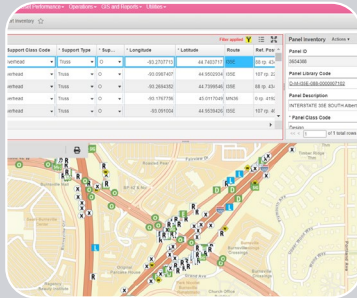


Session Topics



Components and End Section			
		Pipe Attributes	
type	Roadway Type	Pipe Material Type	Pipe Shape
rt	Centerline	Corg. Steel (CSP)	Round
Tile	Other	TP Perf Pipe	Round
r	Mainline	Corg. Aluminized Steel (CAS)	Round
rt	Centerline	Lining	Round



Enterprise Asset Management System

- TAMS

Data Interoperability

- Automated Vehicle Location Data for Operations
- Building Information Modeling (BIM)

Data Collection Efforts

- Remote Sensing
- As-Builts

Data Access

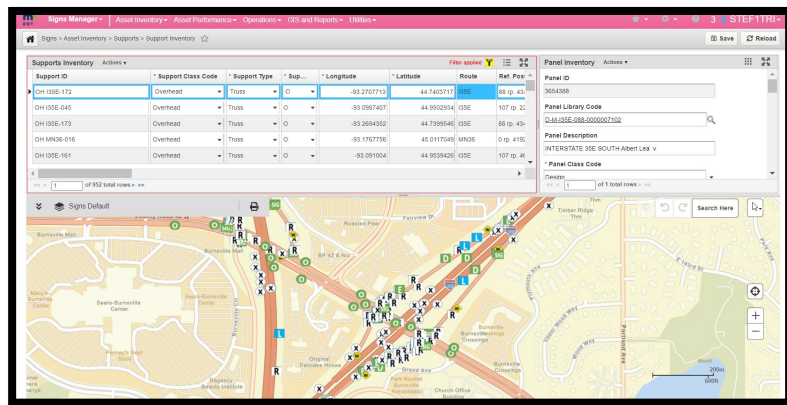
- Georilla
- Data Warehouse

Enterprise Asset Management System

Transportation Asset Management System

Transportation Asset Management System (TAMS)

- Agile Assets Enterprise AM “COTS” Commercial Off The Shelf Software
- Development Started
 - 2016
- 4 Modules, 2000 Users



Asset Inventory & Condition

Performance Measures

Work Planning

Accomplishments

Reporting

Transportation Asset Management System

Ancillary Assets

TAMS Release 1 (2016)

- **Tr**
- **Rc**
- **In**
- **At**
(A)
- **W**
- **Rc**
Devices (RWIS)

TAMS Release 2 (2019)

- **Structures**
- **ds**
- **m Water Tunnels**
- **ier (Guardrail)***
- **ning Systems***
- **Markings (Turn Lanes, :.)**
- **Sections For ce Work Tracking**
- **Sign Structures* and Panels**



TAMS3 Assets (2022)

- **Entrance Monuments***
- **Geotechnical Assets (ERS, lightweight fill, ground improvement, geotechnical special drainage, and instrumentation system)**
- **Pedestrian Infrastructure* (sidewalk and curb ramps)**
- **Snow & Ice Assets Snow fence and snow traps**
- **Pavement Striping**
- **Weigh Station Scales**

****Includes inspection data***

Transportation Asset Management System

Asset Inventory

Maintenance Management | Asset Inventory | Asset Performance | Planning | Operations | GIS & Reports | Utilities | 3 **STEP1...**

Maintenance Management > Asset Inventory > Hydraulic Infrastructure > Pipe Inventory ☆ Save Reload

Inventory **Inspections**

Actions ▼

* Pipe	* Status	* Class Code	Administrative Unit	Route ID	Offset	Beg. Measure	Reference Post Offset	Local Name	Roadway Type	Last Inspection Date	Last Condition	Current Pipe
2221783	Inplace	Storm Drain	9121 - Duluth Subarea	0100000000000035-	14.219	257.271	257+00.188	p267	Centerline	8/20/07	2 - Fair	Round
2221786	Inplace	Culvert	9121 - Duluth Subarea	0100000000000035-	13.316	257.581	257+00.498	p283	Centerline	8/21/07	2 - Fair	Round
2221791	Inplace	Storm Drain	9121 - Duluth Subarea	0100000000000035-	14.083	257.403	257+00.320	p652	Centerline	9/25/07	2 - Fair	Round
2221792	Inplace	Storm Drain	9121 - Duluth Subarea	0100000000000035-	13.663	257.689	257+00.606	p655	Centerline	9/26/07	2 - Fair	Round

<< 1579 of 9879 total rows >>

MMS Default Search Here

	Record History	Documents	Maint. Histor
786211	Yes	0	No
789890	Yes	0	No
879945	Yes	0	No
913871	Yes	0	No
791614	Yes	0	No

Transportation Asset Management System

Inspection Tracking

Signal and ITS Manager

Asset Inventory

Asset Performance

Planning

Operations

GIS & Reports

Signal and ITS Manager > Asset Performance > Signal Pole Inspection Request

SaveReload

Inspection

Actions

Administrative Unit

7000 - Metro District

Status

Pending

Signal System

SigSys-US81-10TH STREET-1735475

Inspection Request Date

8/13/2020

Inspection Date

6/6/2017

Documents

User Update

SOLS1EMM

Inspection Report

Inspection Type

Structural - Signal Pole

Priority

2 - Medium

Assembly ID

21002-5

Due Date

Structural Condition

5-Fair

Comments

Overall condition is fair

Date Update

8/14/2020

Elements and Condition Rating

Inspection Elements

Inspection ElementCondition Ra...CommentsUser UpdateDate Update

S.01.Foundations3-FairCorrosion on green pedestSOLS1EMM8/14/2020

S.02.Anchor Rods3-FairSOLS1EMM8/13/2020

S.03.Transformer / Base Plates3-FairSOLS1EMM8/14/2020

S.04.Pole / Tower3-FairSOLS1EMM8/13/2020

S.05.MAC Lower Connection3-FairSOLS1EMM8/14/2020

S.51.MAC Upper Connection3-FairSOLS1EMM8/14/2020

Element Checklist


Inspection ElementChecklist ItemResultCommentsUser UpdateDate Update


Element Check-lists

General Information

Transportation Asset Management System

Maintenance Work Orders


Maintenance Management -
 Asset Inventory -
 Asset Performance -
 Planning -
 Operations -
 GIS & Reports -
 Utilities -


 Maintenance Management > Operations > Work Orders (Simple) ☆

Work Orders Actions ▼

Highway	WR#	WO#	Activity	Comments	Asset Type	Subactivity	DR?	ICR #	Start Date	Responsibl...
		27295	Clean (Each)		Hydraulic Structures	000: No Suba...	<input type="checkbox"/>		12/3/2018	
▶ US53		132308	Mowing for Safety - Top Cuts (Cen...	Mow Virginia 0531	Section	000: No Suba...	<input checked="" type="checkbox"/>		5/24/2021	
MN65		133724	Other (Hours)	Hibbing-Hwy 65 and Creek Road/Side ...	Pipe	000: No Suba...	<input type="checkbox"/>		6/2/2021	
MN48		66366	Repair in Kind (Linear Foot)		Termini	000: No Suba...	<input checked="" type="checkbox"/>	20270091	2/10/2020	
I35		38849	Repair in Kind (Linear Foot)		Termini	000: No Suba...	<input checked="" type="checkbox"/>	19270633	6/19/2019	
I35		38852	Repair in Kind (Linear Foot)		Termini	000: No Suba...	<input checked="" type="checkbox"/>	19270066	6/19/2019	

<< < 2 of 6 total rows >> >>

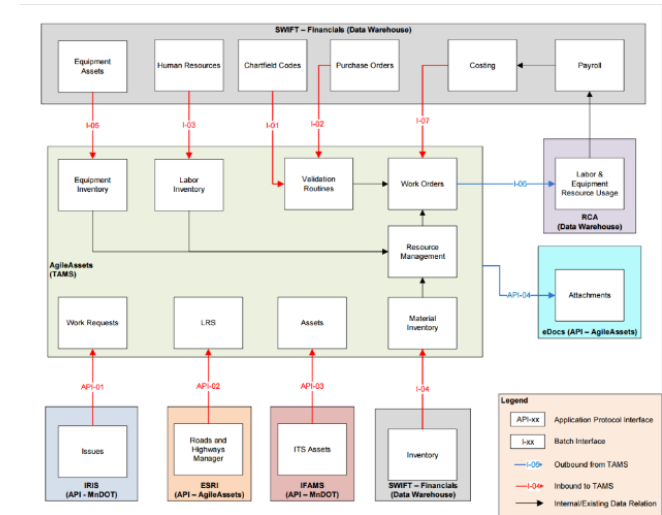
Labor Equipment Material Non-Inventoried Material Location/Asset Direct Costs Contract and PO Cost

Work Target Actions ▼

Approved	Asset Name	* Accomplishments	* Work Date	Route ID	BMP	En...
▶ <input checked="" type="checkbox"/>	US 53 D RP 038+00.972	1	5/24/2021	020000000...	39.061	84.61

Transportation Asset Management System Integrations

- TAMS is integrated with timesheet program, human resources, financial systems (People Soft), signal and ITS operations, equipment tracking, ESRI Roads and Highways (LRS), Georilla (GIS Open source), and document management system (plan sheets).



