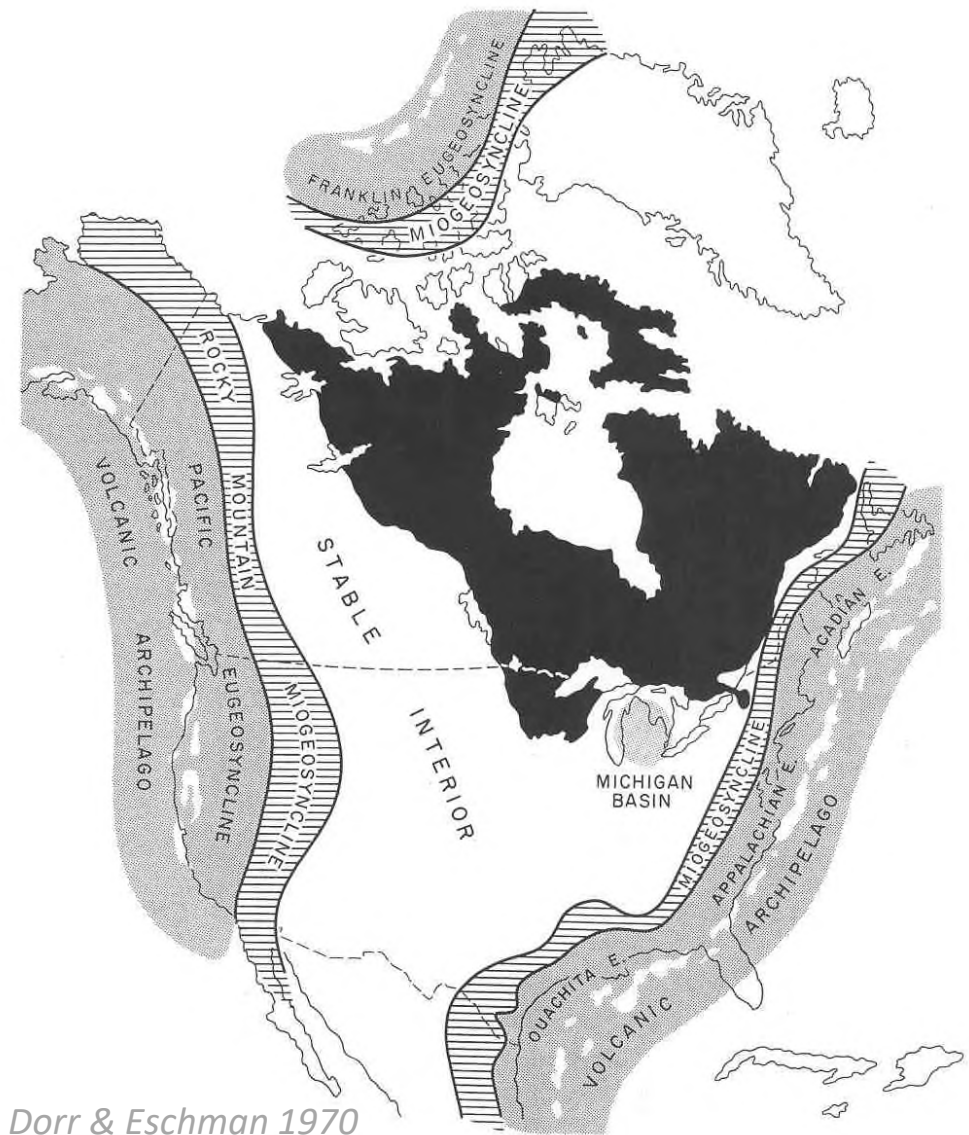


# MDOT Aggregates and AASHTOWare Updates

*Christopher R. Byrum, PhD, PE  
MDOT-CFS – Concrete/Materials Engineer*

*Daniel Burns, PE  
MDOT-CFS – Construction Technology Engineer*



### General Paths of Glacial Advance

#### EXPLANATION



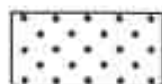
