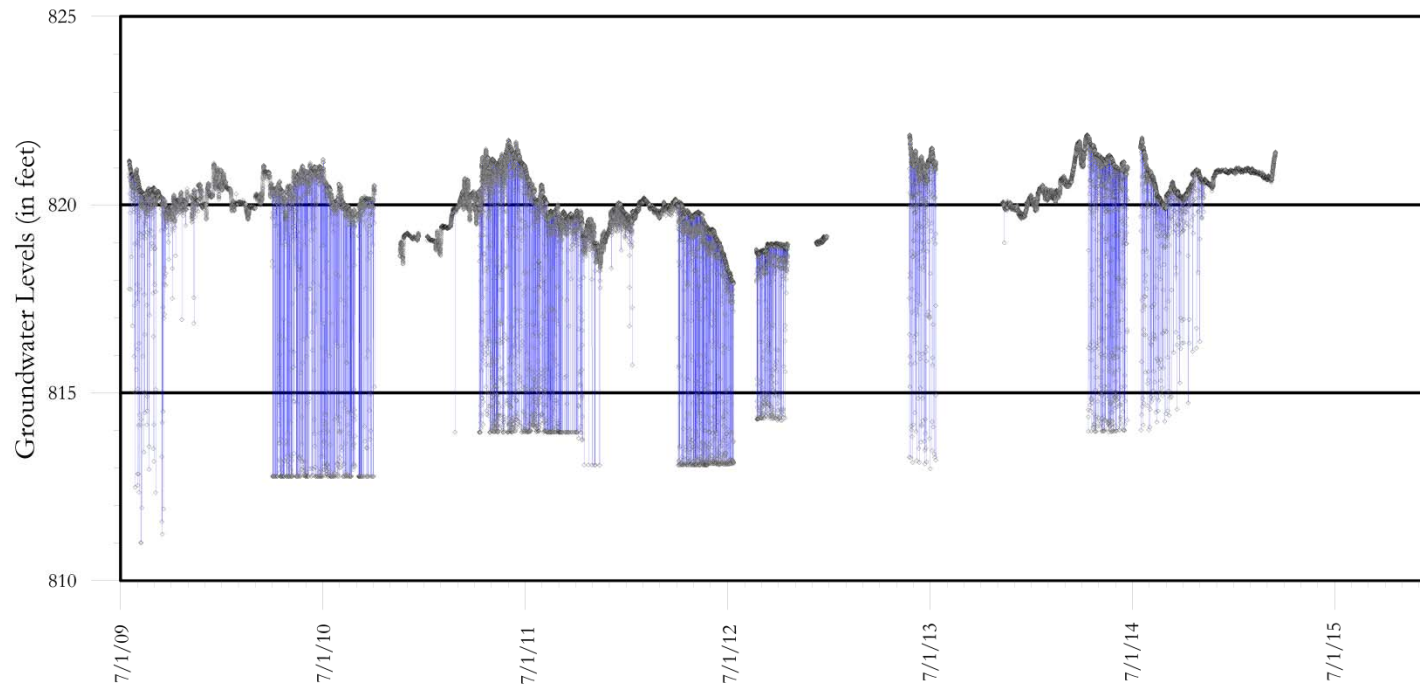
Drawn By:
TJF

Date:
August 10, 2014

Prepared for:



July 1, 2009 to January 1, 2016
Annual Groundwater Levels

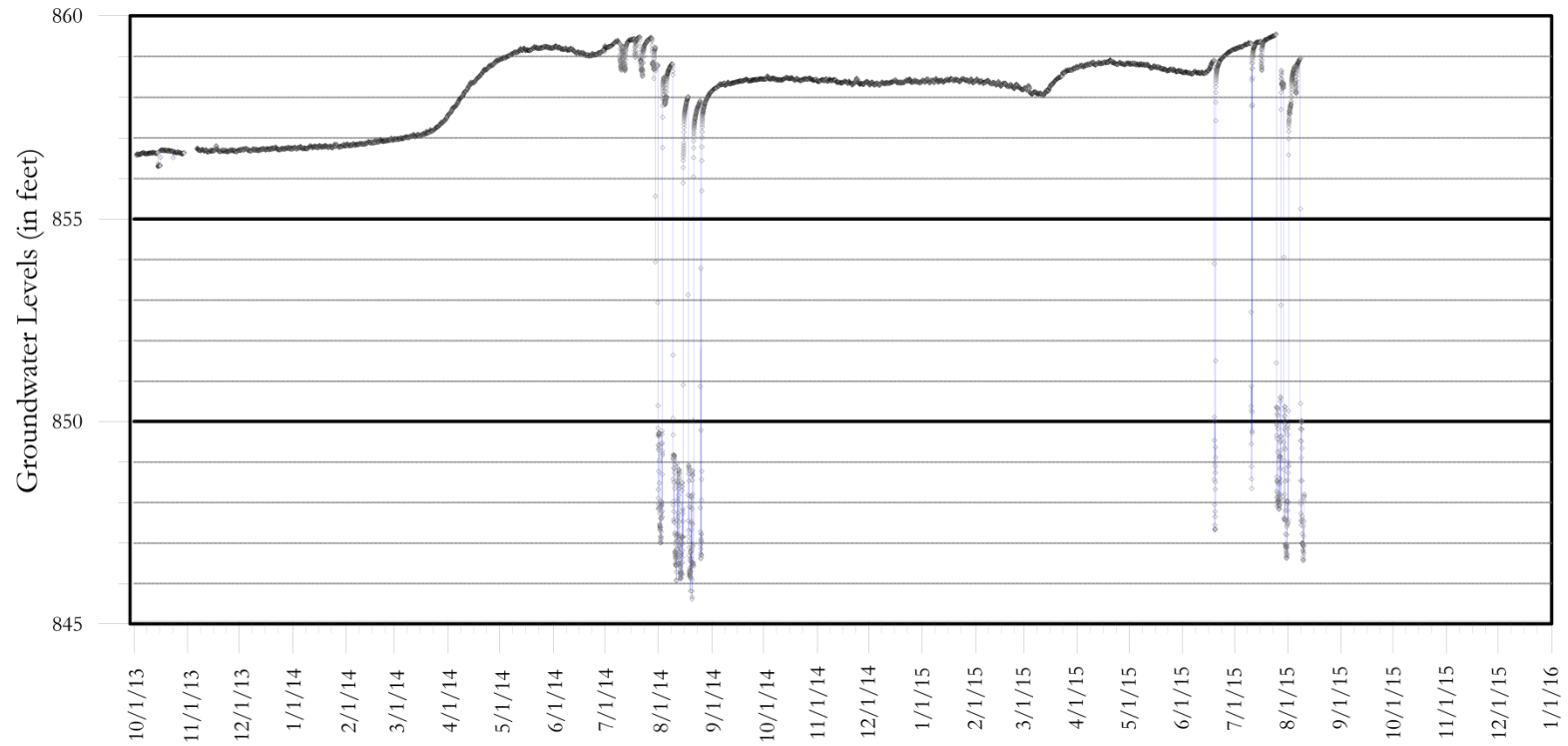


Monitoring Well:
Irrigation Well:

Tritium Inc.
The Higher Standard

1789 E. Bristol Street, Suite B
Elkhart, Indiana 46514
Ph: (574)266-5300
Fax: (574) 266-1795

McKenzie East Monitoring Well Annual Groundwater Levels



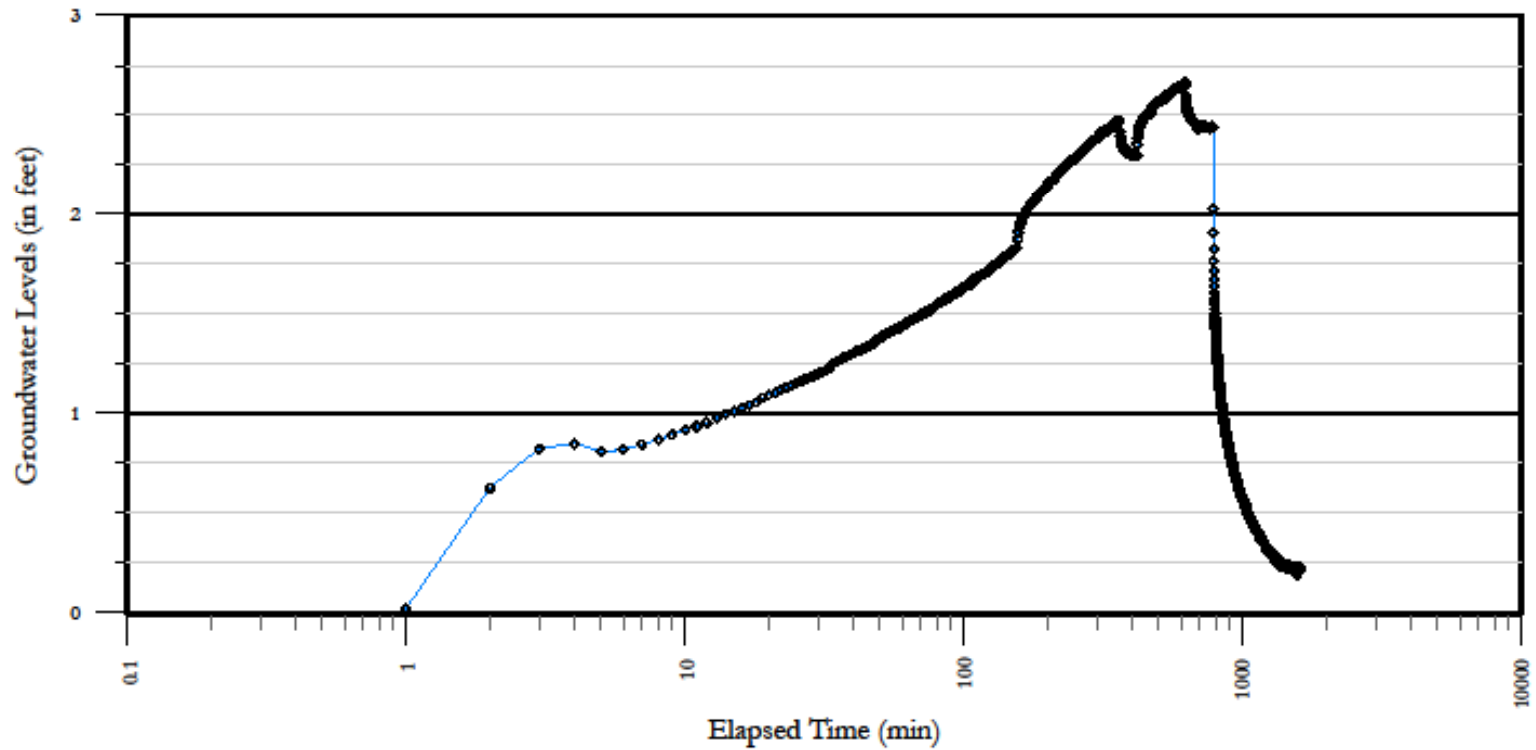
Project:

Monitoring Well: McKenzie East Mw
Irrigation Well: McKenzie East 12-inch



1789 E. Bristol Street, Suite B
Elkhart, Indiana 46514
Ph: (574)266-5300
Fax: (574) 266-1795

Aquifer Performance Test



Project: Kohn's Field (201516)

Monitoring Well: 325 feet

Pumping Rate:

: 800 gpm - with end gun

: 693 gpm - without end gun

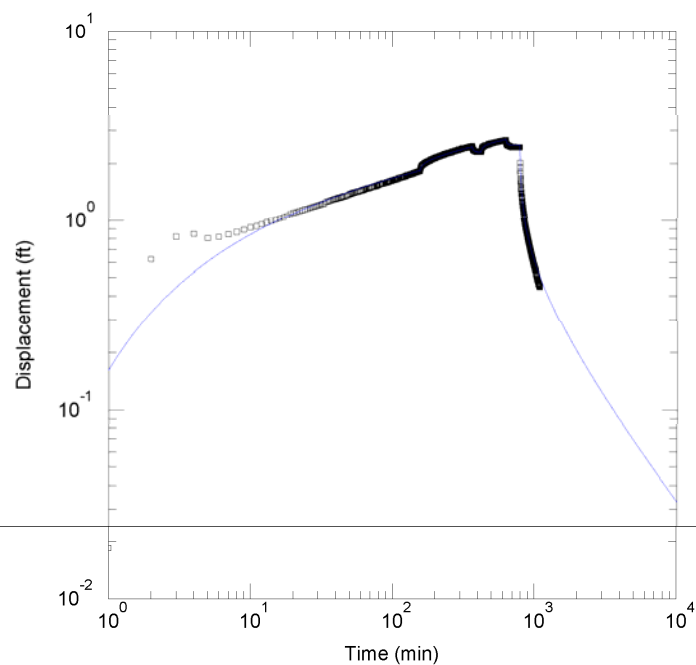
Tritium Inc.
THE HYDROLOGISTS

1789 E. Bristol Street, Suite B

Elkhart, Indiana 46514

Ph: (574)266-5300

Fax: (574) 266-1795



WELL TEST ANALYSIS

Data Set: T:\...\Kohn's Field (800-693).aqt