Maintenance Management

Asset Inventory

Asset Performance

Planning

Operations

GIS & Reports

Utilities

Maintenance Management > Asset Inventory > Earth Retaining Systems > ERS Inventory

ERS Inventory

Actions

Min Height	Avg Height	Structure Length	Wall Area	Features Carried	Features in Front	Consequence of Risk	Documents	Inspection History	Maint. History	Record History
1	4	348	1392	Paved Road	Vegetation		1	1	No	Yes

Documents

Actions ▾

Refresh from eDocs

Is Linked	Document Type	Category	Document Name	Description
			R-008-013-006	

Actions ▾

Large Icons ▾

Route ID
0200000

Offset
9.163

Beg. Me.
12+72.12

PROPOSED RETAINING WALL PROFILE

Transportation Asset Management System

Damage Restitution *New* Automation

MMS - Damage Restitution Enhancement



Resources > Damage Restitution > Labor > Equipment > Materials > Reports > Utilities > 3 STEF1

Resources > Damage Restitution > DR Claim ☆ Save Relo

CLAIMS RECORDS

* Claim ID	Entered By	* District	ICR #	* Claim Status	Multiple Claims	Accident Date	Asset Type	Asset ID	Thru R...	Cross S...	Dir	Latitu...	Longit...	City	Township	Ref Point	County
203	NELS2BAR	DISTRICT	19270066	3 COMPLETED	<input checked="" type="checkbox"/>	1/7/2019	Linear Barriers	Traffic C...	I35		Nort	46.576352	-92.585032	Duluth		254.747	Carlton
211	NELS2BAR	DISTRICT	19271245	3 COMPLETED	<input type="checkbox"/>	5/19/2019	Linear Barriers		I35	Midway Stree	Sout	46.711874	-92.261868			247.17	Saint L
212	NELS2BAR	DISTRICT	19271244	3 COMPLETED	<input type="checkbox"/>	5/19/2019			I35		Nort	46.711351	-92.263370			247.148	Saint L
213	NELS2BAR	DISTRICT	19270989	3 COMPLETED	<input type="checkbox"/>	4/16/2019			I35		Nort	46.031915	-92.925220			184.533	Pine
214	NELS2BAR	DISTRICT	19270633	3 COMPLETED	<input type="checkbox"/>	3/2/2019	Linear Barriers		I35		Nort	46.504943	-92.674960			220.5	Carlton
104	NELS2BAR	DISTRICT	19271473	3 COMPLETED	<input type="checkbox"/>	6/13/2019	Linear Barriers		I35		Sout	46.313258	-92.828179			205.248	Pine
310	NELS2BAR	DISTRICT	19270499	3 COMPLETED	<input type="checkbox"/>	2/15/2019	Linear Barriers		I35	Midway Road	Sout	46.720979	-92.238477	Duluth		248.502	Saint L
307	NELS2BAR	DISTRICT	19800082	3 COMPLETED	<input type="checkbox"/>	1/14/2019	Linear Barriers		MN210		East	46.638509	-93.168090			182.060	Pine
311	NELS2BAR	DISTRICT	19271041	3 COMPLETED	<input type="checkbox"/>	4/22/2019	Linear Barriers		I35		Sout	46.721923	-92.237301	Duluth		248.557	Saint L

<< 1 of 420 total rows >>

Work Records

WO#	WR#	Activity	Completion Date	Documents	Asset	Thru Route	Subactivity
35518	15434	Repair in Kind (Linear Foot)	7/1/2019	0	TBT-I35-247-34	I35	000: No Subactivity
35767	15434	Repair in Kind (Linear Foot)		0	TBT-I35-247-34		000: No Subactivity
38852		Repair in Kind (Linear Foot)		0	TBT-I35-227-29B	I35	000: No Subactivity
39135		Repair in Kind (Linear Foot)	7/1/2019	0	TBT-I35-227-29B	I35	000: No Subactivity

Add Work Requests

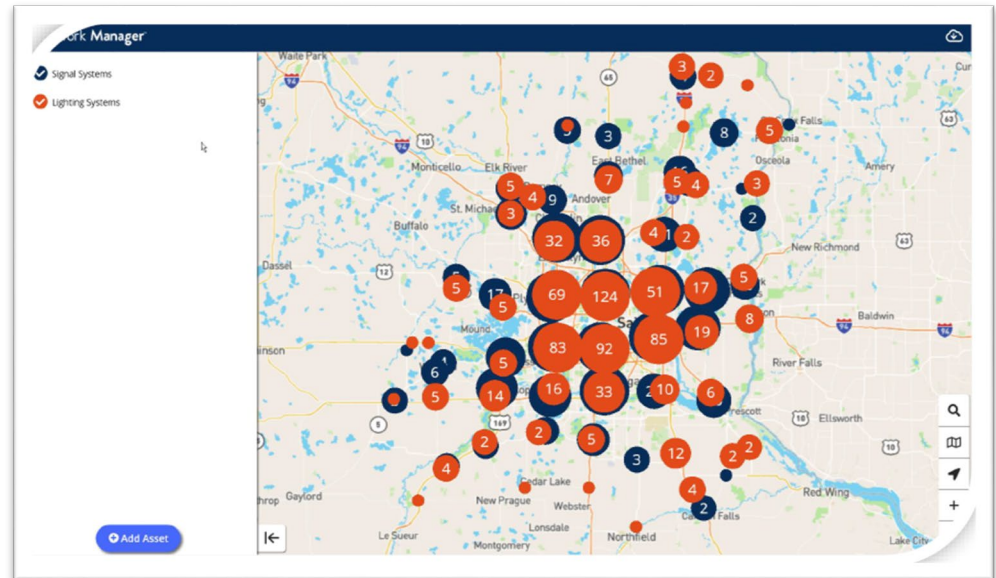
Add Work Orders

RM Default

Transportation Asset Management System

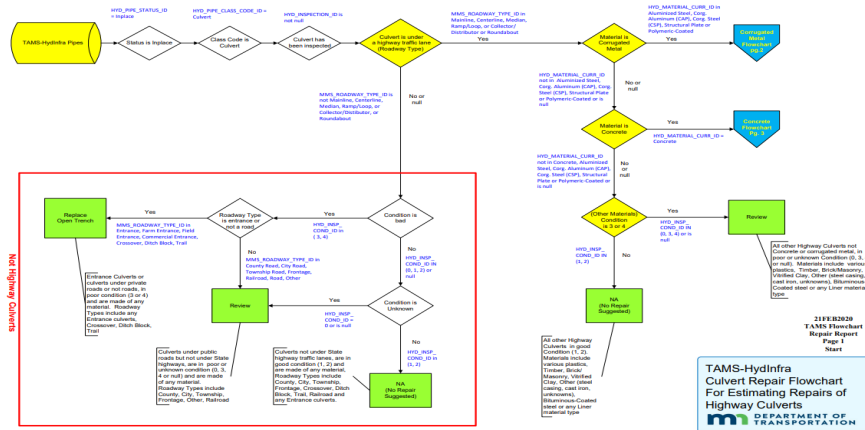
New Work Manager

- Field Ready
- User Friendly
- Database Integration
- Map/Form Combo
- Meet Work-Flow Needs
 - ✓ Inventory
 - ✓ Inspections
 - ✓ Work Orders
- Consultant Accessible



The screenshot shows the 'Noisewall Inspection' form interface. The form is titled 'Noisewall Inspection' and includes several input fields for data entry. The fields are: 'Location' (with a 'Pick location' button), 'MnDOT Wall Number' (marked as 'Required'), 'Status', 'Inspection Request Date', 'Priority', 'Inspection Date', and 'Inspector Name'. A sidebar on the left side of the form displays a list of inspection groups and defects, including 'Noisewall Inspection', 'Noisewall Inspection Defects', and 'Noisewall Inspection Defects'. The form is designed for easy data entry and includes a 'Back' button at the top left.

