

## Wisconsin Department of Transportation

Division of Transportation System Development  
Bureau of Technical Services  
Surveying & Mapping Section  
Geodetic Surveys Unit

Truax Center, 3502 Kinsman Blvd.  
Madison, WI 53704

January 27, 2017



## Wisconsin Height Modernization Program

WISCORS Stakeholder 2 Meeting

Friday, January 27, 2017

Kalahari Convention Center  
Cypress Room  
1305 Kalahari Drive  
Wisconsin Dells, WI 53965



## WISCORS STAKEHOLDER 2 MEETING AGENDA

| Time             | Topic  |
|------------------|--|
| 12:15 – 12:30 pm | Sign In  |
| 12:30 – 1:15 pm  | <b>The Wisconsin Height Modernization Program</b> <ul style="list-style-type: none"> <li>➤ Background and Development</li> <li>➤ Current Status of WI-HMP (Active &amp; Passive Networks)</li> <li>➤ WISCORS System Components, Maintenance Plan, Cost &amp; State Statute</li> <li>➤ WISCORS Stakeholder 1: Questionnaire Analysis</li> <li>➤ WISCORS System Proposed Revised Subscription Options, Registration/Billing &amp; Exemptions</li> <li>➤ Fee Development – Other States</li> <li>➤ Communications Plan</li> </ul> |
| 1:15 – 2:00 pm   | Question and Answer Session: Requests for input/feedback from attendees  |



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## Wisconsin Height Modernization Program Background and Development

- The Wisconsin Height Modernization Program (WI-HMP) was established by the National Geodetic Survey (NGS), an agency of NOAA, to enhance the accuracy and redundancy of latitude, longitude, and elevation information used in the construction of roads, bridges, and other applications.
- In 1998, NOAA was directed by Congress to implement the system throughout the country. In Wisconsin, NOAA provided annual grants from 2002 through 2011. Since inception, over \$20 million has been invested in this system in Wisconsin; 70% coming from NOAA grants, 30% from WisDOT.
- WI-HMP consists of both a passive and an active network which together provide precise three-dimensional positioning.
- The passive network known as the Geodetic Control Network provides the basic framework of latitude, longitude, and elevation data on survey marks throughout Wisconsin.
- The active network, the Wisconsin Continuously Operating Reference Stations (WISCORS), provides a cost effective method with the aid of GPS to obtain position information with high accuracy, in seconds and with less equipment and labor.
- This combined survey efficiency benefits and supports the state's highway improvement projects through accuracies in design surveys/construction and mapping applications. Other applications include but not limited to precision agriculture, flood plain mapping, GIS, etc.



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## Wisconsin Height Modernization Program Passive Network (Geodetic Survey Control Network)

Two types of geodetic survey control stations:

Bench marks



Vertical-Only

High order leveled elevation known to 1/8-inch (0.01 feet)

\$8,000 Replacement Cost



GPS stations



3-Dimensional

Precise horizontal position to 1/8-inch (0.01 feet) and elevation known to less than 1 inch (0.07 feet)

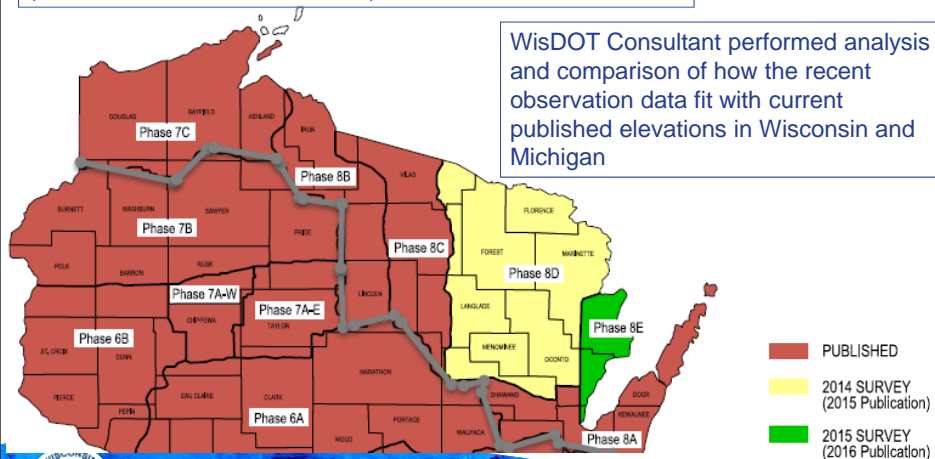
Up to \$25,000 Replacement Cost

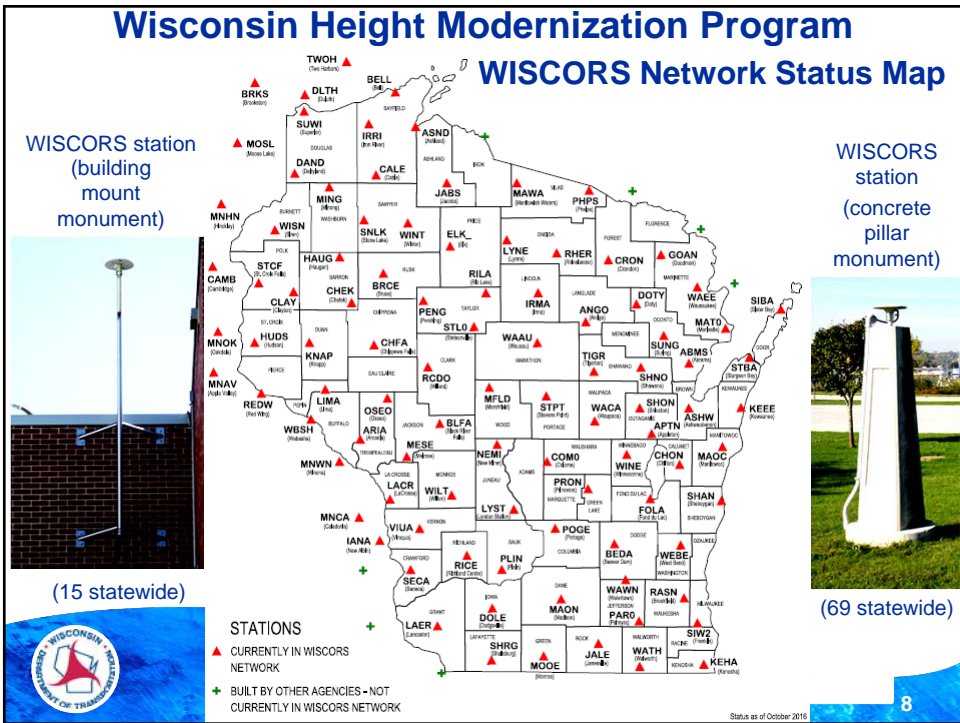
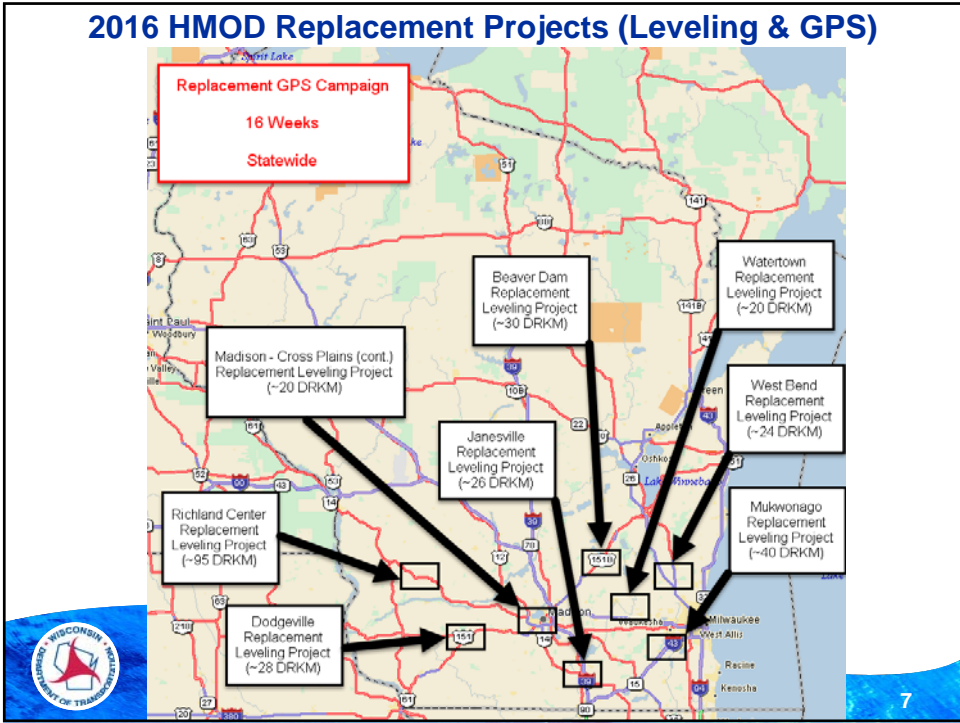


## Status of Passive Network (Initial Development)

Ongoing discussions between WisDOT, WisDOT Consultant, MDOT, NGS Consultant and NGS to determine a final adjustment of the entire northern tier of Wisconsin (Phases 7C, 8A, 8B, 8C, 8D, 8E)

WisDOT Consultant performed analysis and comparison of how the recent observation data fit with current published elevations in Wisconsin and Michigan