 Date: 12/14/15

Time: 08:30:09

PROJECT INFORMATION

Company: Tritium, Inc.
 Project: 201516
 Location: Kohn's Field
 Test Date: 10/13/15 to 10/26/15

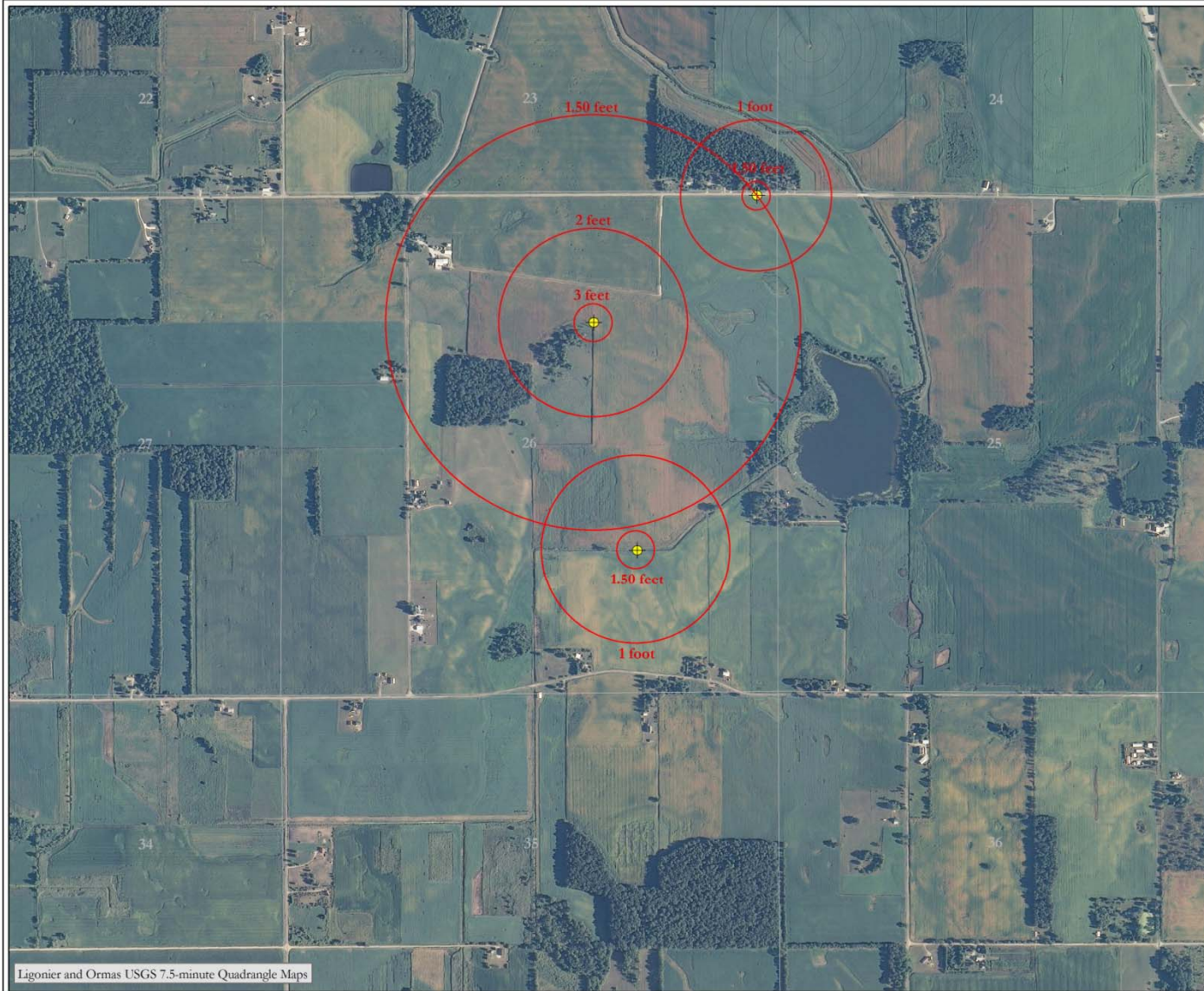
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Irrigation Well	0	0	Monitoring Well	0	325