New Maintenance Work Planning



1. Asset type and inspection results plugged into decision tree
2. Results TAMS Table of individual asset repairs
3. Did asset repairs get done? Check work order accomplishments.
4. Report on Work Demand
5. Plan for next season of Work

Maintenance Management

Asset Inventory

Asset Performance

Planning

Operations

GIS & Reports

Utilities

Maintenance Management

Asset Performance

Work Demand

Maintenance Assets Work Demand

Admin Unit

Select Admin Unit

Asset

Pipe

Activity

Select Activity

Maintenance Assets Work Demand Details

Year	Activity	Asset Type	Asset ID	District	Administrative Unit	Suggested Repair	Last Condition	Assessment Defect Status	Inspection Date	Accomplished Work?	Work Date	Work Demand
2022	Inspection (Hours)	Pipe	2518078	7324 - Hastings Subarea	Review	1 - Line New	Yes	6/28/2021	Yes	6/28/2021	No	
2022	Inspection (Hours)	Pipe	2275454	7324 - Hastings Subarea	Review	0 - Unable to Inspect	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2192158	7331 - Plymouth Subarea	Install Pipe - Trench	3 - Poor	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2650584	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2286941	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2286937	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2182128	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/4/2021	No	6/4/2021	No	
2022	Inspection (Hours)	Pipe	2286934	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/4/2021	No	6/4/2021	No	
2022	Inspection (Hours)	Pipe	2192128	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/4/2021	No	6/4/2021	No	
2022	Inspection (Hours)	Pipe	2286048	7324 - Hastings Subarea	None	2 - Fair	Yes	6/4/2021	No	6/4/2021	No	
2022	Inspection (Hours)	Pipe	2186470	7324 - Hastings Subarea	None	1 - Line New	Yes	6/28/2021	No	6/28/2021	No	
2022	Inspection (Hours)	Pipe	2248436	7331 - Plymouth Subarea	Install Pipe - Trench	4 - Severe	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2286991	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2286960	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	3950574	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2181955	7331 - Plymouth Subarea	None	2 - Fair	Yes	6/30/2021	No	6/30/2021	No	
2022	Inspection (Hours)	Pipe	2223730	7331 - Plymouth Subarea	Install Pipe - Trench	3 - Poor	Yes	6/30/2021	No	6/30/2021	No	

Maintenance Level 1 Repair Totals for Highway Culverts

20% of 1378 Level 1 Repairs to do State-wide = 276

Level 1 Repairs	700 - Metro District	9100 - District 1	9200 - District 2	9300 - District 3	9400 - District 4	9600 - District 6	9700 - District 7	9800 - District 8	Grand Total
Joint Repair	11	97	16	29	43	135	122	79	532
Paved Invert	4	8	5	2	6	11	10	1	47
Replace Aprons	3	15	8	7	10	5	4	4	56
Reset	14	129	82	61	78	97	201	81	743
Total Number of Level 1 Repairs	32	249	111	99	137	248	337	165	1378
20% of Level 1 Repairs - Target	6	50	22	20	27	50	67	33	276

Data Interoperability

Automated Vehicle Location Data for Operations
Building Information Modeling (BIM)

Data Interoperability Operations

- Operations Activities
 - Snow and Ice
 - Herbicide Application
 - Mowing
 - Striping
- Labor, Equipment, Materials



Figure 1 – A complete AT500 installation, as seen from the passenger side (Source: IMO Data Collection and Application Demonstration Project final report)

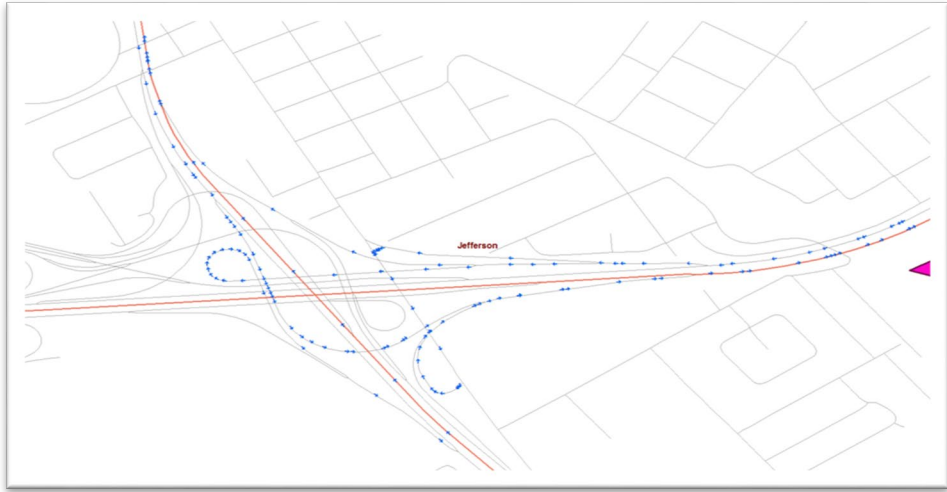


Figure 2 – A complete AT500 installation, as seen from the operator's side (Source: IMO Data Collection and Application Demonstration Project final report)



Data Interoperability

- Create work orders (LEM)
- (?) update asset data
- AVL turned spatial
- Match TAMS Format
- API or other means of importing

[illegible][illegible]

Operations Data

Automated AVL Work Orders

m DOT Maintenance Management | Asset Inventory ▾ Asset Performance ▾ Planning ▾ Operations ▾ GIS & Reports ▾ Utilities ▾ 3 STEF1TRI

Maintenance Management > Operations > Work Orders ☆ Save Reload

Insert Insert Like Make Daycards Complete Copy

Work Orders									Account Codes			
Highway	WR #	WO #	* Activity	Description/Comme...	Asset Type	Start Date	Finish Date	Work Order Status	Appr...	* Project ID	Valid Acct	User U
I35E		147551	Fence Repair and Installation (Linear Foot)	Fence repair on 35E and C	Section	9/8/2021	9/8/2021	(Active) Not Assigne	T790081	TP9F0611	<input checked="" type="checkbox"/>	DIAZ1R
I35E		147556	Fence Repair and Installation (Linear Foot)	Fence repair on 35E and F	Section	9/8/2021	9/8/2021	(Active) Not Assigne				
MN65		147563	Gravel Shoulder Restoration (Centerline Mile)	Hwy 65 Shouldering	Section	9/2/2021	9/10/2021	(Closed) Ready to C				
I94		147470	Light Patching (Centerline Mile)	Emergency pothole repair	Section	9/8/2021	9/8/2021	(Active) Not Assigne				

<< 22 of 30 total rows >>

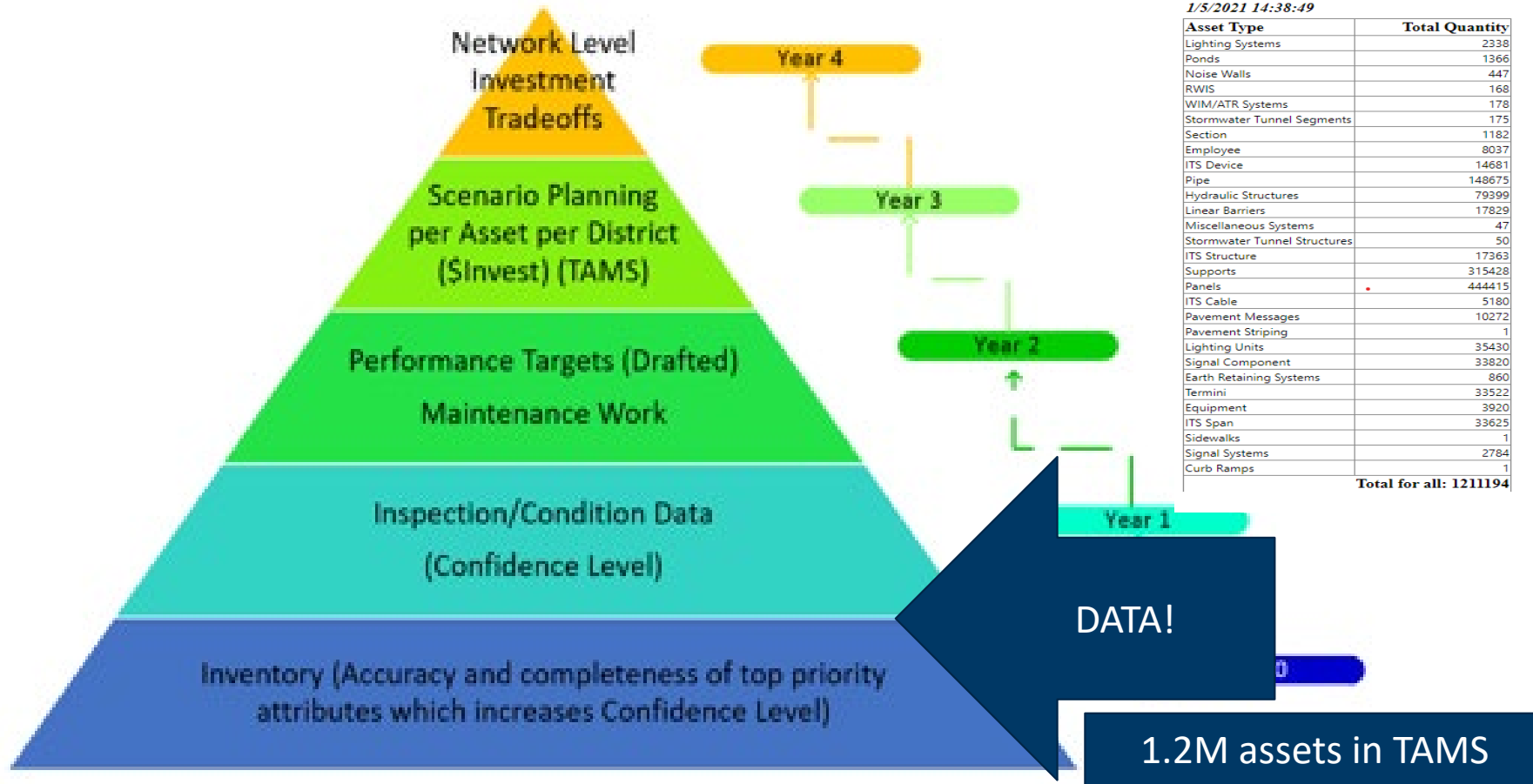
Labor Equipment Material Non-Inventoried Material Location/Asset Direct Costs Contract and PO Cost