Wisconsin end moraines



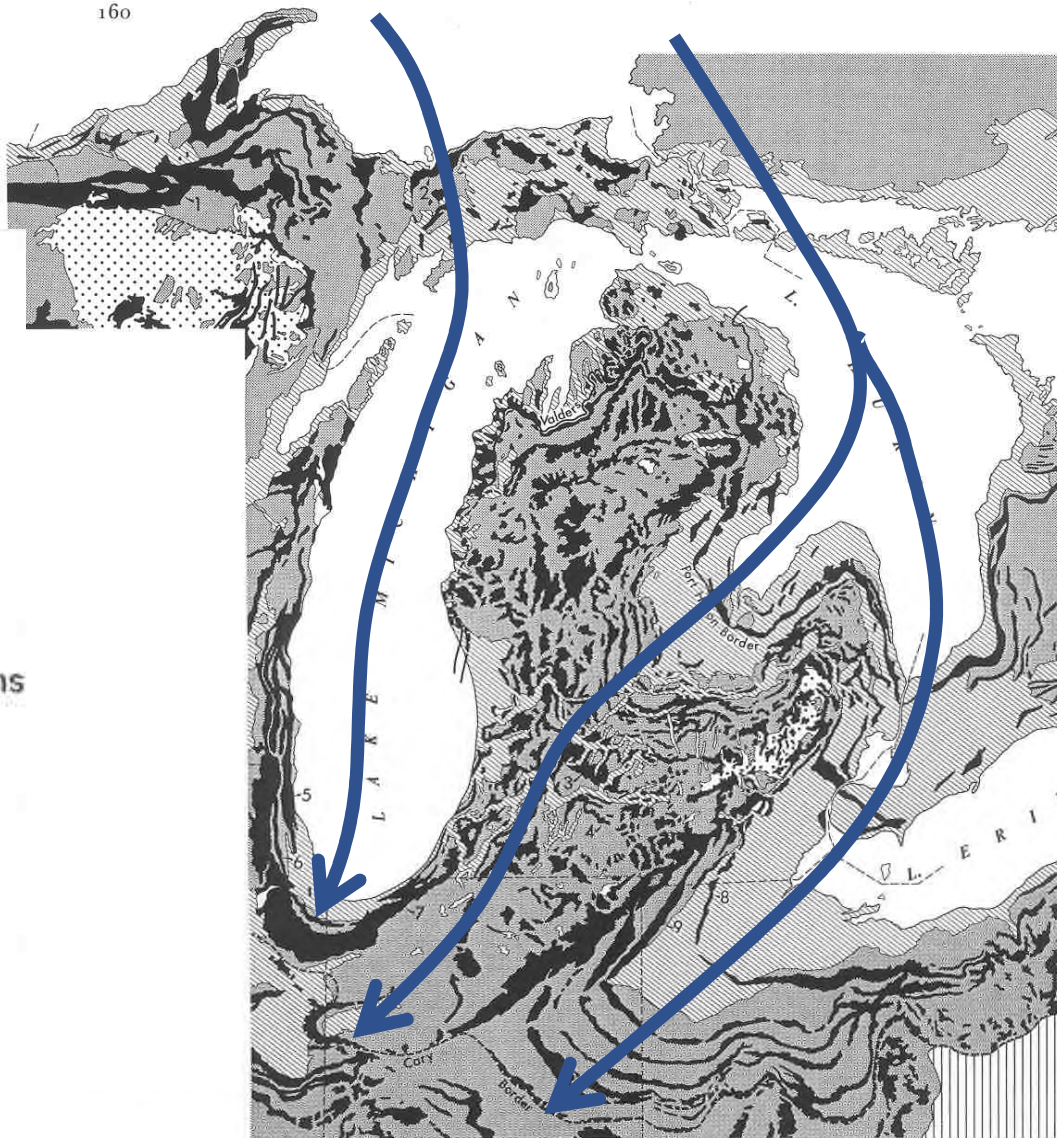
Ground moraines and outwash plains



Lake sediments



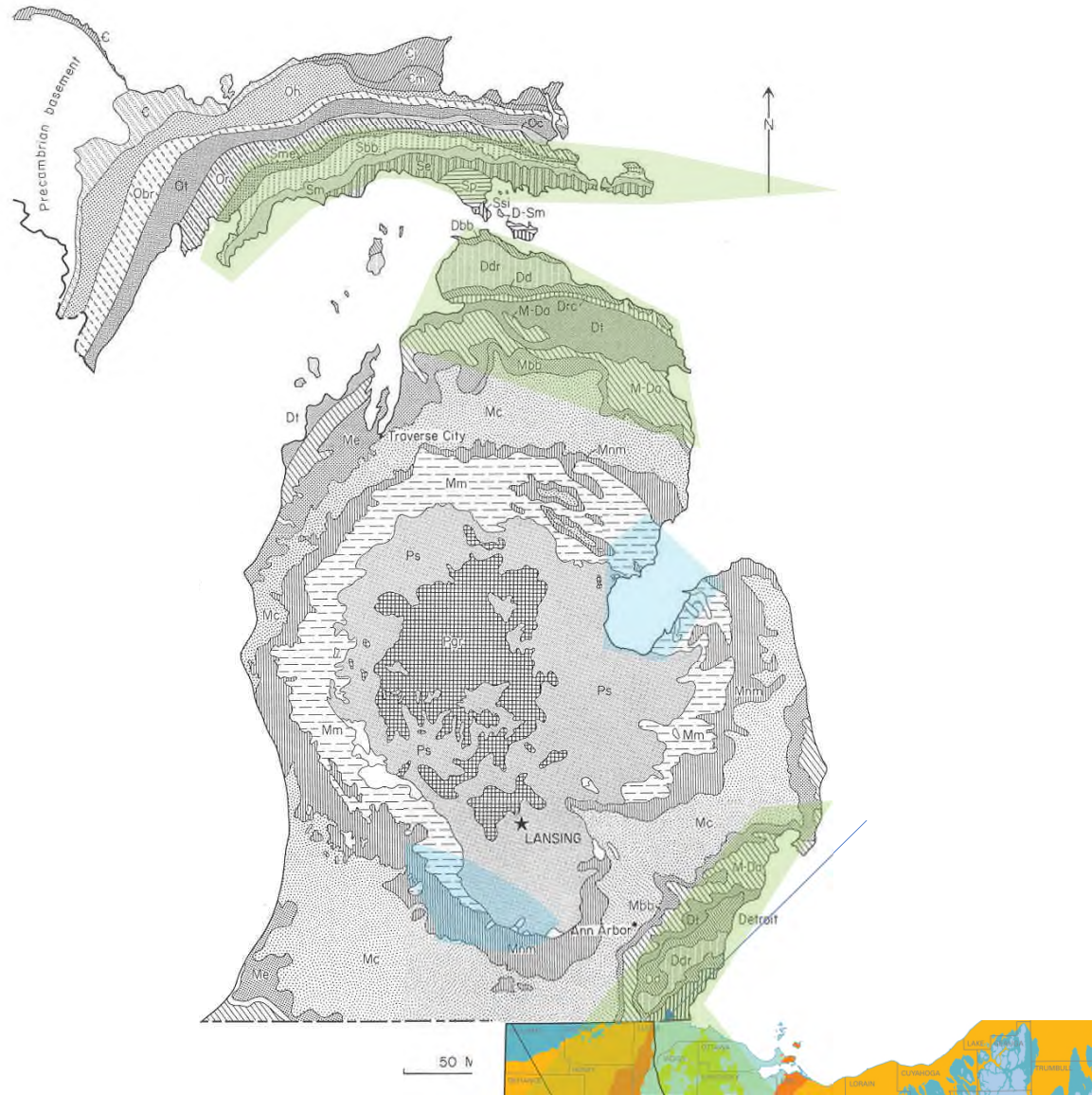
Ice-contact stratified drift





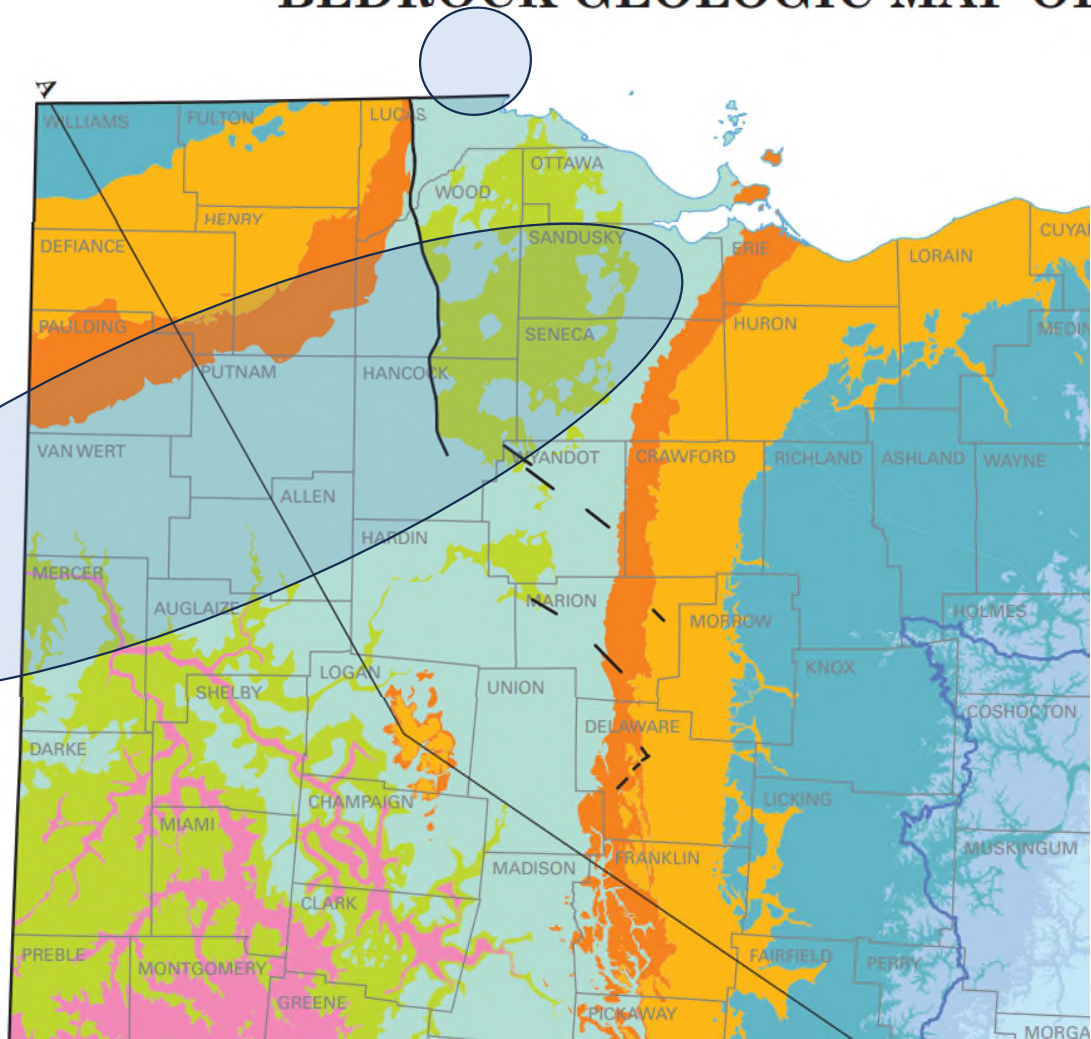
# CARBONATES

	<i>Pennsylvanian</i>
Pgr	Grand River
Ps	Saginaw
	<i>Mississippian</i>
Mb	Bayport
Mm	Michigan
Mnm	Napoleon-Marshall
Mc	Coldwater
Mbb	Berea-Bedford
Mc	Ellsworth-Antrim
	<i>Mississippian Devonian</i>
M-Da	Antrim
	<i>Devonian</i>
Dt	Traverse
Drc	Rogers City
Dd	Dundee
Ddr	Detroit River
Dbb	Bois Blanc
	<i>Devonian Silurian</i>
D-Sm	Mackinac breccia
	<i>Silurian</i>
Sbi	Bass Island
Ssi	St. Ignace
Sp	Point Aux Chenes
Se	Engadine
Sm	Manistique
Sbb	Burnt Bluff
Sme	Mayville



from Dorr & Eschman 1970

# BEDROCK GEOLOGIC MAP OF OHIO



**Mississippian** (about 322 to 359 million years ago)—Sedimentary rocks: sandstone, shale, siltstone, conglomerate, and minor limestone. Marine to marginal marine origin.