SOLUTION




Aquifer Model: Confined
 $T = 2.851E+4 \text{ ft}^2/\text{day}$
 $Kz/Kr = 0.1$

Solution Method: Theis
 $S = 0.0004682$
 $b = 46. \text{ ft}$



Ligonier and Ormas USGS 7.5-minute Quadrangle Maps

LEGEND

-  Predicted Interference Effects
-  Irrigation Well Location
-  Registered Private Wells

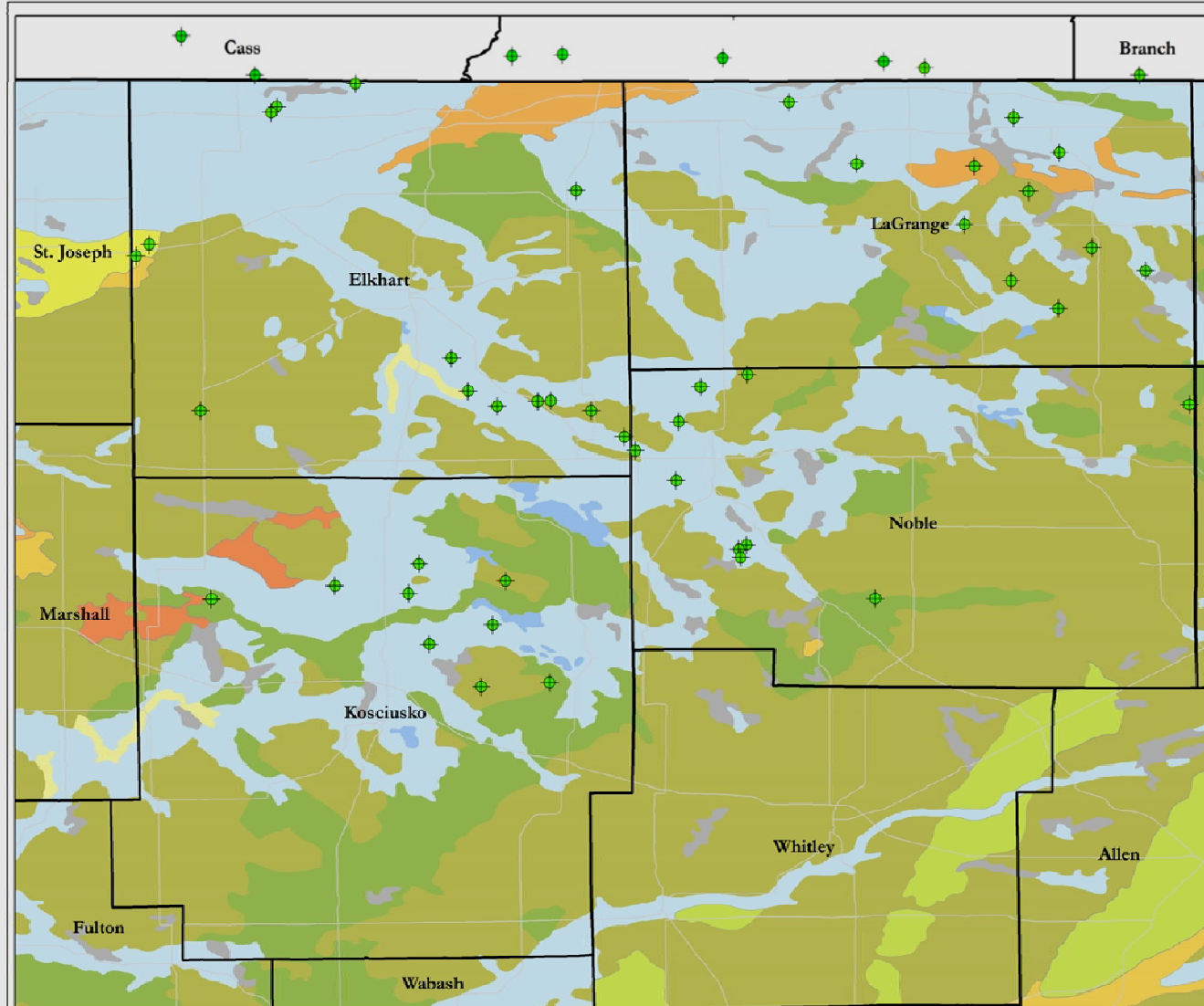


0 1,000 2,000 Feet

1 inch equals 1,000 feet

FIGURE 4
Predicted Interference Effects

		Project: Irrigation Well Evaluation
Drawn By: TJF	Date: August-2014	Tritium Inc.