Work Target												
E...	Primary Objective Id	Primary Herbicide Target Id	Water Present?	Acres Treated	Start Time	End Time	Material Stock	Sand Amount	Salt Amount	Brine Amount	Measurement Unit	Us
134.56			<input type="checkbox"/>									DIA

Herbicide Data

Snow & Ice Data

Building Information Modeling Data is The Foundation of Asset Management



Focus on The BIM Asset Information Model: Asset Management Strategy

AMSIP Data Action Plan Recommendation #6 “Interoperable Design, Construction, and Asset Management Software Systems (data) Forming a Whole Lifecycle Approach... “BIM”.



© UK Crossrail

Figure 13. Graph. Comparison of asset information growth between current and an alternate “whole lifecycle” project delivery practice. Adapted from (UK Crossrail).

Let's Adopt BIM for the VALUE in the creation, collaboration, and exchange of shared models and intelligent structured data

BIM Asset Information Model Can Include...

- Asset register or inventory
- Topographic data and quantities delivered
- Condition and/or Performance Data
- Asset Life Expectancy Data
- Construction Activities and Costs
- Contextual Data Such as Climate and Surroundings
- Asset History

BIM and Asset Management



BIM and Asset Management



BIM is mandated by UK Government for central government funded projects from 2016, under the Government Construction Strategy. The majority of developments since this strategy was launched have focused on BIM for design and construction. However, a core objective of the strategy is to maximise whole life value and minimise whole life costs and risks. To support this objective ICE and IAM are jointly developing an Application Guide on *Enhancing Asset Management through BIM*. This short factsheet introduces the planned Application Guide; its purpose, scope and content; and seeks feedback and contributions from the target readers to ensure that the Guide meets the needs of the users.

Purpose

BIM

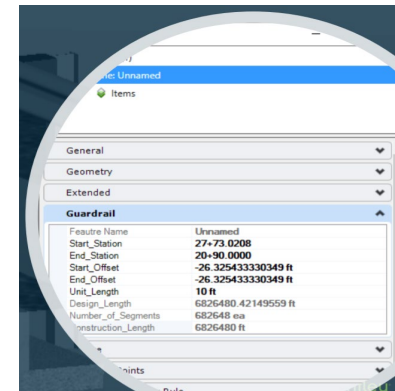


Building To Institutionalize MnDOT BIM

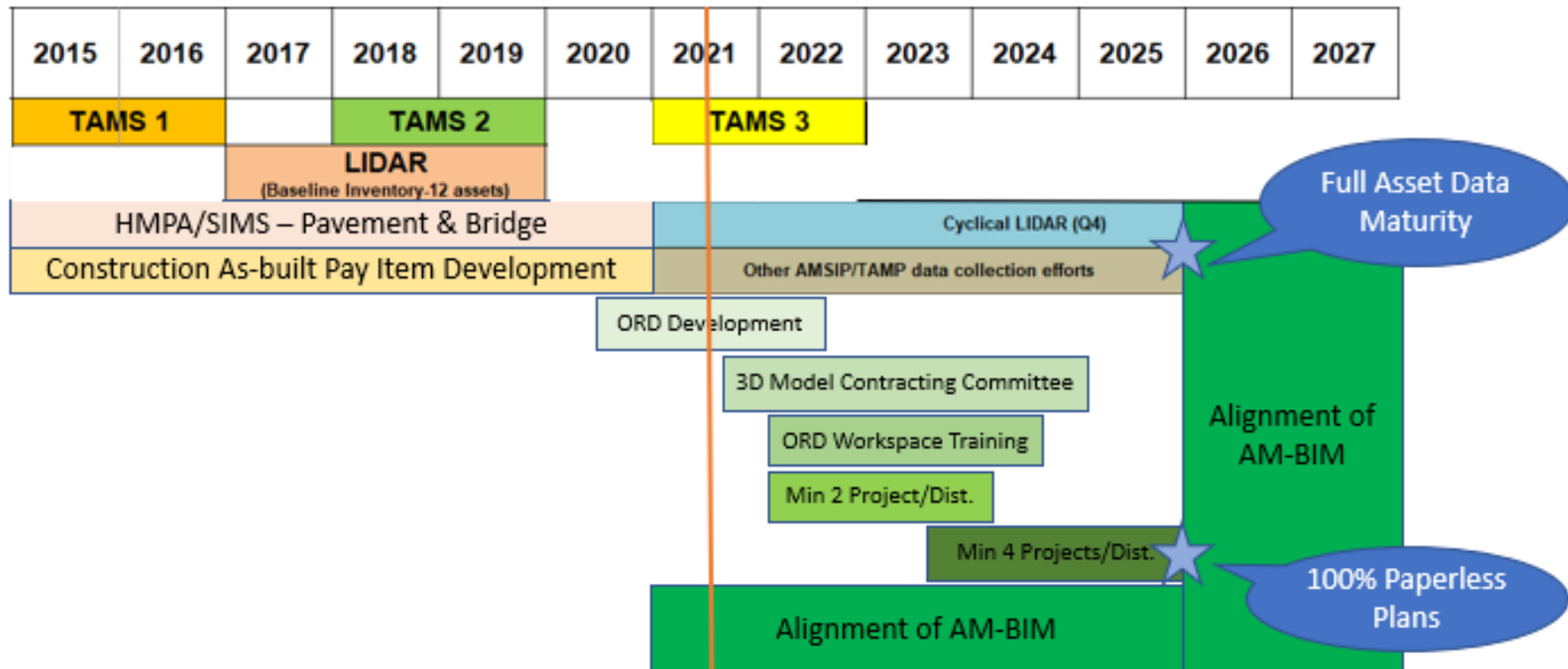
1. RTMC (ITS assets) and Metro District lighting operations has been providing GIS to CADD for design and utilizing CADD design data to create pending GIS for 15+years (FME).
2. Metro District utilized sign Microstation placement tool for 5 years, 30% design savings utilizing existing sign data for sign plan GIS to CADD <efficiencies report>
3. In current design business process, MnDOT already captures asset characteristics, asset type, size, materials.
4. Training opportunities while moving to 3-D design
5. New Enterprise Software Systems, AASHTOware, TAMS, ORD
6. Innovative Agnostic Data Exchange Options, Application Program Interface (API) and Industry Foundation Classes (IFC)



Major Highway Projects, Trunk Highway Fund Expenditures and Efficiencies Report



MnDOT BIM Timeline



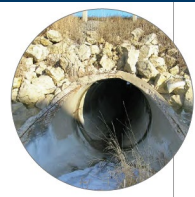
BIM

TH169 Elk River Pilot Project



Project Overview for the TH 169 Elk River Redefine

- \$130 Million Construction Cost
- 3 miles of reconstruction
- Five Proposed Interchanges
- Construction Manager/General Contractor (CMGC) Delivery Method
- Continuous iterative design instead of traditional design/review cycles