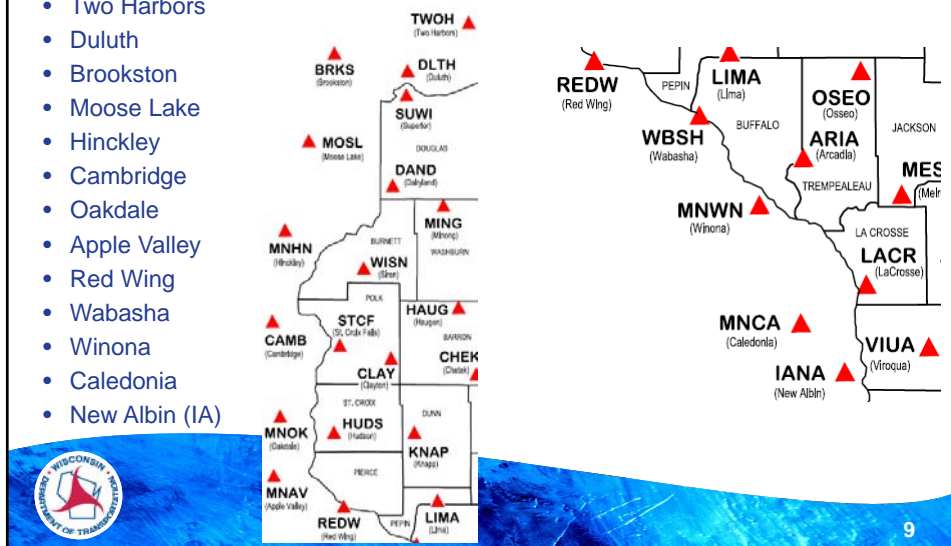




## WISCORS Network Status Update

- Thirteen (13) MnCORS stations were incorporated into the WISCORS Network on October 2, 2016

- Two Harbors
- Duluth
- Brookston
- Moose Lake
- Hinckley
- Cambridge
- Oakdale
- Apple Valley
- Red Wing
- Wabasha
- Winona
- Caledonia
- New Albin (IA)



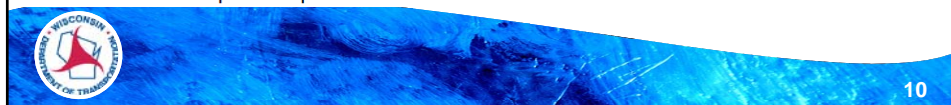
## WISCORS Network Status Update

### The Challenge:

- Lost De Pere CORS in 2016
- Losing Lyndon Station CORS in 2017
  - Losing Portage CORS in 2017
  - Losing La Crosse CORS in 2017

Requirements for establishment of a CORS station include, but are not limited to, the following:

- CORS spacing requirements
- WisDOT/Partner Agreements
- Site accessibility and conditions (i.e. obstruction angles, etc.)
- Security of site
- Soil conditions
- Internet service provider options
- Electricity capabilities
- CORS component specifications



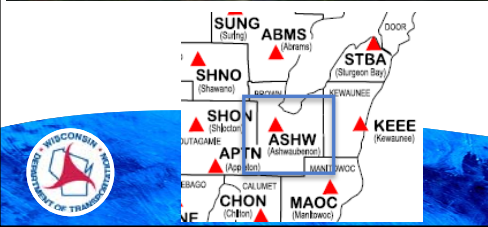
### De Pere CORS Removal

- Brown County Fairgrounds Reconstruction Project – removing large berm
- Less than 60 days to remove CORS base/obelisk due to project start date



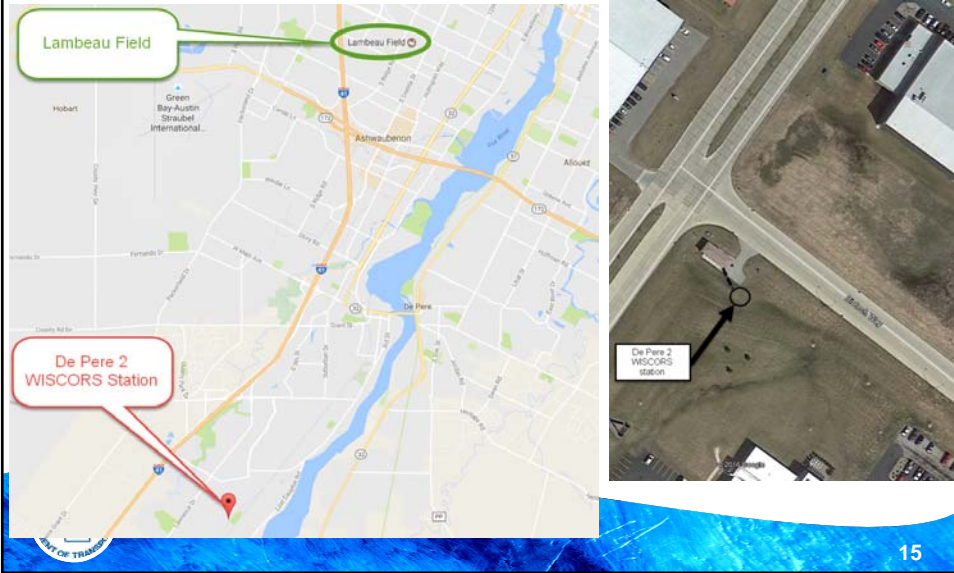
### Ashwaubenon CORS (ASHW) – WisDOT NE Region Building

- Installation of building mount at NE Region – Green Bay building
- Incorporated into the WISCORS Network on September 7, 2016



# WISCORS Network Status Update

- **New Replacement WISCORS Station – De Pere 2**  
- Located at the City of De Pere Water Utility (to be incorporated in 2017)



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- Located at the City of De Pere Water Utility

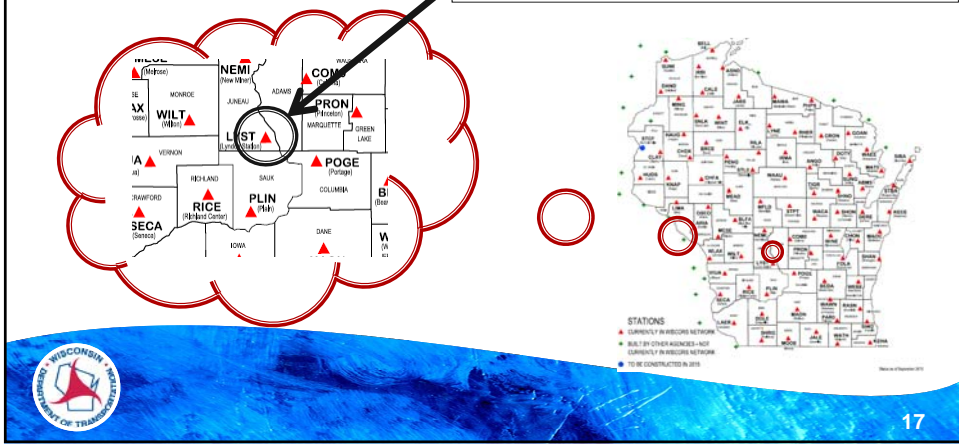




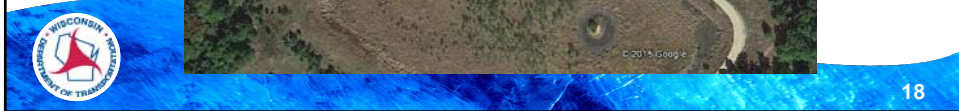
# Badger Coulee Transmission Line Project