**Devonian** (about 359 to 385 million years ago)—Sedimentary rocks: mainly shale and siltstone with some sandstone. Marine to marginal marine origin.

**Devonian** (about 385 to 407 million years ago)—Sedimentary rocks: mainly limestone and dolomite with some shale, and minor sandstone. Marine and eolian origin.

*Period of widespread erosion*

**Silurian** (about 416 to 423 million years ago)—Sedimentary rocks: dolomite, anhydrite, gypsum, salt, and shale. Marine and restricted marine origin.

**Silurian** (about 423 to 435 million years ago)—Sedimentary rocks: dolomite and shale with some limestone. Marine origin.

*Period of widespread erosion*

**Ordovician** (about 446 to 450 million years ago)—Sedimentary rocks: shale and limestone. Marine origin.

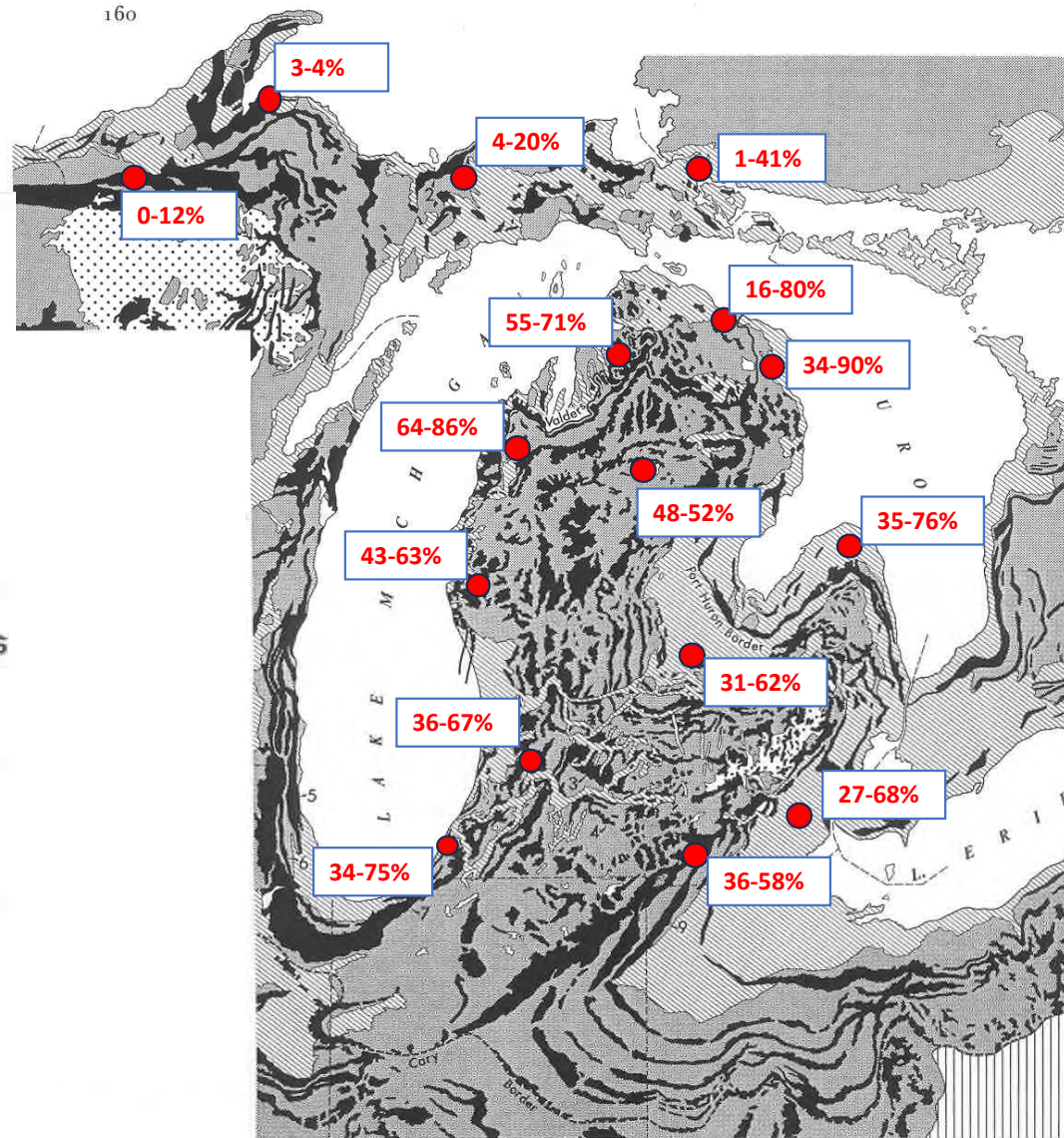
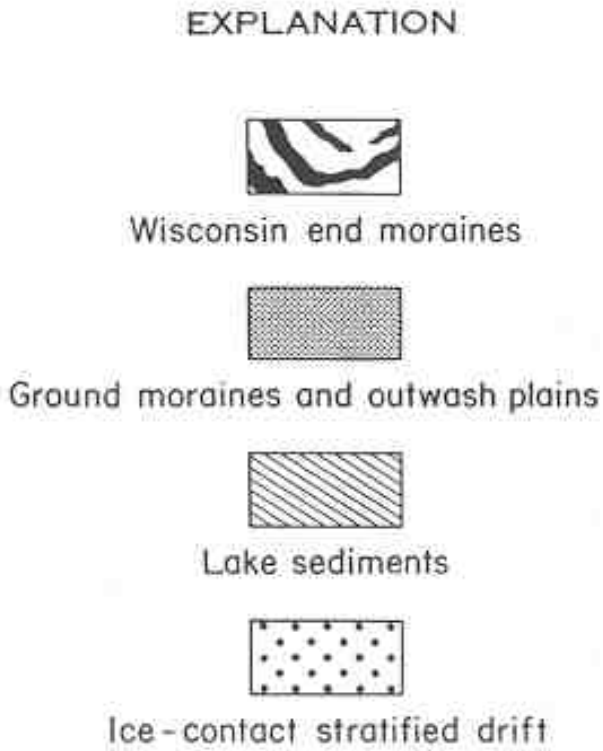
**Ordovician** (about 450 to 460 million years ago)—Sedimentary rocks: limestone and shale. Marine origin.