BIM

Enterprise Proof of Concept

- **Goal #1** – Repeatable Proof of Concept
- **Goal #2** - Design and Implement the flow of asset management data within and across software platforms.
- **Partners** - Bentley (Lead), MnDOT, WSB, Trimble, Agile Assets

- **Milestones**

1. Asset Class For Pilot
2. Asset Data Elements and Format
3. Data Models
4. Implement Existing Asset Data
5. Develop Connection Points and Data Flow



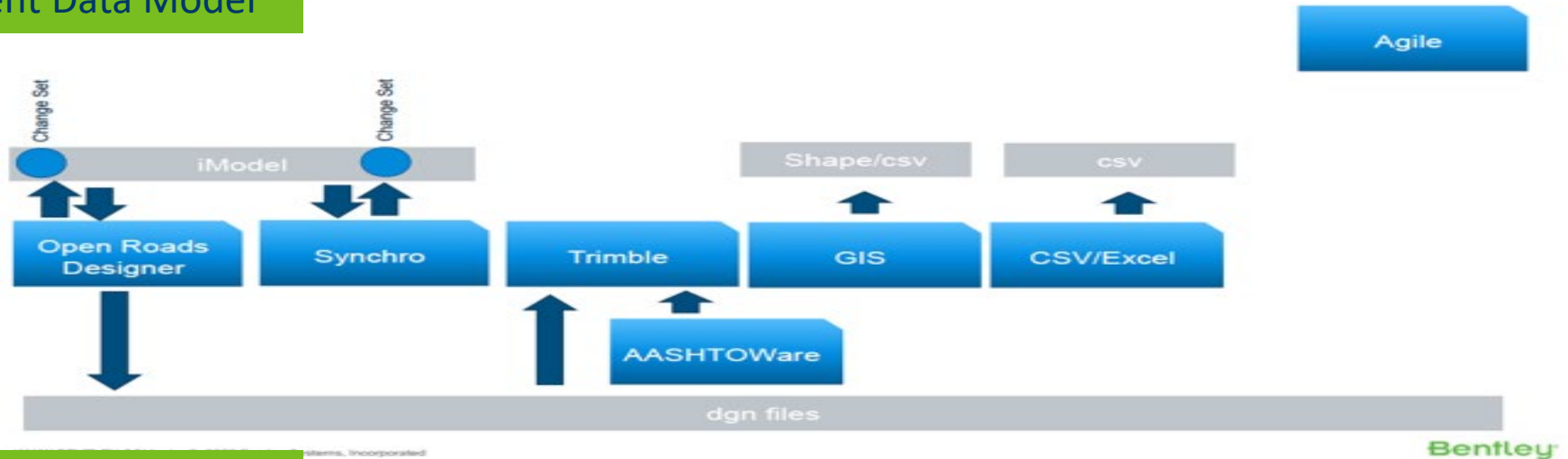
BIM Asset Information Model

	B	C	D	E	F	G	H	I	J	K	L	M
	COLUMN_ID	COLUMN_ALIAS	Populate for Proof-of-Concept	Note	Reference Value Enforced?	Reference Table	Data Type	Size	Scale	DB Required	Unique Identifier	SOR
1												
2	HYD_STRUCTURE_ID	Hydraulic Structures	Yes*	This is our systems Unique auto-intger, aka "TAN"	No	HYD_STRUCTURE_INVE	Integer			Yes	Yes	TAMS
3	HYD_STRUCTURE_NAME	Hydraulic Structures	No	Auto-populated as converted text from HYD_ST	No		String	100		Yes	No	
4	HYD_STRUCTURE_STATUS_ID	Hydraulic Structures Status	Yes		Yes	SETUP_ASSET_STATUS	Integer			Yes	No	ORD
5	HYD_STRUCTURE_CLASS_CODE_ID	Hydraulic Structures Class Code	Yes		Yes	HYD_STRUCTURE_CLAS	Integer			Yes	No	ORD
6	HYD_STRUCTURE_TYPE_ID	Structure Type	Yes		Yes	SETUP_HYD_STRUCTURE	Integer			No	No	ORD
7	OWNER_ID	Administrative Unit	No		Yes	SETUP_OWNER	Integer			Yes	No	
8	LOCAL_NAME	Local Name	Yes	As			String	100		No	No	ORD
9	MMS_ROADWAY_TYPE_ID	Roadway Type	Yes*	If		ROADWAY	Integer			No	No	ORD
10	HYD_GRATE_TYPE_ID	Grate/Frame Type	No			GRATE TY	Integer			No	No	
11	HYD_MAT_STRUCTURE_ID	Material Type	Yes*	If		MAT_STRU	Integer			No	No	ORD
12	HYD_STRUCT_DIAMETER	Structure Diameter In	No				Number	22	4	No	No	
13	HYD_STRUCT_HEIGHT	Structure Height Ft	Yes				Number	22	4	No	No	ORD
14	HYD_SUMP_DEPTH	Structure Sump Depth Ft	No				Number	22	4	No	No	
15	HYD_NUM_PIPES	# Connected Pipes	Yes	If			Integer		0	No	No	ORD
16	HYD_MAT_RING_ID	Ring Material	Yes*	If		MAT_RING	Integer			No	No	ORD
17	MMS_RIPRAP_CLASS_ID	Riprap Class	No			RIPRAP	Integer			No	No	
18	HYD_SPCD_MAKE_ID	SPCD Make	No			PCD_MA	Integer			No	No	
19	HYD_SPCD_MODEL	SPCD Model	No				String	100		No	No	
20	HYD_SPCD_SKIMMER_ID	Skimmer	No			PCD_SKI	Integer			No	No	
21	HYD_SPCD_NUM_CELLS	# of Cells	No				Integer		0	No	No	
22	HYD_SPCD_ACCESS_PTS	# of Access Points	No				Integer		0	No	No	
23	HYD_SPCD_SED_DEPTH	Sediment Capacity Depth Ft	No				Number	22	4	No	No	
24	HYD_SPCD_MAINT_FREQ	Expected Maintenance Freq Mos	No				Integer		0	No	No	
25	HYD_SPCD_SPEC_EQUIP	Special Equipment Needed	No				String	100		No	No	
26	COMMENT_STR	Comments	Yes	As			String	4000		No	No	ORD
27	MMS_YEAR_TO_FIX	Year to Fix	No				Integer		0	No	No	
28	HYD_REP_PROJORG_ID	Repair Project Type/Org	No			EP_PROJ	Integer			No	No	
29	HYD_REP_PRIORITY_ID	Repair Priority	No			ISP_PRIC	Integer			No	No	
30	HYD_REP_NOTES	Repair Notes	No		No		String	1000		No	No	
31	HYD_REG_NOTES	Regulatory Notes	No		No		String	1000		No	No	
32	HYD_MS4_AREA	MS4 Area	No		Yes	SETUP_YES_NO	Integer			No	No	
33	HYD_OUTFALL	Outfall?	No		Yes	SETUP_YES_NO	Integer			No	No	
34	MMS_INSP_FREQUENCY	Inspection Frequency Mo	No		No		Integer		0	No	No	
35	MMS_YEAR_BUILT	Year Built	Yes	4-digit year	Yes	SETUP_YEAR	Integer			No	No	AASHTO
36	MMS_SP_NUMBER	Built SP Number	Yes		No		String	100		No	No	ORD
37	MMS_STATION	Station	No		No		String	100		No	No	
38	DATE_ACTIVE	Date Activated	No		No		Date			No	No	
39	DATE_RETIRE	Retire Date	No		No		Date			No	No	
40	COUNTY_ID	County	No		Yes	SETUP_COUNTY	Integer			No	No	
	HYD_STRUCTURE_INVENTORY	HYD_PIPE_INVENTORY	HYD_PIPE_END_SECTIONS	HYD_PIPE_COMPONENTS	HYD_POND_INVENTORY	WORK_ORDERS	WORK_ORDERS_LOCATION	WORK_ORDERS_COSTS				