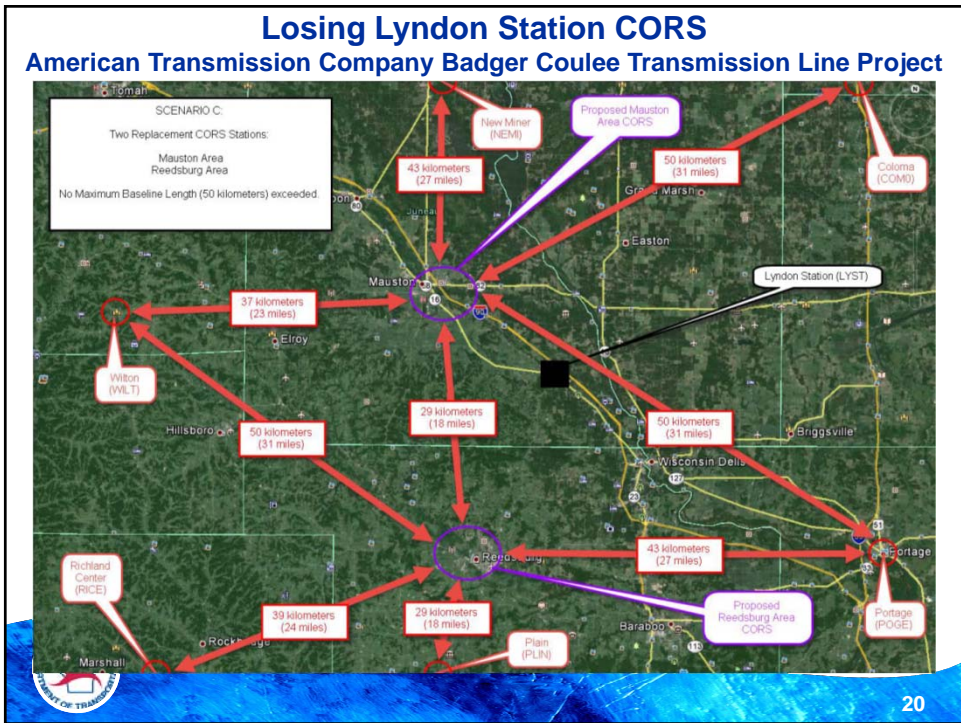
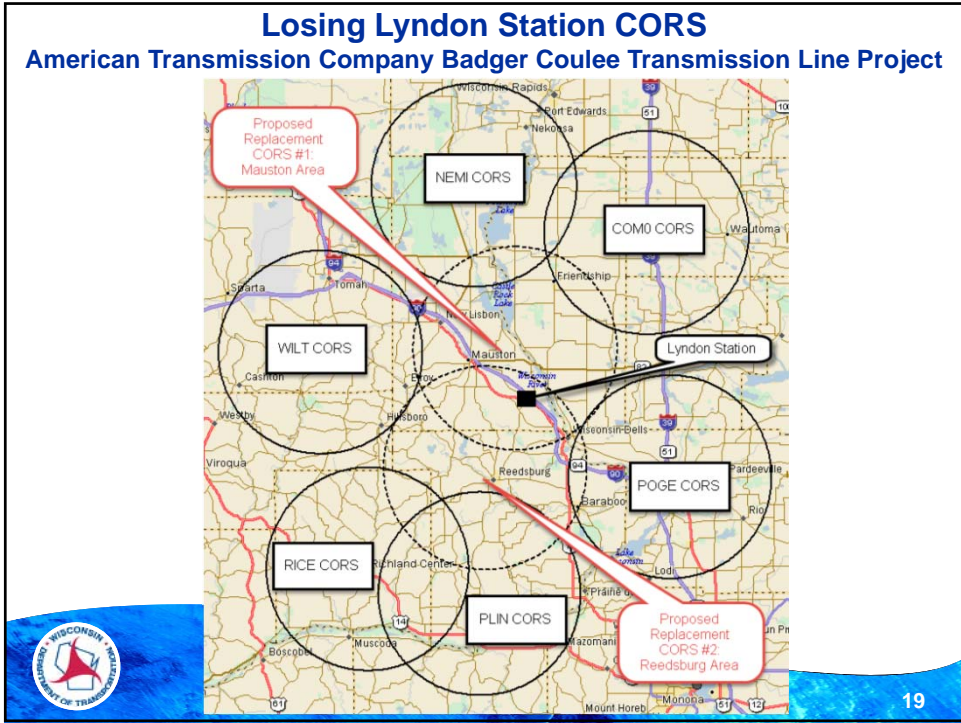
- ❖ 180-mile, 345-kilovolt (high voltage) transmission line
- ❖ La Crosse to Madison
- ❖ ~ \$580 million project
- ❖ Begin Construction – 2016; Full in-service – 2018

Lyndon Station CORS station to be affected



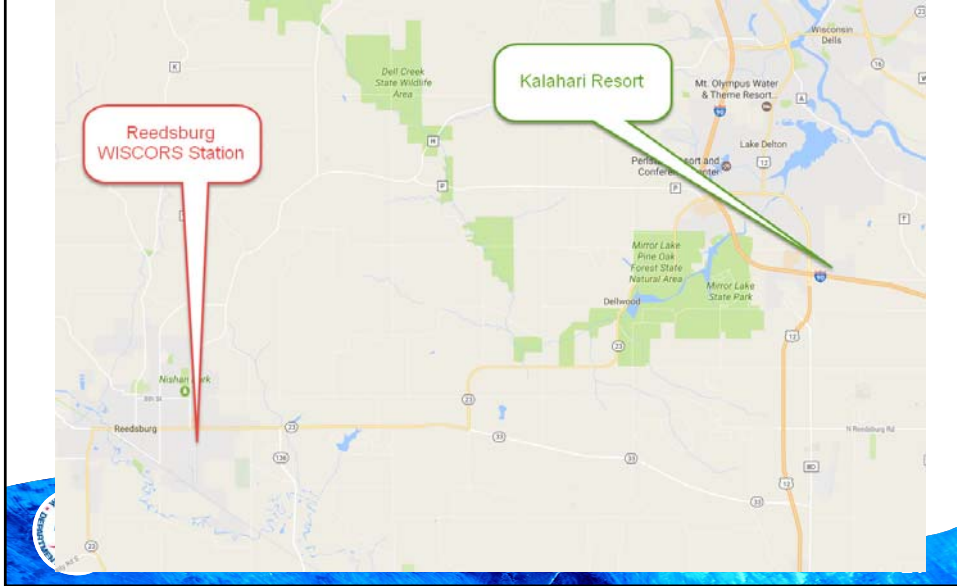
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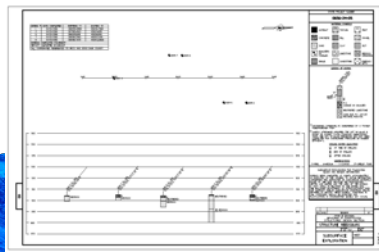


# WISCORS Network Status Update

- **New Replacement WISCORS Station – Reedsburg**  
- Located at the Reedsburg Municipal Airport (to be incorporated in 2017)

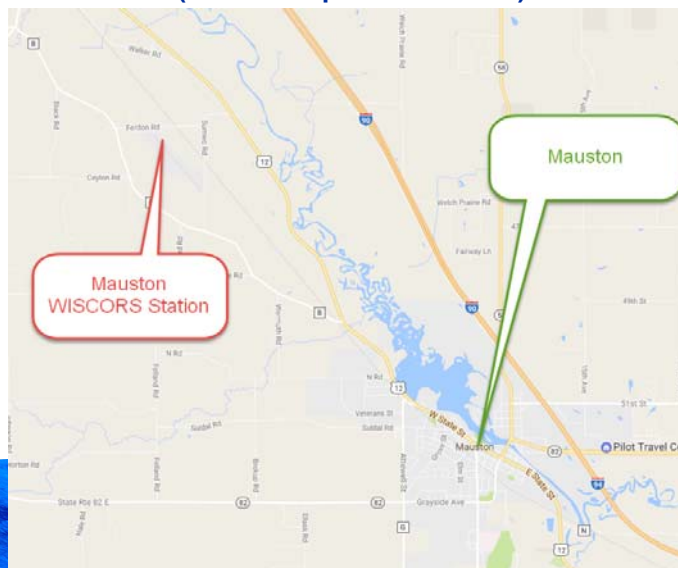


- **New Replacement WISCORS Station – Reedsburg**  
- Located at the Reedsburg Municipal Airport



## WISCORS Network Status Update

- **New Replacement WISCORS Station – Mauston**
  - Located at the Mauston/New Lisbon Union Airport (to be incorporated in 2017)

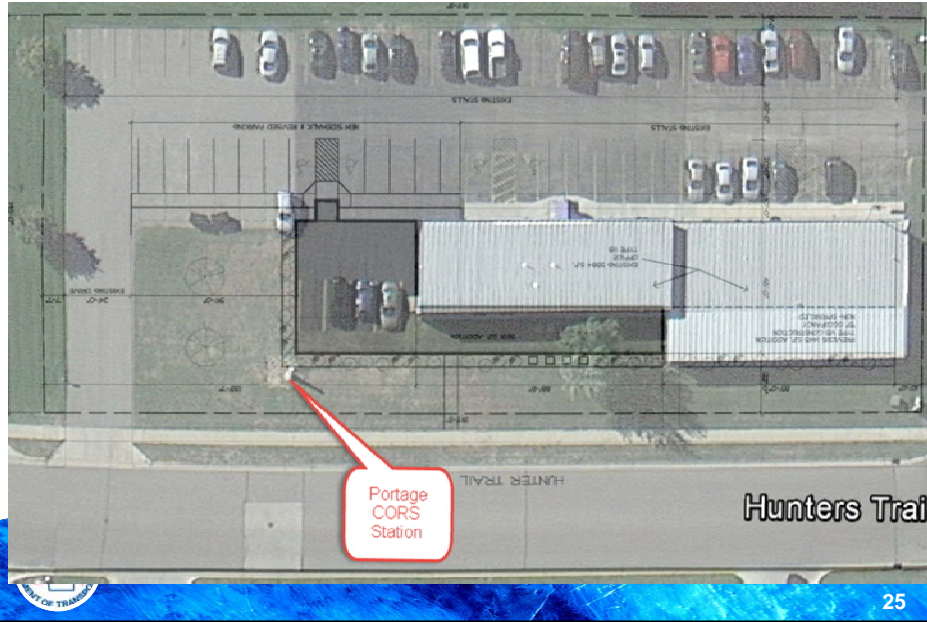


- **New Replacement WISCORS Station – Mauston**
  - Located at the Mauston/New Lisbon Union Airport



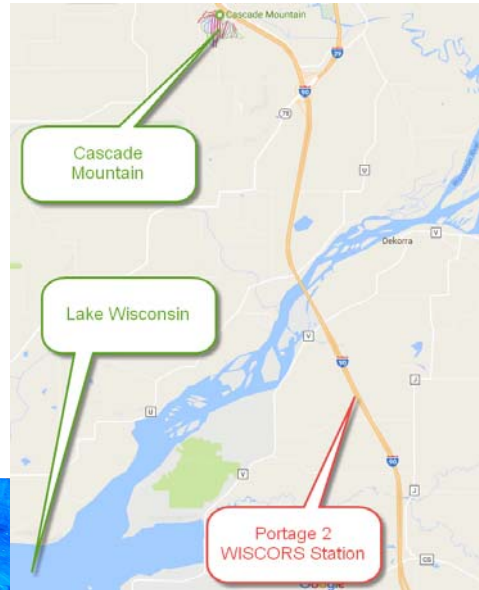
## WISCORS Network Status Update

- Losing Portage CORS Station – Portage DMV



## WISCORS Network Status Update

- New Replacement WISCORS Station – Portage 2  
- Located at Rest Area 11 along SB I 39 / EB I 90/94