LEGEND

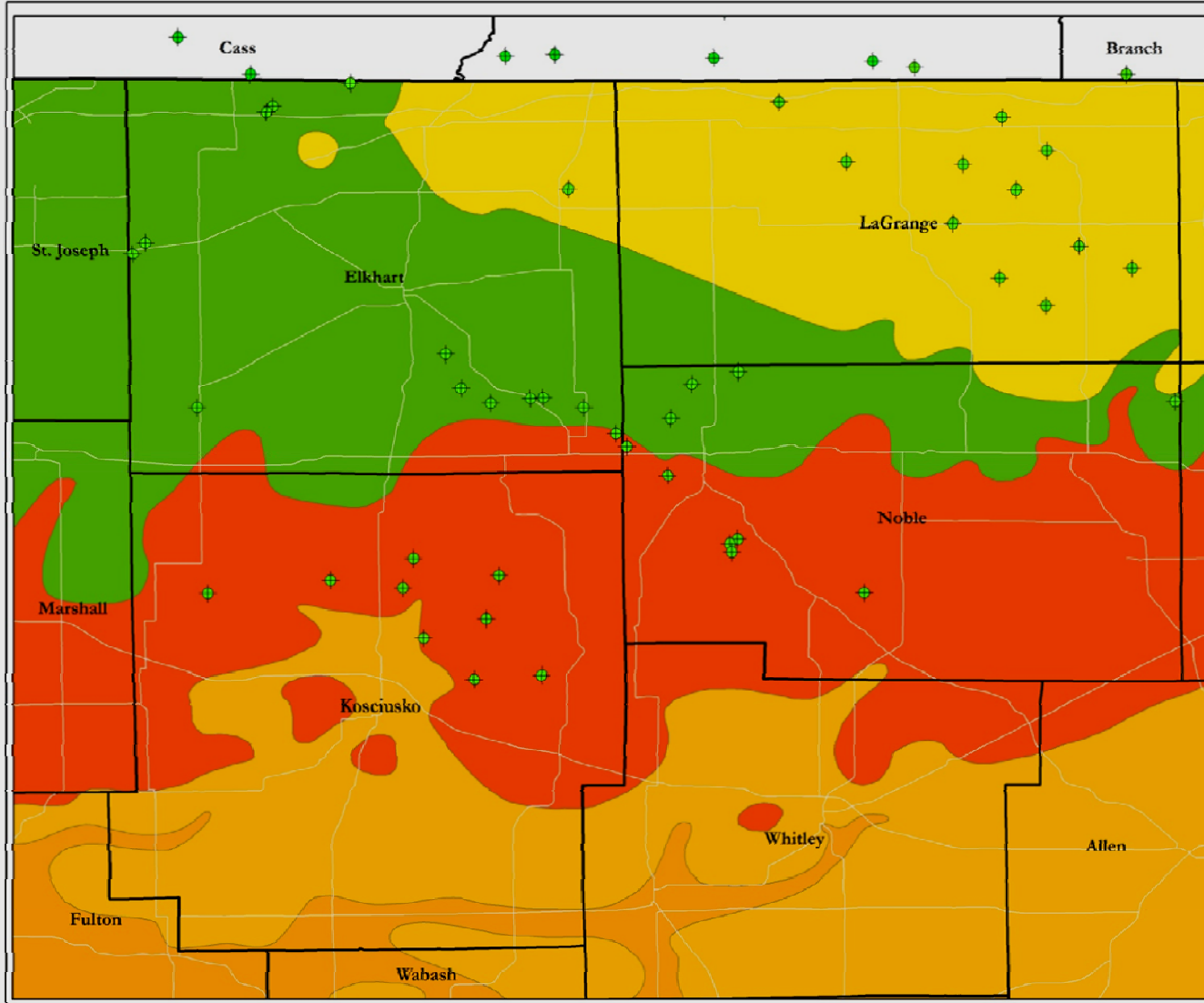
-  Monitoring Wells
-  Roads_TIGER05_IN
-  Lake or Dune Sand
-  Muck
-  Alluvium Deposits
-  Outwash Deposits
-  Mixed drift
-  Glacial Till Deposits



0 2.5 5 10 Miles

FIGURE 2
Surficial Geology

Prepared for LENK Group		Project: LENK Model	
Drawn By: TJF	Date: Mar-2015	Tritium & Inc.	



LEGEND

- Monitoring Wells
- Roads_TIGER05_IN
- Antrim Shale
- Coldwater Shale
- Ellsworth Shale
- Muscatatuck Group
- Wabash Formation

FIGURE 3
Bedrock Geology

Prepared for: LENK Group	Project: LENK Model	
Drawn By: TJF	Date: Mar-2015	Tritium & Inc.

Cass County Pilot Study Approvals and Support

1. Michigan Department of Environmental Quality
2. Michigan Department of Natural Resources
3. Michigan Geologic Survey
4. United States Geologic Survey
5. Michigan Groundwater Advisory Council
6. Southwest Michigan Groundwater Advisory Council
7. Michigan Farm Bureau
8. Nine County Presidents Michigan Farm Bureau
9. Michigan Corn Growers Association
10. Michigan Soybean Growers Association
11. Michigan Office of Great Lakes