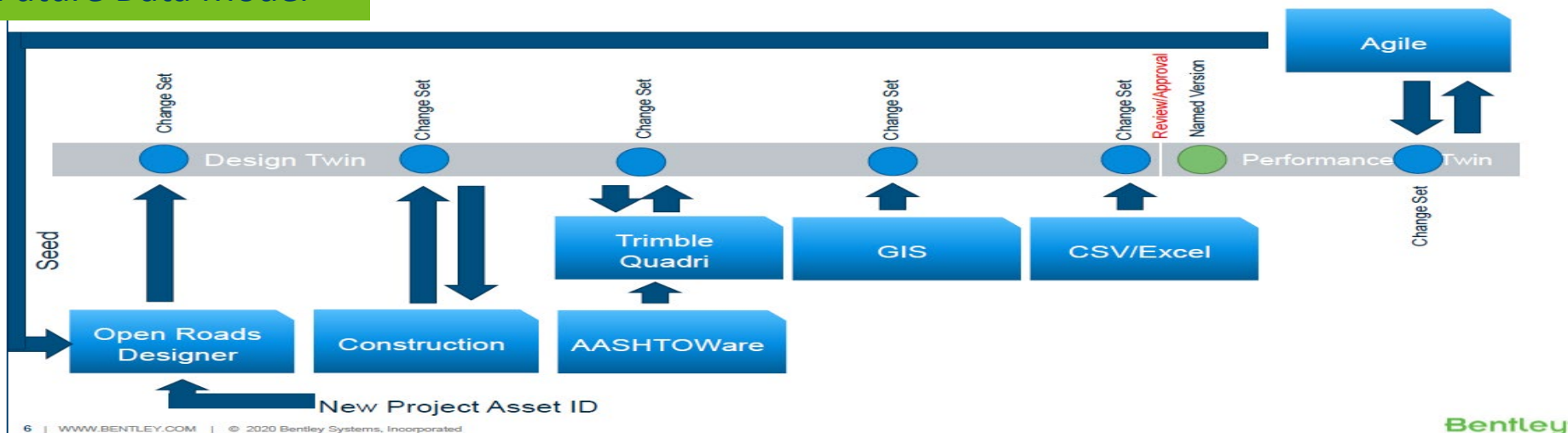
Asset Class
Geometric Location
Asset Attributes
Work Order Activity
Asset Cost
System Source of Record
Data Verification Steps
Data Modification Process

BIM System and Data Interoperability

Current Data Model



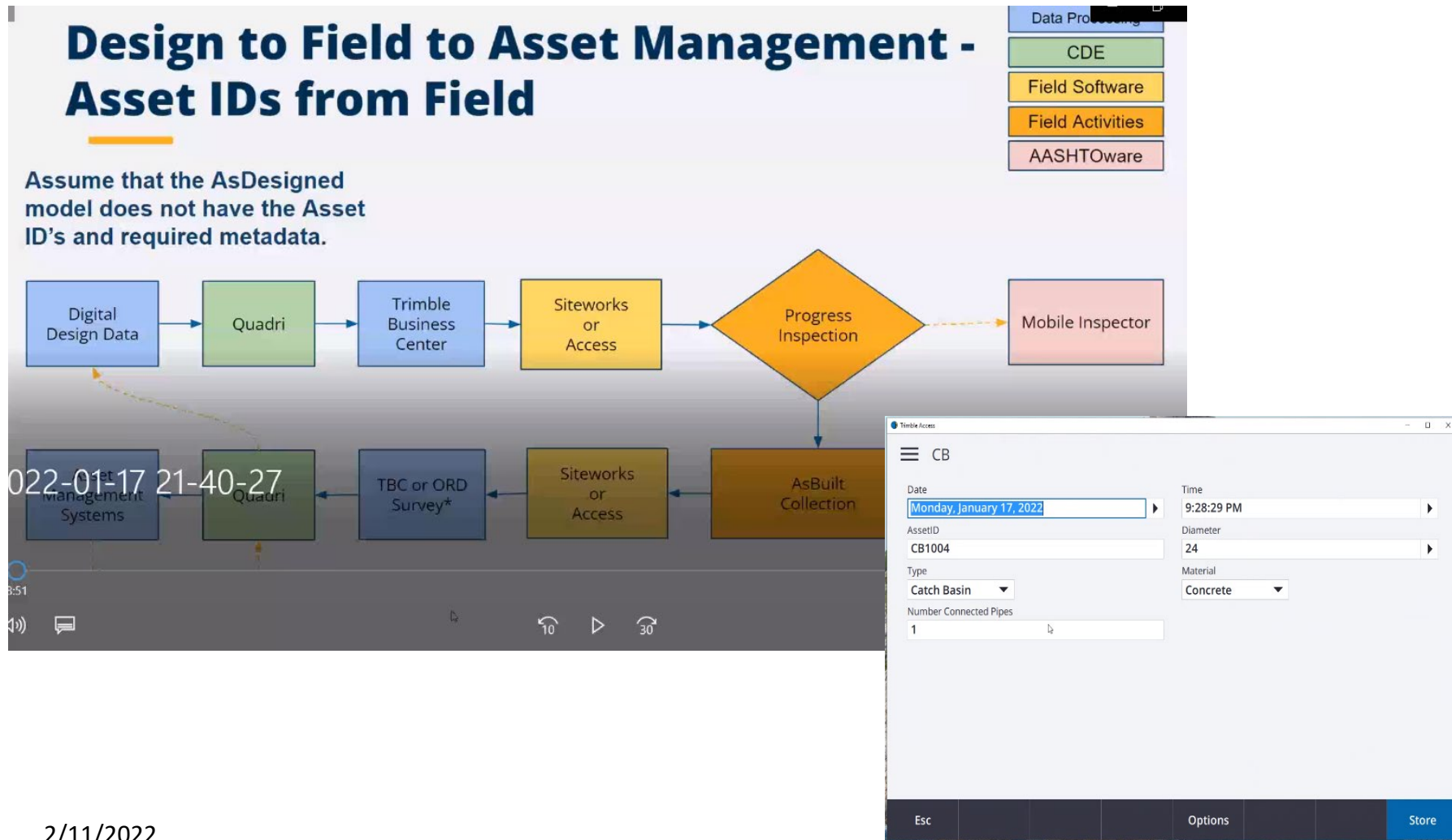
Future Data Model



BIM System and Data Interoperability

Design to Field to Asset Management - Asset IDs from Field

Assume that the AsDesigned model does not have the Asset ID's and required metadata.



Next Steps

- Add bridge, signals, lighting, ITS, signs, traffic barrier, noise walls, ERS, and pavement marking assets into pilot.
- Does the Pilot Scale Up? Incorporate MnDOT Design.
- Continued Collaboration across functional areas (software)
 - Project Data Management (ORD),
 - Construction (AASHTOware),
 - Maplewood Lab (VETA - material & roadway model mgmt system)
 - Sustainability office (TBD)
 - Bridge Office (InspectTECH)
 - Asset Management Program Office (TAMS)



Asset Data Collection

As-Builts

- Remote Sensing

Asset Data Collection As-Builts

S-66 (2011) AS BUILTS

Use when pay item is on Project.

SP2020-66

S-66.1	DESCRIPTION As-built Asset Features shall be captured in standard Asset Class deliverable formats.
S-66.2	MATERIALS – BLANK
S-66.3	CONSTRUCTION REQUIREMENTS
A	As-built Deliverables in Project Scope Complete deliverables marked with an "X" in Table 2011-1. Certain asset classes use multiple.

Insert "X" in the first column to indicate the deliverable is in the Project scope.

- As-built Feature Survey Memorandum is required on all Projects.
- Designer to confirm Project scope with each functional group.
- Do not delete rows from table.

Table 2011-1
As Built Deliverables

In scope	Deliverable Name
X	As-built Feature Survey Memorandum
	Blowing Snow Control Systems As-built Mark-up Plan
	Blowing Snow Control Systems As-built Survey Data
	Bridge As-built Mark-up Plan
	Bridge As-Built Data
	Bridge Uncontaminated Concrete Management Record
	Bridge Paint System Quality Manual (final submitted by Contractor)
	Drainage As-built Mark-up Plan
	Drainage Pipes As-built Survey Data
	Drainage Ponds-Basins As-built Survey Data
	Drainage Structures As-built Survey Data
	Drainage Ponds-Basins Bathymetry Contours
	Drainage Professional Surveyor Letter
	Facility Site As-built Survey Data
	Geotech Earth Retaining Structures (ERS) As-built Survey Data
	Geotech Slopes (Mechanically Stabilized Earth) As-built Survey Data



Search MnDOT A to Z

As-Built Deliverable

Home Bridge Drainage Facility Geotechnical Lighting Noise Pmt. Msg. Rumble Signal Signs TMS Traffic Barrier Contacts

As-built

[As-built Feature Survey Memo Template](#) is a cover page for submitting WGS84 Lat Long survey data.

Pay Item Requirements

Deliverables should be emailed to: The Engineer and ASBUILTS.DOT@state.mn.us.

Note: With a revamped Construction Requirements Section in 2020, The Boiler plate language is found under 2011 (AS-BUILTS) on [Special Provisions Webpage](#).

As-let Plans show project specific deliverables on [eDOCS Public Webpage](#).