(to be incorporated in 2017)



- **New Replacement WISCORS Station – Portage 2**
  - Located at Rest Area 11 along SB I 39 / EB I 90/94
  - Powered exclusively by solar system



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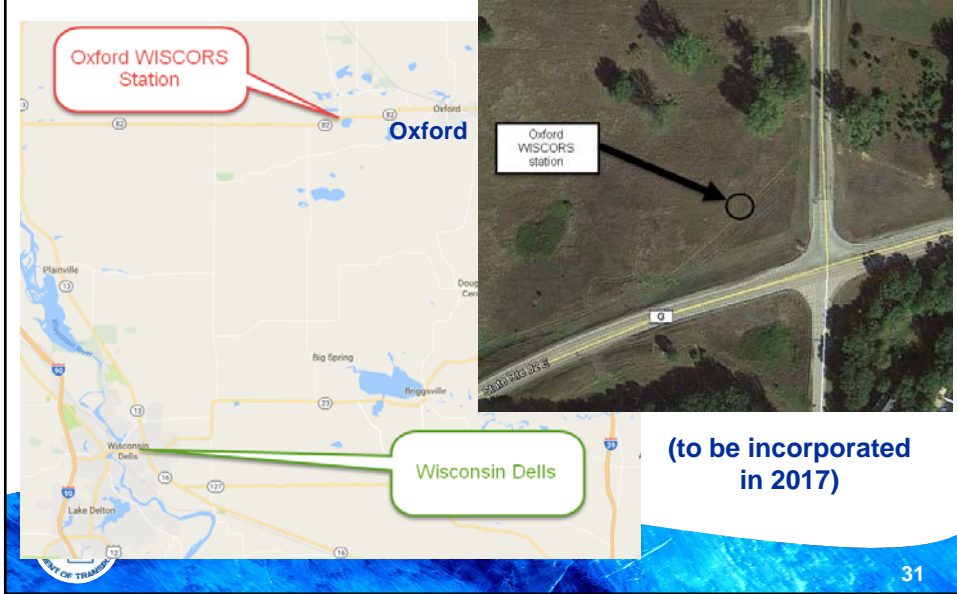


- **New Replacement WISCORS Station – Portage 2**
  - Located at Rest Area 11 along SB I 39 / EB I 90/94
  - Powered exclusively by solar system



## WISCORS Network Status Update

- **New Replacement WISCORS Station – Oxford**  
- Located west of Oxford along STH 82 corridor in Adams County

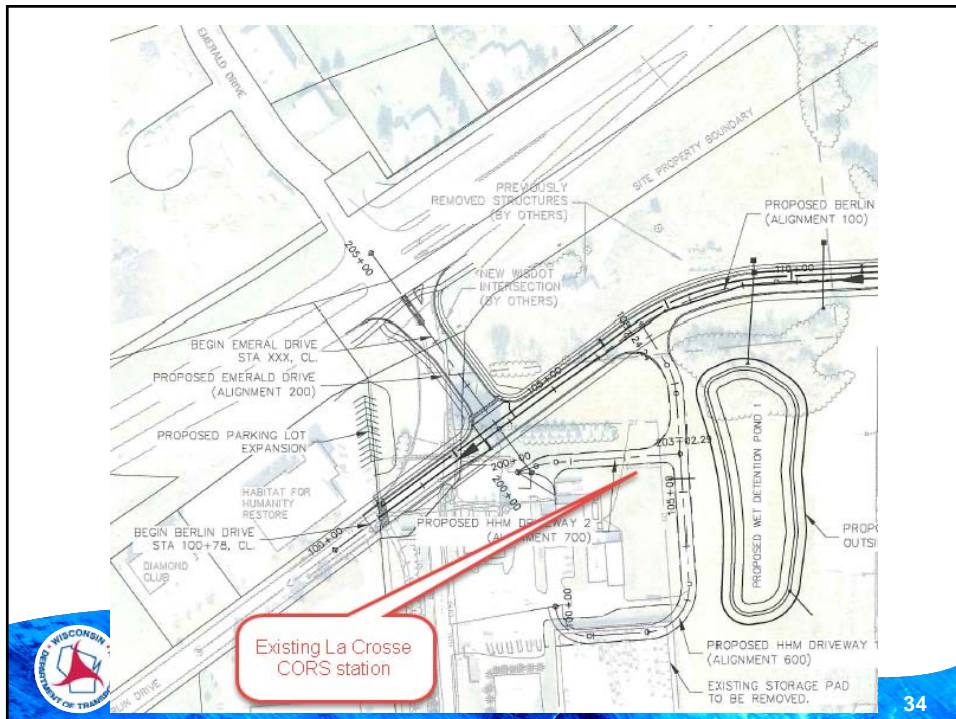


- **New Replacement WISCORS Station – Oxford**  
- Located west of Oxford along STH 82 corridor in Adams County





- **New Replacement WISCORS Station – La Crosse**  
- Located at La Crosse Solid Waste Facility - ~50 south of existing station (to be incorporated in 2017)



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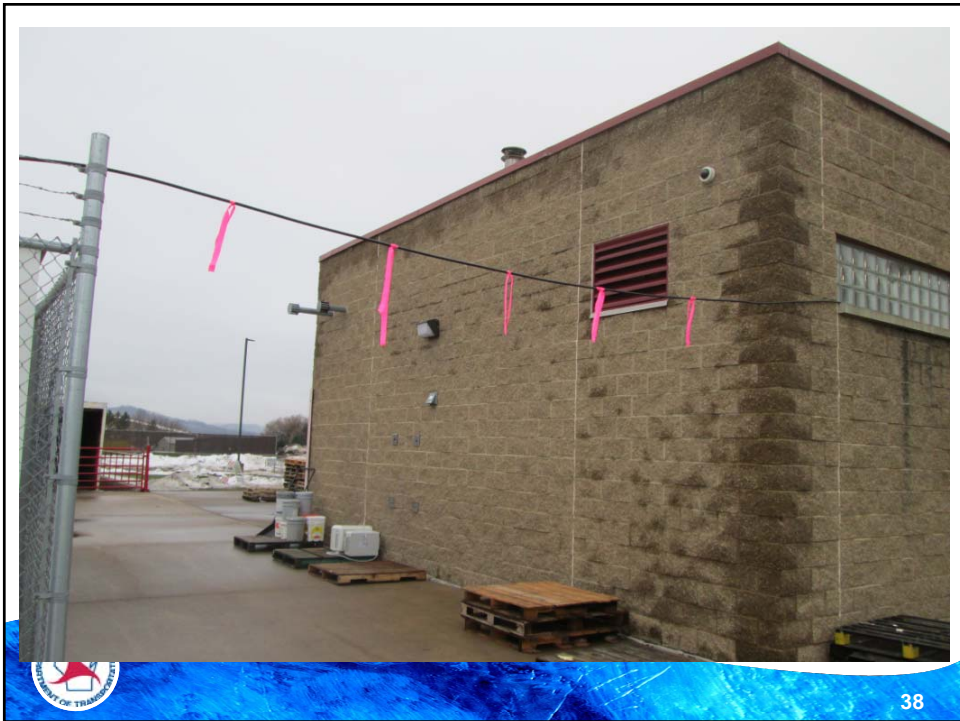


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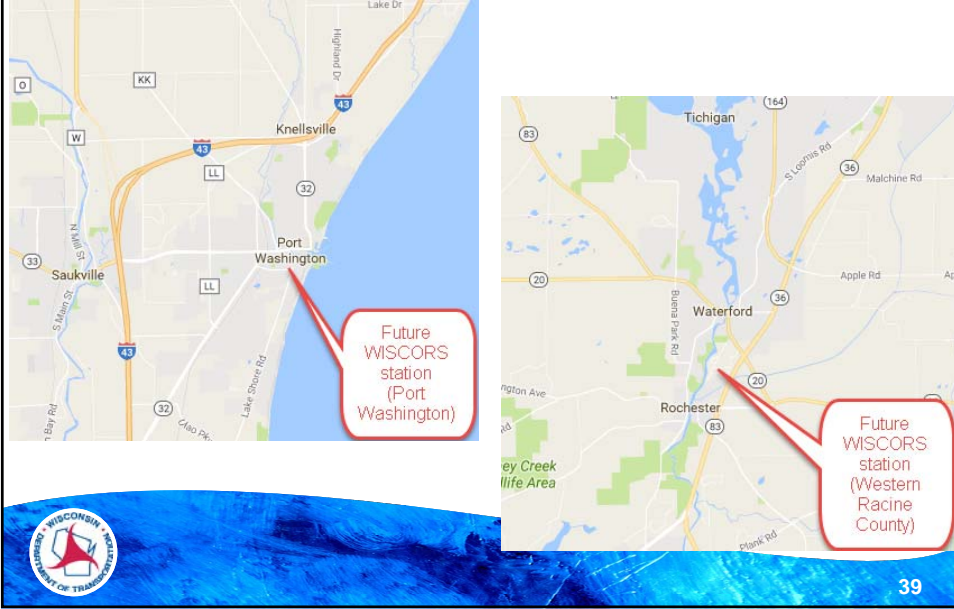
- **New Replacement WISCORS Station – La Crosse**  
- Located at La Crosse Solid Waste Facility - ~50 south of existing station