*Period of widespread erosion*

**Ordovician and Cambrian** (about 486 to 510 million years ago)—Sedimentary rocks: mainly dolomite, sandstone, shale, with minor limestone. Marine origin. (Shown in cross section only)



Carbonate Percentages for  
Select Mixed Glacial  
Sand/Gravel Deposits



# CARBONATES

Frz Exp = 0.038%  
 Sp Gr = 2.67  
 Abs = 0.93 / 1.02 %

Frz Exp = 0.014%  
 Sp Gr = 2.64  
 Abs = 2.04 / 2.77 %

Frz Exp = 0.008%  
 Sp Gr = 2.66  
 Abs = 0.62 / 0.81 %

Frz Exp = 0.092%  
 Sp Gr = 2.54  
 Abs = 1.79 / 2.59 %

Frz Exp = 0.070%  
 Sp Gr = 2.55  
 Abs = 2.09 / 2.533 %

Frz Exp = 0.042%  
 Sp Gr = 2.69  
 Abs = 1.12 / 1.30 %

Frz Exp = 0.001%  
 Sp Gr = 2.78  
 Abs = 0.49 / 0.82 %

Frz Exp = 0.003%  
 Sp Gr = 2.80  
 Abs = 0.35 / 0.63 %

Frz Exp = 0.014%  
 Sp Gr = 2.61  
 Abs = 1.12 / 1.45 %

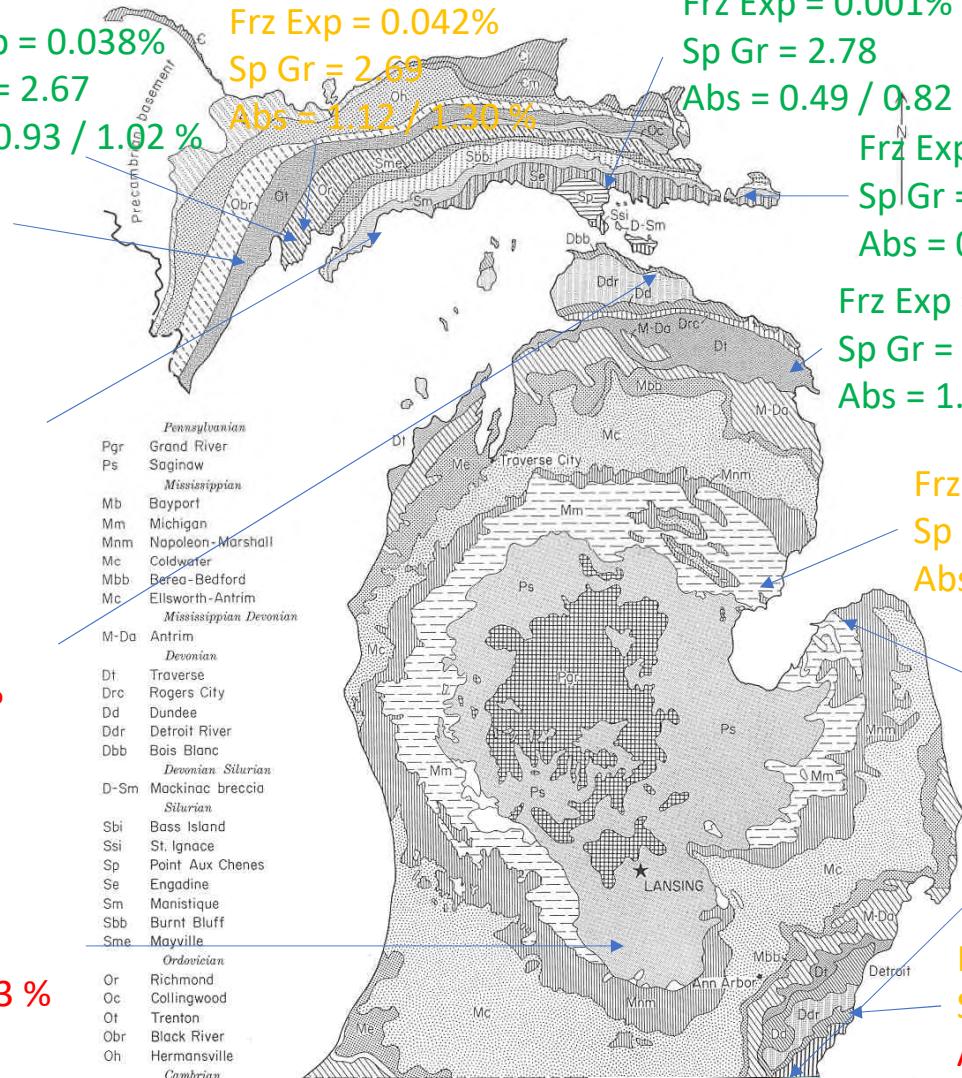
Frz Exp = 0.045%  
 Sp Gr = 2.60  
 Abs = 1.61 / 2.09 %

Frz Exp = 0.029%  
 Sp Gr = 2.61  
 Abs = 1.29 / 1.38 %

Frz Exp = 0.013%  
 Sp Gr = 2.64  