Website Navigation

Tabs are alphabetical from-left-to-right across top banner of screen, each with Asset-Class-specific content:

As-built coordinators

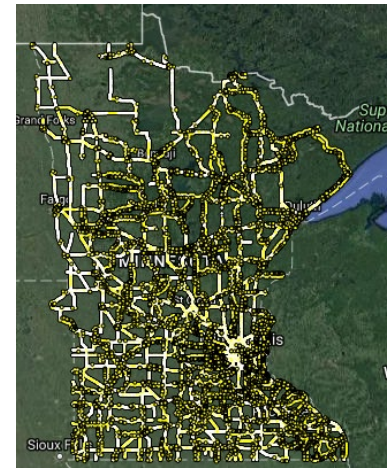
Metro Area: Douglas.Maki@state.mn.us
Greater Minnesota: Trisha.Stefanski@state.mn.us
Greater Minnesota: Michael.Cremin@state.mn.us

Summary of Inventory Management Process:

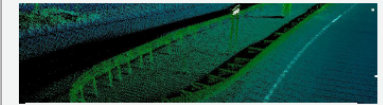


Asset Data Collection Statewide lidar Project

- Consultant Performed Traffic Barrier Inventory and Boots on The Ground Assessment + Additional Asset Extraction
 - Identify non-compliant assets and improve safety
 - Formatted for TAMS



By The Numbers...



47,678 safety assets identified

15,500 End Terminals

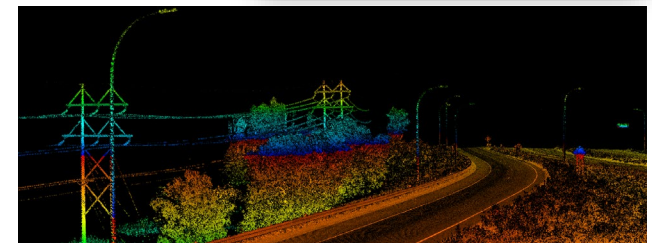
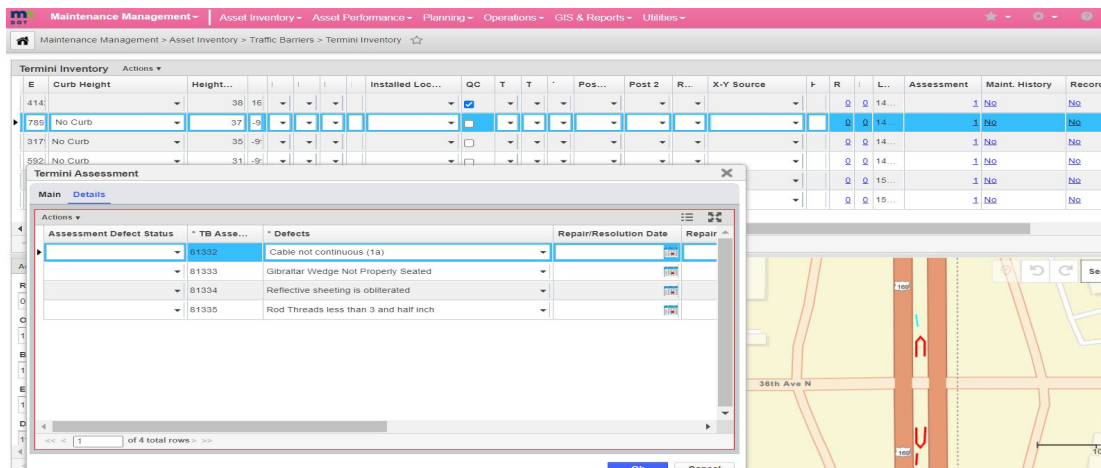
6,180 Cable Anchors

3,099 Cable Barriers

2,512 Crash Cushions

7,375 Transitions

13,012 Longitudinal Metal Barriers



- Bridge Clearance
- Catch Basins
- Concrete Barriers
- Access Points
- Light Poles
- Pavement Paint Striping
- Roadway Surface (edge of pavement)
- Rumble Strips
- Signs
- Traffic Signal Poles
- Utility Line Clearances
- Reference Markers

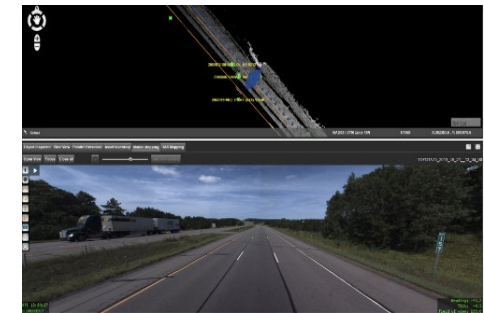
Asset Data Collection Annual Remote Sensing

- Contract To Collect Above Ground Assets

Annual cyclical collection using lidar is ~½ the cost of GPS field collection.



Goal to Start
Contract
May 2022



Area of Focus	Included Cyclical LIDAR?	Gap Inv Needs?	Comments
Roadway Characteristics – Joint Centerline, edge of pavement, crown and cross-slopes	Yes – if accurate enough	No	Centerline of roadway and edge of pavement with 6" x,y accuracy for Intelligent Compaction. AMG crown and cross-slopes. Maintenance might impact as-built record, so QC needed. Some smart construction equipment (muck buckets) contains GPS. Other equipment with outdated software or no hardware. Meet w/ OCIC to push for as-builts (e.g. ponds) from equipment. Currently using RD-M1
Hydraulic Infrastructure – Catch Basins and Culvert Markers	Yes	No	Catch basin changes since 2018-2019. Including plan sets. Add parked car obstruction mitigation. Culvert markers statewide. Conflate to TAMS. Bring up 2018 Lidar data conflation need with Districts on Friday.
Snow Fence Snow Trap	TBD	Yes	Snow fence might be obtained via other means like drones or arial lidar. Most is 200' lateral distance and cannot be seen via lidar. Meeting with Photogrammetry to discuss options. Snow Traps – could they be seen via lidar in winter. Good research project.
District 4 GIS	NA	No	Drainage Pond Inventory Needs. Talk to D4 Hydro Engineer and send request of locations to photogrammetry. Colin Lee doing work with drones.
Freight and Commercial Vehicles – bridge clearances, OSS clearances, utility	Yes	No	Agata created tool that is very useful for the public to scope routes pre-survey. Having additional clearance data both (horizontal and vertical) has advanced state of practice. Need a tool (same or new) to store this data after extraction. Existing system is called route builder, new system at some point may utilize this data but not at roll out 2022.