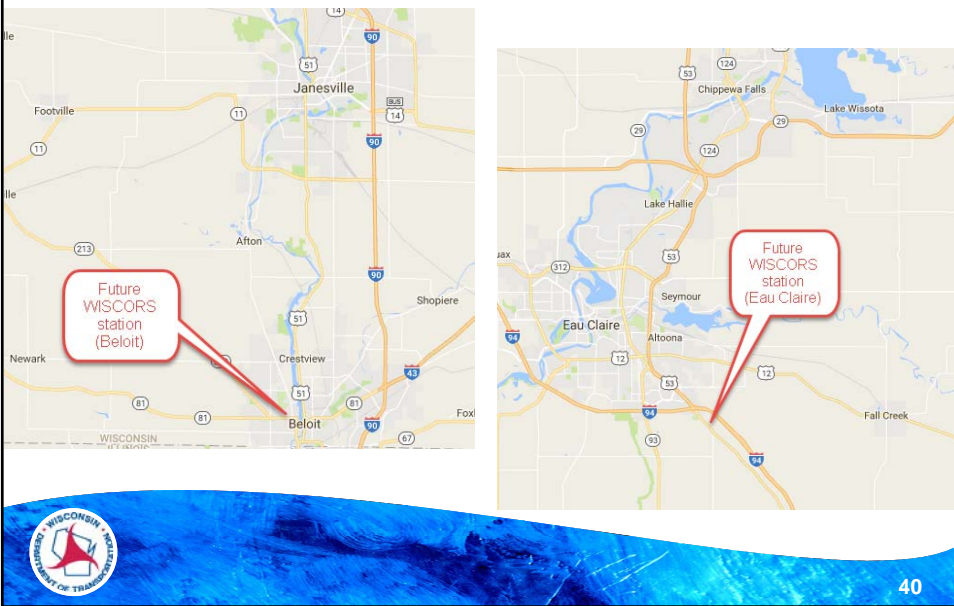
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- **Additional Proposed Future Densification CORS Stations**
  - Port Washington (Ozaukee County)
  - Western Racine County (Racine County)



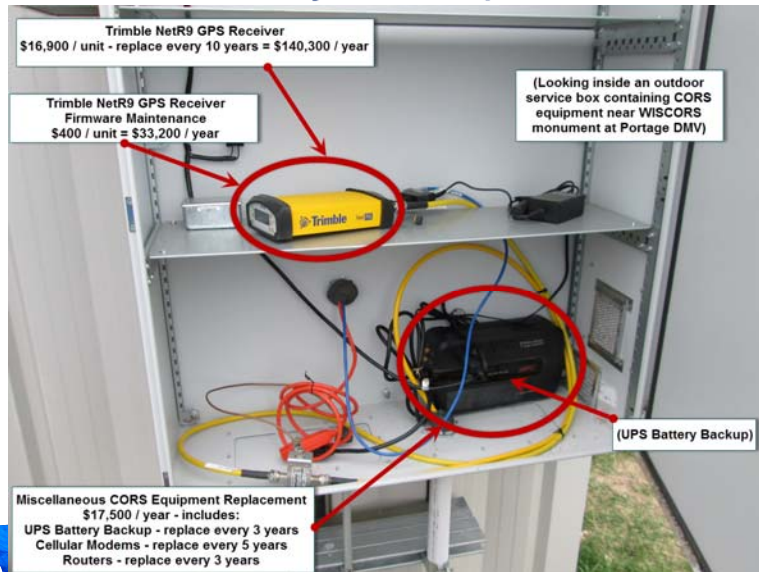
- **Additional Proposed Future Densification CORS Stations**
  - Beloit (Rock County)
  - Eau Claire (Eau Claire County)



## Wisconsin Height Modernization Program WISCORS System Components



## Wisconsin Height Modernization Program WISCORS System Components



## Wisconsin Height Modernization Program WISCORS SYSTEM COMPONENTS

### ANNUAL MAINTENANCE BUDGET (2015)

- NetR9 Receivers: (83 sites x \$16,900/unit x 10 year replacement schedule) = \$140,300 / year
- Software Maintenance - NetR9 Receiver Firmware: (83 sites x \$400 / unit) = \$33,200 / year
- Trimble Pivot Software Level 1 Support = \$22,000 / year
- Trimble Pivot Software Rover Integrity Application = \$9,000 / year
- Trimble Pivot Software Integrity Manager = \$7,000 / year
- Trimble Software Upgrade (7 year replacement schedule) = \$11,000 / year
- Server Expansion / Replacement (5 year replacement schedule) = \$10,000 / year
- Miscellaneous CORS Equipment Replacement = \$17,500 / year
  - (UPS Battery Backups every 3 years)
  - (Cellular Modems every 5 years)
  - (Routers every 3 years)
- CORS Equipment, Repairs and Supplies (including repairing NetR9's, etc.) = \$15,000 / year
- Catastrophic Destruction of a CORS Monument = \$40,000 / year

### Annual Maintenance of WISCORS Network

**= \$305,000 / year\***

\*Current costs - will be  
adjusted for inflation



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## Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development

- The annual equipment and software maintenance cost of the WISCORS Network = \$305,000.
- Bill System Resource Budget (annually) = \$49,500.
- Total Annual WISCORS Network Maintenance Cost = \$305,000 + \$49,500 = \$354,500. (excludes \$35,000 initial Set-up Cost to be funded by WisDOT).
- The intent of the proposed System Maintenance Fee is to provide adequate funding for continuous WISCORS operation.
- The proposed System Maintenance Fee is not intended to recuperate any public funds already spent on system development.



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## Wisconsin Height Modernization Program State Statute

### 85.63 Surveying reference station system.

- 85.63(1) The department shall administer a surveying reference station system consisting of all of the following:
  - 85.63(1)(a) A passive system consisting of a network of monuments located throughout the state that are used to generate latitude, longitude, and elevation data.
  - 85.63(1)(b) An active surveying reference station system consisting of reference stations statewide that continuously transmit global positioning system data to a system server, and the server that receives and processes the data received from the reference stations.
- 85.63(2) The department may charge a fee for providing access to the system under sub. (1) in an amount to be established by rule. All fees received under this subsection shall be deposited in the general fund and credited to the appropriation account under s. 20.395 (3) (jg). *(85.63 History: 2013 a. 20.)*
- 20.395 (3)(jg). Surveying reference station system. From the general fund, all moneys received under s. 85.63 (2), for maintenance and operation costs of the surveying reference station system under s. 85.63 (1).



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## Wisconsin Height Modernization Program State Statute

- 2013 Act 20, the 2013-15 Biennial Budget Act, created s. 85.63, Wis. Stats, which directs the Wisconsin Department of Transportation (DOT) to administer a Surveying Reference Station System program and authorizes DOT to collect a fee for user access to the system.
- S. 85.63 (2) authorizes DOT to establish the fee by administrative rule. The administrative rule gains its authority from the statute. The rule's purpose is to provide additional detail on the administration of the provision and the fee.
- The Statement of Scope for this Permanent Rule was approved by DOT Secretary Mark Gottlieb, P.E., as required by s. 227.135(2), Wis. Stats. SS 080-14, on December 5, 2013, and was approved by the Governor on January 24, 2014, published in Wisconsin Administrative Register No. 698 on March 1, 2014.
- Permanent Rule Making: Wisconsin Administrative Code Trans Ch. 58 Relating to: Surveying Reference Station System (Height Modernization) User Fee.
  - Establish the fee at a level that will generate funding to cover the hardware, software and other costs associated with ongoing upgrades and maintenance of the surveying reference station system and to provide for needed server and system component replacement on a lifecycle basis.
  - Distribute the costs of the surveying reference system upgrades, maintenance and replacement among system users.



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## Wisconsin Height Modernization Program WISCORS Stakeholder Questionnaire Analysis



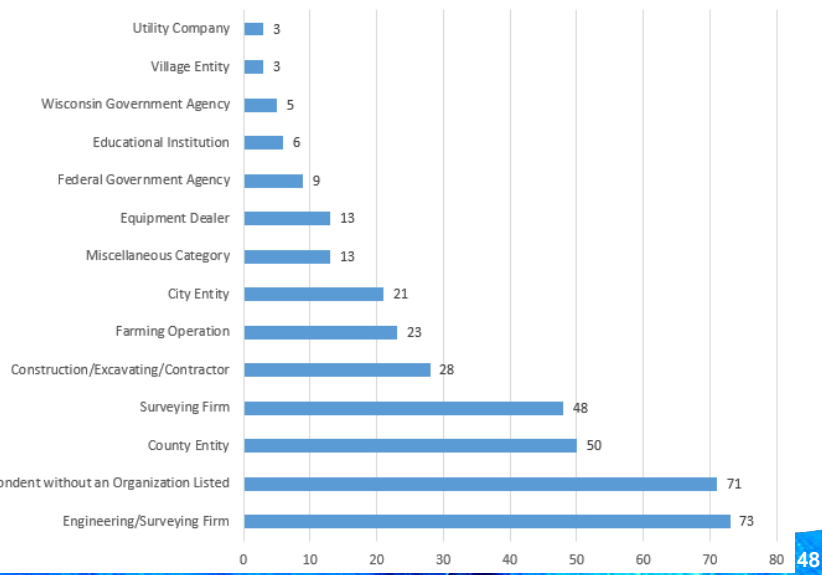
### WISCORS Stakeholder Questionnaire

- WISCORS Stakeholder Questionnaire sent to all registered users on February 2, 2016. Questionnaire were also available at 2016 WSLS Institute and WLIA Conference booths.
- Goal and Objective of Questionnaire:
  - Gained stakeholder feedback to help WisDOT decide how to administer a WISCORS Network user fee.
- Questionnaire noted that stakeholder views and opinions were strictly informational.
- Over 350 respondents had returned questionnaires analyzed.