 Abs = 2.04 / 2.77 %

Frz Exp = 0.061%  
 Sp Gr = 2.56  
 Abs = **2.89 / 3.75 %**

Frz Exp = 0.000%  
 Sp Gr = 2.92  
 Abs = 0.26 / 0.27 %  
 basalt trap rock  
 Canada



- Pgr Pennsylvanian Grand River
- Ps Pennsylvanian Saginaw
- Mb Mississippian Bayport
- Mm Mississippian Michigan
- Mnm Mississippian Napoleon-Marshall
- Mc Mississippian Coldwater
- Mbb Mississippian Berea-Bedford
- Mc Mississippian Antrim
- M-Da Mississippian Devonian Antrim
- Dt Devonian Traverse
- Drc Devonian Rogers City
- Dd Devonian Dundee
- Ddr Devonian Detroit River
- Dbb Devonian Bois Blanc
- D-Sm Devonian Silurian Mackinac breccia
- Sbi Silurian Bass Island
- Ssi Silurian St. Ignace
- Sp Silurian Point Aux Chenes
- Se Silurian Engadine
- Sm Silurian Manistique
- Sbb Silurian Burnt Bluff
- Sme Silurian Mayville
- Or Ordovician Richmond
- Oc Ordovician Collingwood
- Ot Ordovician Trenton
- Obr Ordovician Black River
- Oh Ordovician Hermansville
- Cam Cambrian
- Em Cambrian Munising
- Cj Cambrian Jacobsville
- C Cambrian undivided