- Benefits

- ✓ One Consultant
- ✓ Conflation w/Existing Data
- ✓ Easier Asset Owner Review

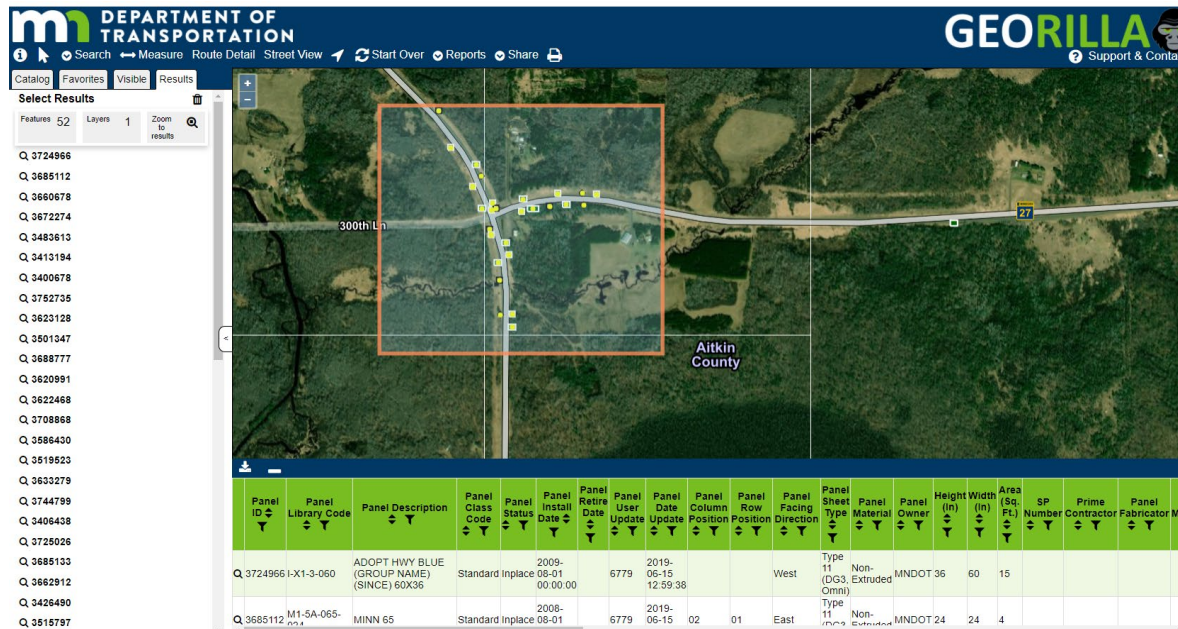
Data Access & Analytics

Georilla

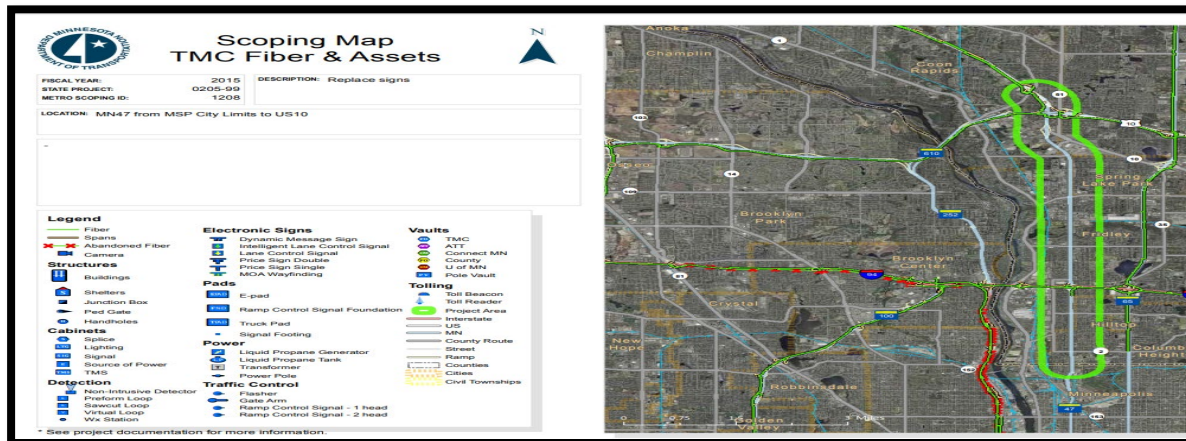
Data Warehouse

Interactive Dashboards

Data Access and Analytics Georilla and Scoping Maps

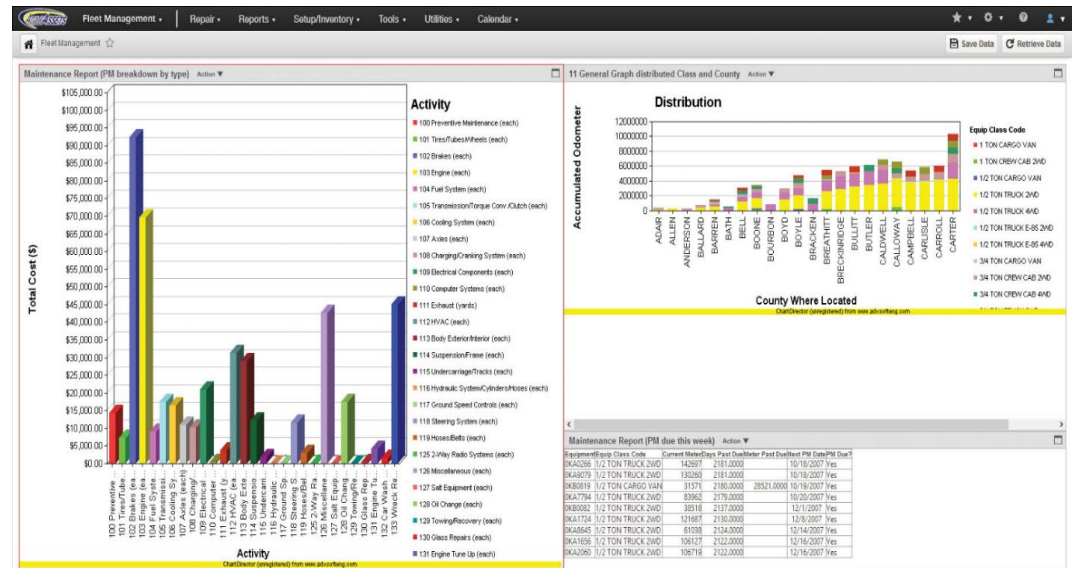
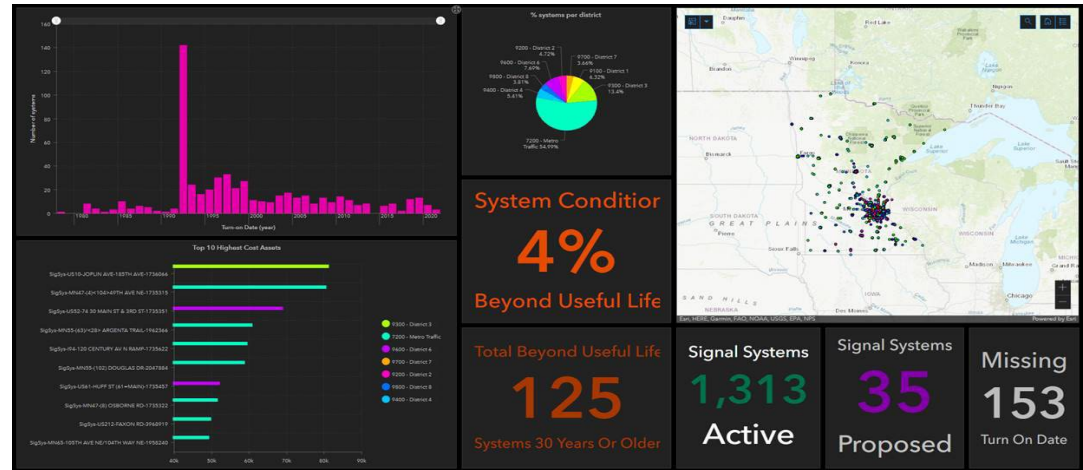
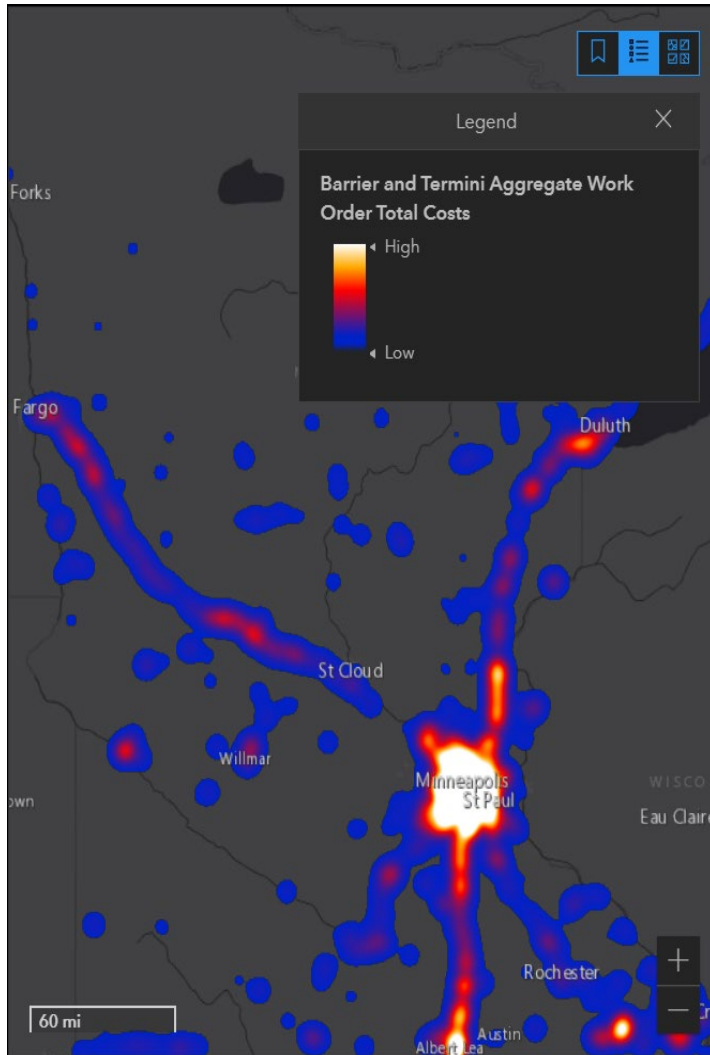


- Open-Source GIS Viewer
- Over 200 layers
- STIP Project Overlay
- Export Function
- Metro Data Linked to Scoping Maps



[illegible]

Asset Data Access and Analytics Dashboards



Final Thoughts...

- Find small wins.
- Idea, Concept, Pilot, Implementation.
- Communicate across functional areas, look for synergy.
- Re-visit technology as costs go down and opportunities increase.
- Be a leader that supports change.
- Innovation is exciting, but don't be afraid to make mistakes.
- Two steps forward and one step back!

Thank You!

Trisha.Stefanski@state.mn.us