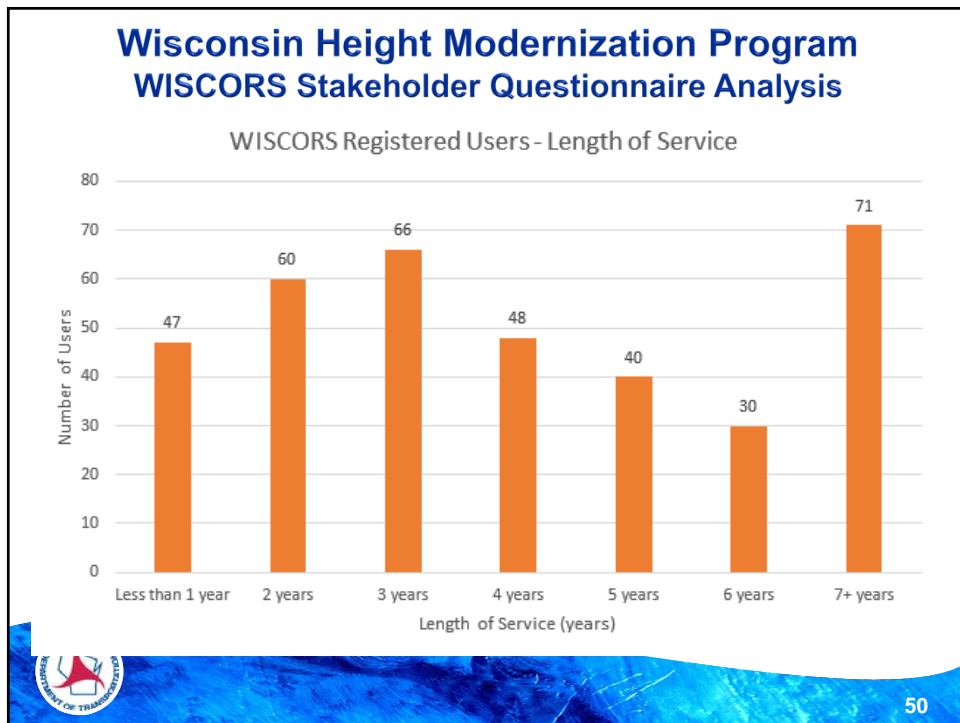
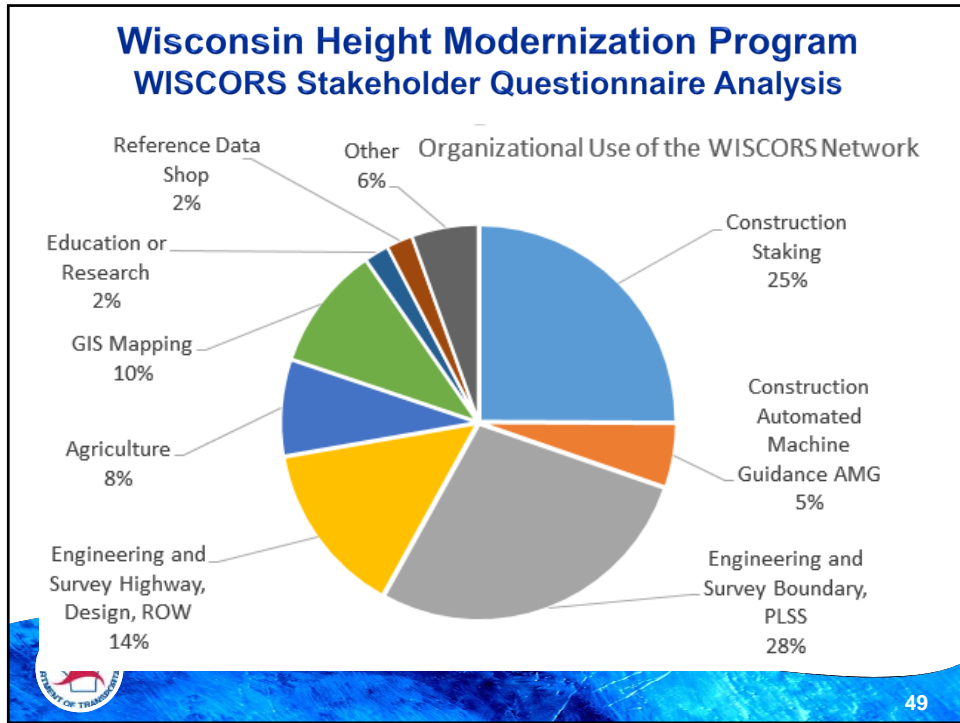


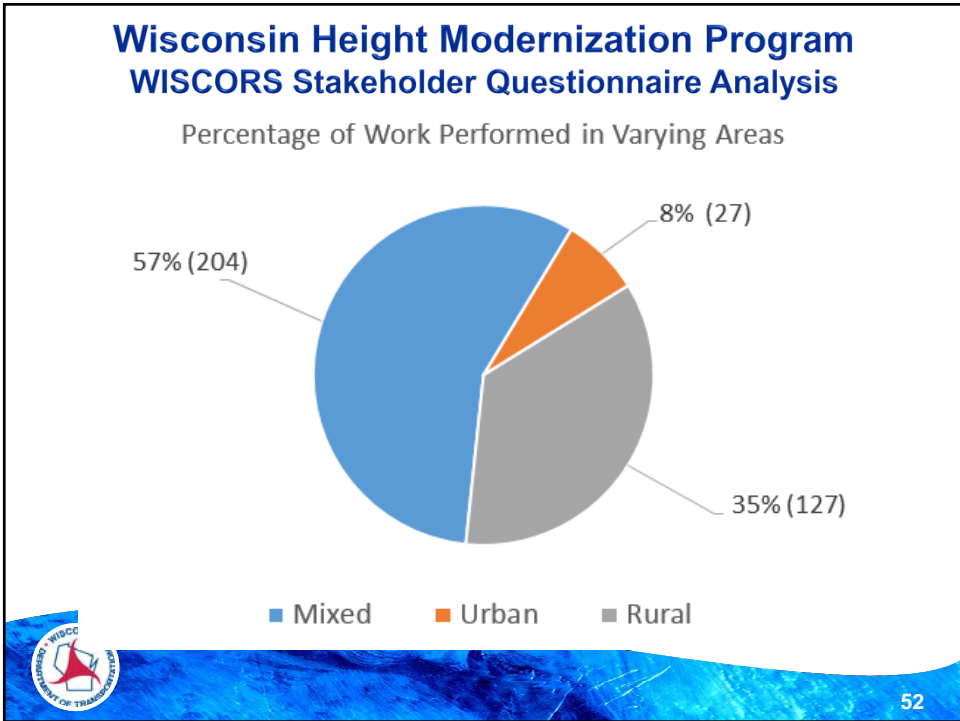
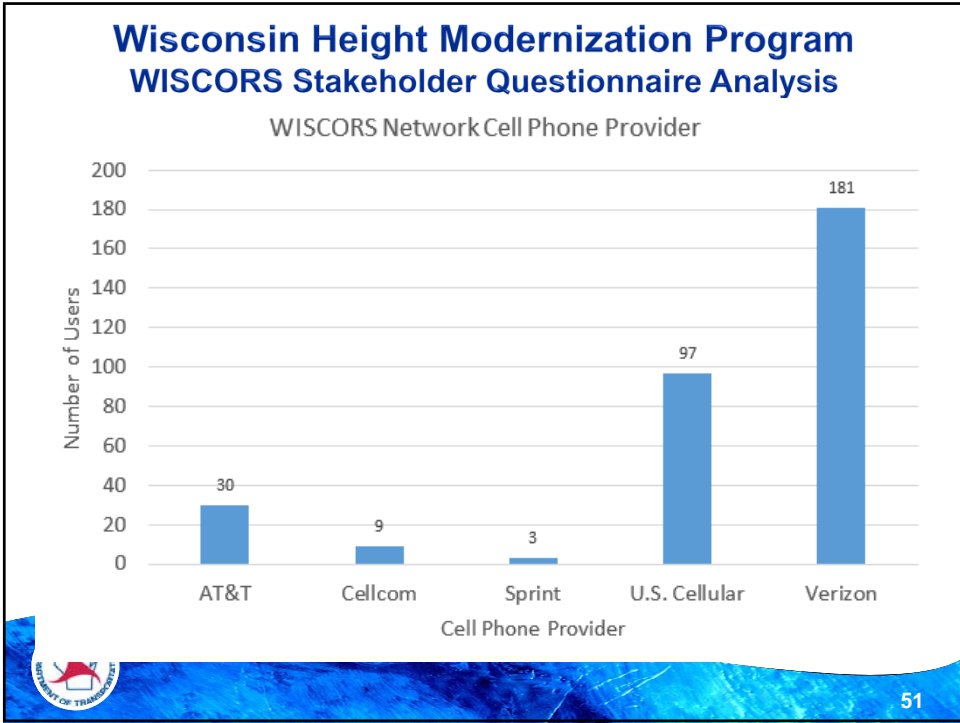
## Wisconsin Height Modernization Program WISCORS Stakeholder Questionnaire Analysis

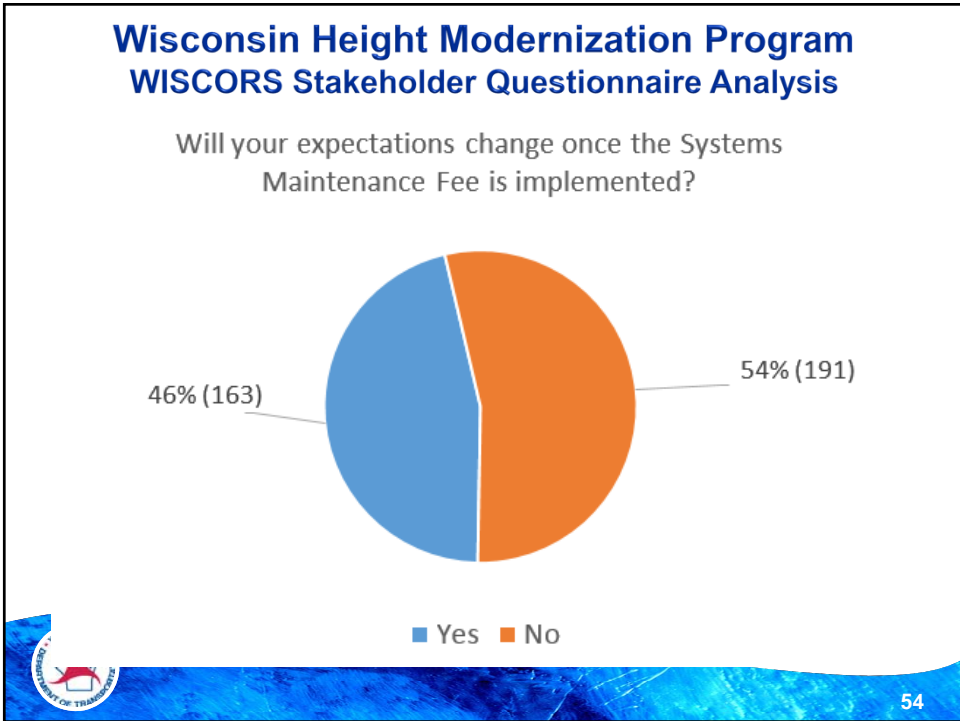
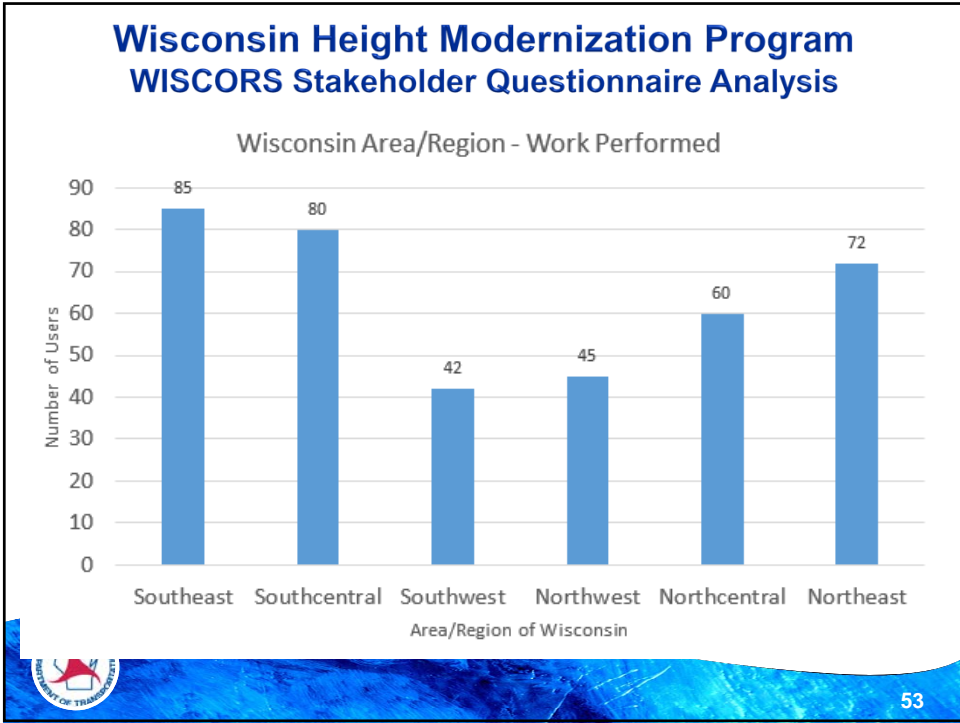
Organizational Categories from WISCORS Questionnaire Respondents

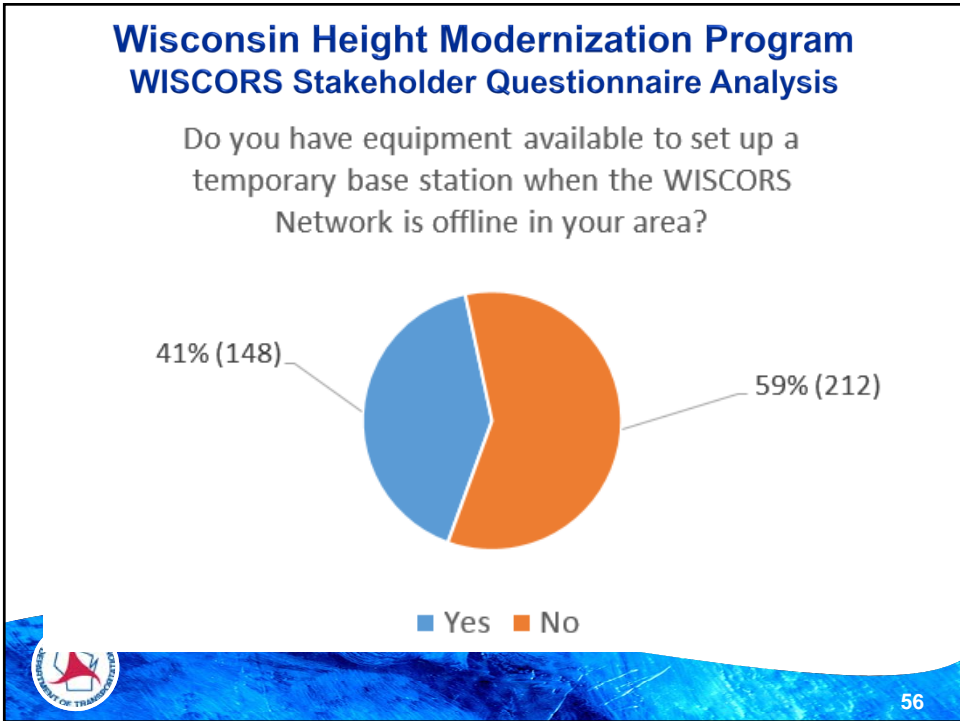
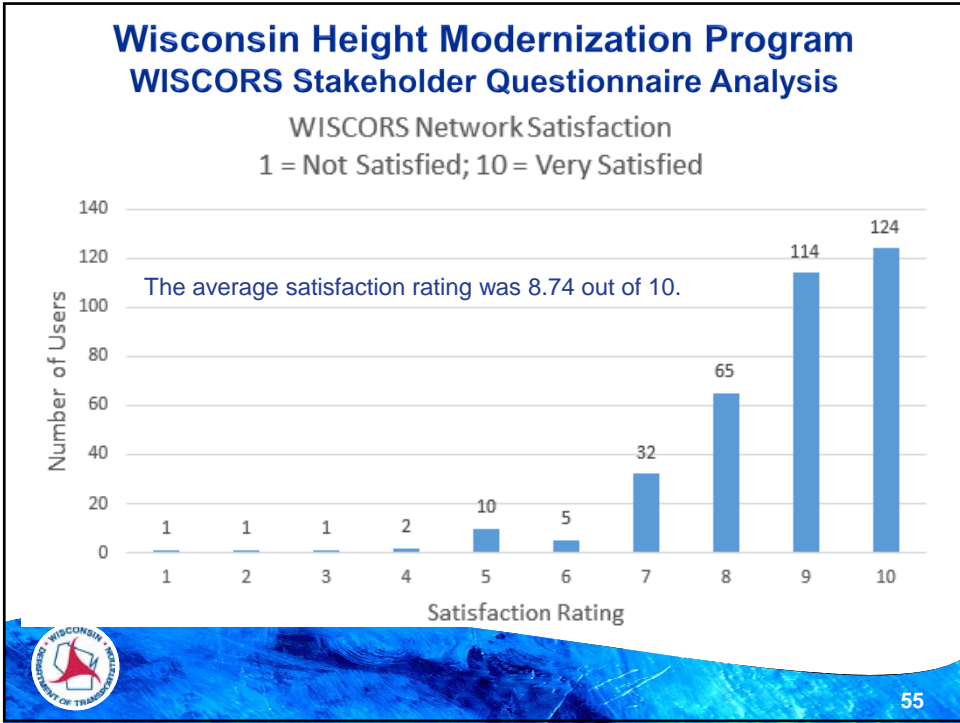






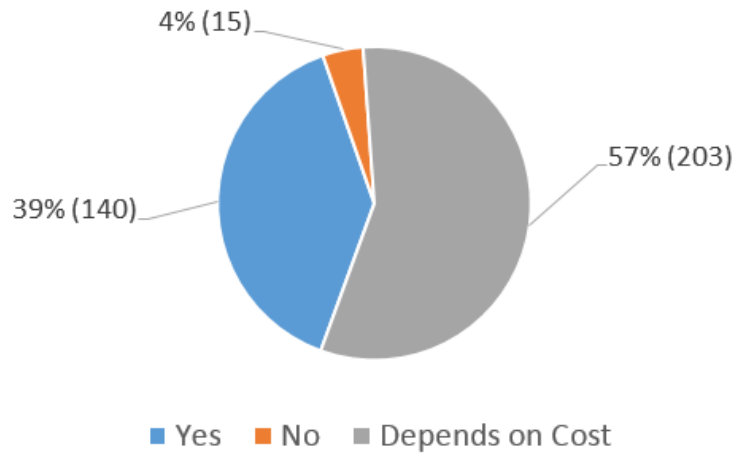






### Wisconsin Height Modernization Program WISCORS Stakeholder Questionnaire Analysis

Will you continue to Use the WISCORS Network after a Systems Maintenance Fee is implemented?



### Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development Revised Proposed Subscription Options

Yearly Subscription Rate(s):

- Individual Subscription Rate:
  - \$300 per subscriber per year.
  
- Organizational Subscription Rate:
  - \$300 per subscriber per year for the first 5 subscribers in the organization + \$150 per subscriber per year thereafter.

Monthly Subscription Rate:

- \$50 per subscriber per month.

Proposed rates are by subscriber login.



## Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development Revised Proposed Subscription Options

### Example 1:

- Organization A – to subscribe 7 users for one year.
  - \$300 per subscriber per year x first 5 subscribers = \$1,500.
  - \$150 per subscriber per year thereafter x 2 subscribers = \$300.
- Organization A total for one year = \$1,800 for 7 subscribers.

### Example 2:

- Organization B – to subscribe 3 users for one year, 2 users for three months each.
  - \$300 per subscriber per year x 3 subscribers = \$900.
  - \$50 per subscriber per month x 2 subscribers x 3 months = \$300.
- Organization B total for combined yearly and monthly subscriptions = \$1,200 for 5 subscribers.



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## Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development Revised Proposed Subscription Options

### Example 3:

- Agriculture User C – to subscribe 1 user for 3 months total for spring planting / fall harvesting.
  - \$50 per subscriber per month x 1 subscriber x 3 months = \$150.
- Agriculture User C = \$150 for 3 months for 1 subscriber.

### Example 4:

- Vermont Firm X – to subscribe 4 users for 1 week.
  - \$50 per subscriber per month x 4 subscribers x 1 month = \$200.
- Vermont Firm X = \$200 for 1 week for 4 subscribers.



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## Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development Registration and Billing

- Proposed Registration and Billing System still under development.
- Registration will be different!
- To register, each proposed subscriber to complete:
  - Subscription level form(s).
  - Department of Administration (DOA) form(s).
- Proposed acceptable methods of payment:
  - Cash.
  - Check.
  - Money order.
- Billing will not commence until after the Rule goes into effect (State FY18) and subscribers have been notified.



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## Wisconsin Height Modernization Program WISCORS System Maintenance Fee Development Exemptions

### Proposed Exempt Entities:

- Wisconsin Department of Transportation subscribers.
- WISCORS Cooperative Partners.
- Border States (Minnesota DOT, Iowa DOT, Michigan DOT).
- Higher Education Institutions:
  - Private Colleges (independent).
  - Public Colleges (state colleges/universities).
- Reference Data Shop for Post Processing.



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## Wisconsin Height Modernization Program Proposed Level of Service

- The following levels of service are proposed:
  - GPS data output/corrections from WISCORS stations 24/7/365 to subscribers.
  - System monitoring during regular work hours of 8:00 a.m. to 4:30 p.m. Monday through Friday. The system will not be monitored during state holidays.
  - Notification of system maintenance schedule(s) to subscribers.
  - WISCORS Administration Team will attempt to restore system service and/or outages as soon as practicable.
  - No subscriber refund or credit for outages or time that the WISCORS Network is unavailable.



## Wisconsin Height Modernization Program Fee Development In Other States

### Networks That Charge A User Fee

| AGENCY/State CORS Network Comparisons – Networks that Charge a User Fee |  |                                     |   |   |  |
|---|--|-------------------------------------|---|---|--|
|   | Seattle Public Utilities                       | Tennessee DOT                       | South Carolina Geodetic Survey                    | North Carolina Geodetic Survey            | Utah Automated Geographic Reference Center                             |
| # Staff dedicated to day-to-day operations                              | 3  | 4                                   | 3   | No information                            | No information   |
| # Stations in Network   | 80   | 70                                  | 45  | 95  | 80 (No Passive Network)  |
| # Receivers Owned   | 4  | 70                                  | 45  | 85  |  |
| # Subscribers   | 75   | 208                                 | 450   | 1717                                      | 400 (paying and non-paying)  |
| Cost for Subscription   | \$1900 w/price breaks                          | \$300 annual 5-yr contract required | \$700 1 <sup>st</sup> year, \$600 each year after | \$500 one-time fee, \$250 per added login | \$600 annual through a web portal Fee established by State Legislature |
| User fee revenue generated  | >\$100,000                                     | 208 users about \$62,000            | \$270,000   |   | Yet to determine if fee covers cost of operation                       |
| Annualized Maintenance Cost   | Partners responsible for equipment maintenance | >\$62,000                           | <\$270,000  |   | Yet to be determined   |





## Wisconsin Height Modernization Program Fee Development In Other States

### Networks That Do Not Charge A User Fee

| AGENCY/State CORS Network Comparisons – Networks that do NOT Charge a User Fee |                           |          |                                 |                       |   |  |          |
|--|---------------------------|----------|---------------------------------|-----------------------|---|--|----------|
|  | Indiana DOT               | Iowa DOT | Kentucky Transportation Cabinet | Michigan DOT          | Minnesota DOT                                       | Missouri DOT                           | Ohio DOT |
| # Staff dedicated to day-to-day operations                                     | 1                         | 1        | 1                               | 1                     | 3   | 1                                      | 1        |
| # Stations in Network  | 45                        | 98       | 39                              | 85                    | 131   | 91                                     | 54       |
| # Receivers Owned  | 45                        | 82       | 24                              | 54                    | 120   | 80                                     | 50       |
| # Subscribers  | 1773                      | N/A      | N/A                             | N/A                   | N/A   | 804                                    | 2663     |
| Cost for Subscription  | N/A; has available budget | N/A      | N/A                             | N/A                   | N/A   | N/A                                    | N/A      |
| User fee revenue generated   | N/A                       | N/A      | N/A                             | N/A                   | N/A   | N/A                                    | N/A      |
| Annualized Maintenance Cost  | \$50,000 - \$80,000       |          | \$100,000- \$150,000            | \$400,000 FY14 budget | \$275,000, doesn't include geodetic control program | \$2M investment, \$200,000 annual cost |          |



## Wisconsin Height Modernization Program Summary of Fee Development In Other States

- Our neighboring states of Minnesota, Iowa and Michigan (DOT) do not charge a user/subscription fee.
- Most agencies that charge a user/subscription fee are not DOTs. Tennessee DOT charges a user fee of \$300/year with a required 5-year contract.
- State agencies in South Carolina and Utah charge the fee as an annual subscription (SC: \$700 first year, \$600 annual renewal; UT: \$600 annual fee through legislative action).
- North Carolina has a one-time access cost of \$500 for two ports and \$250 for each additional port.

Synthesis Report was generated by the WisDOT Research Unit.



## Wisconsin Height Modernization Program Communication Plan

Communicate Rule Completion in State FY18:

- Notice of Public Hearing:
  - ❖ Opportunity to submit comments to the Wisconsin Department of Transportation
  - ❖ <http://adminrules.wisconsin.gov>
- News Release – Social Media.
- 2018 WSLs Institute – WISCORS Update session to be scheduled.
- Display panel update for Agriculture and Corn-Soy shows.
- Consider Final Stakeholder meeting when Billing System is operable and before first bill is sent out.



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## Wisconsin Height Modernization Program WISCORS Network Operation Contacts

### Jacob J. Rockweiler, P.E.

Wisconsin Height Modernization Program Manager  
Wisconsin Department of Transportation  
Truax Center  
Surveying and Mapping Section  
3502 Kinsman Blvd.  
Madison, WI 53704  
Email: [wiscors@dot.wi.gov](mailto:wiscors@dot.wi.gov)

### Diane Arendt, P.L.S


Technical Applications Specialist  
Wisconsin Department of Transportation  
Truax Center  
Surveying and Mapping Section  
3502 Kinsman Blvd.  
Madison, WI 53704  
Email: [wiscors@dot.wi.gov](mailto:wiscors@dot.wi.gov)

### Elliot Smith

WISCORS Network Administrator  
Wisconsin Department of Transportation  
Truax Center  
Surveying and Mapping Section  
3502 Kinsman Blvd.  
Madison, WI 53704  
Email: [wiscors@dot.wi.gov](mailto:wiscors@dot.wi.gov)



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**Question and Answer Session**

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