from Dorr & Eschman 1970



























# MDOT's Aggregate Wear Index, AWI value

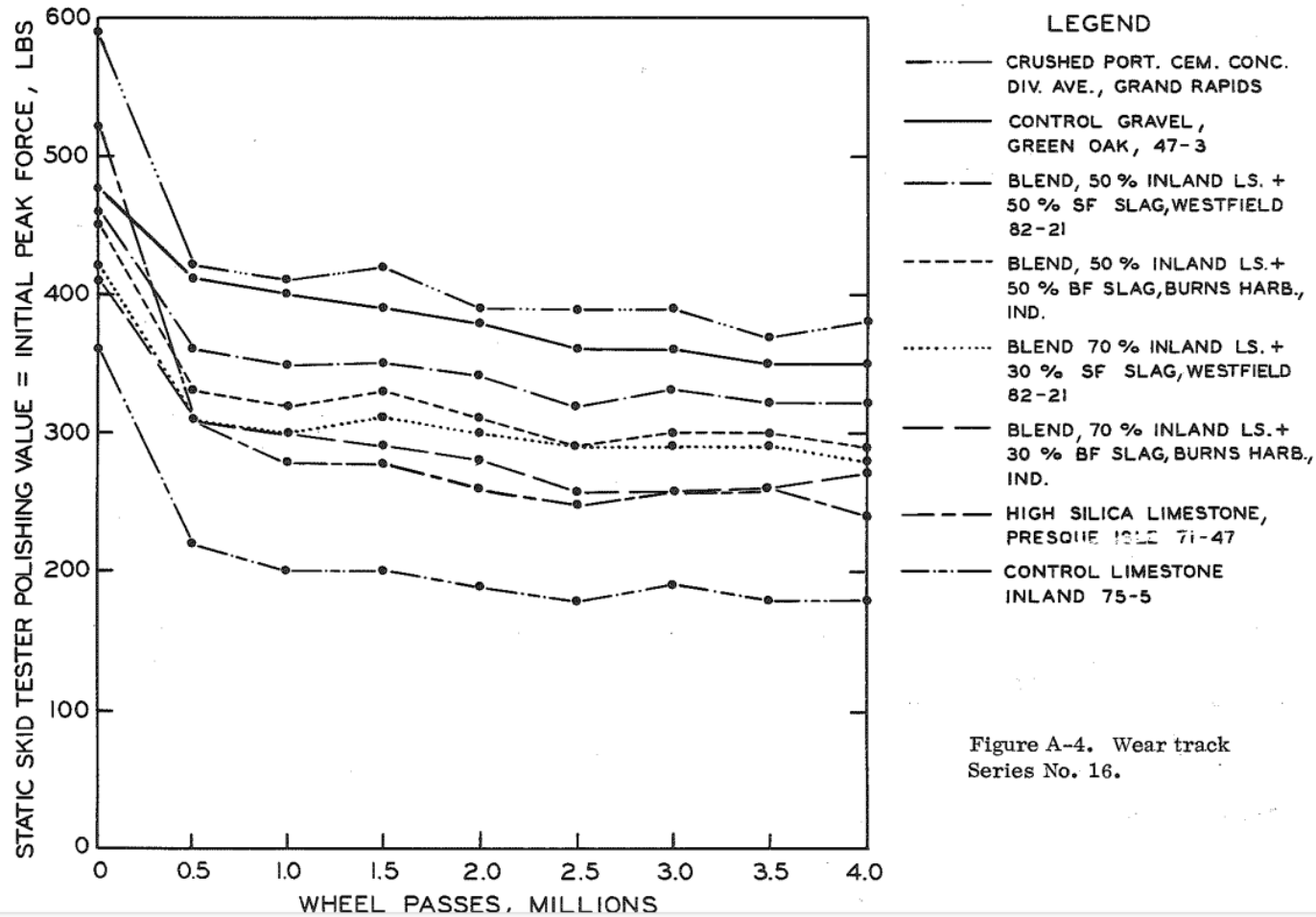
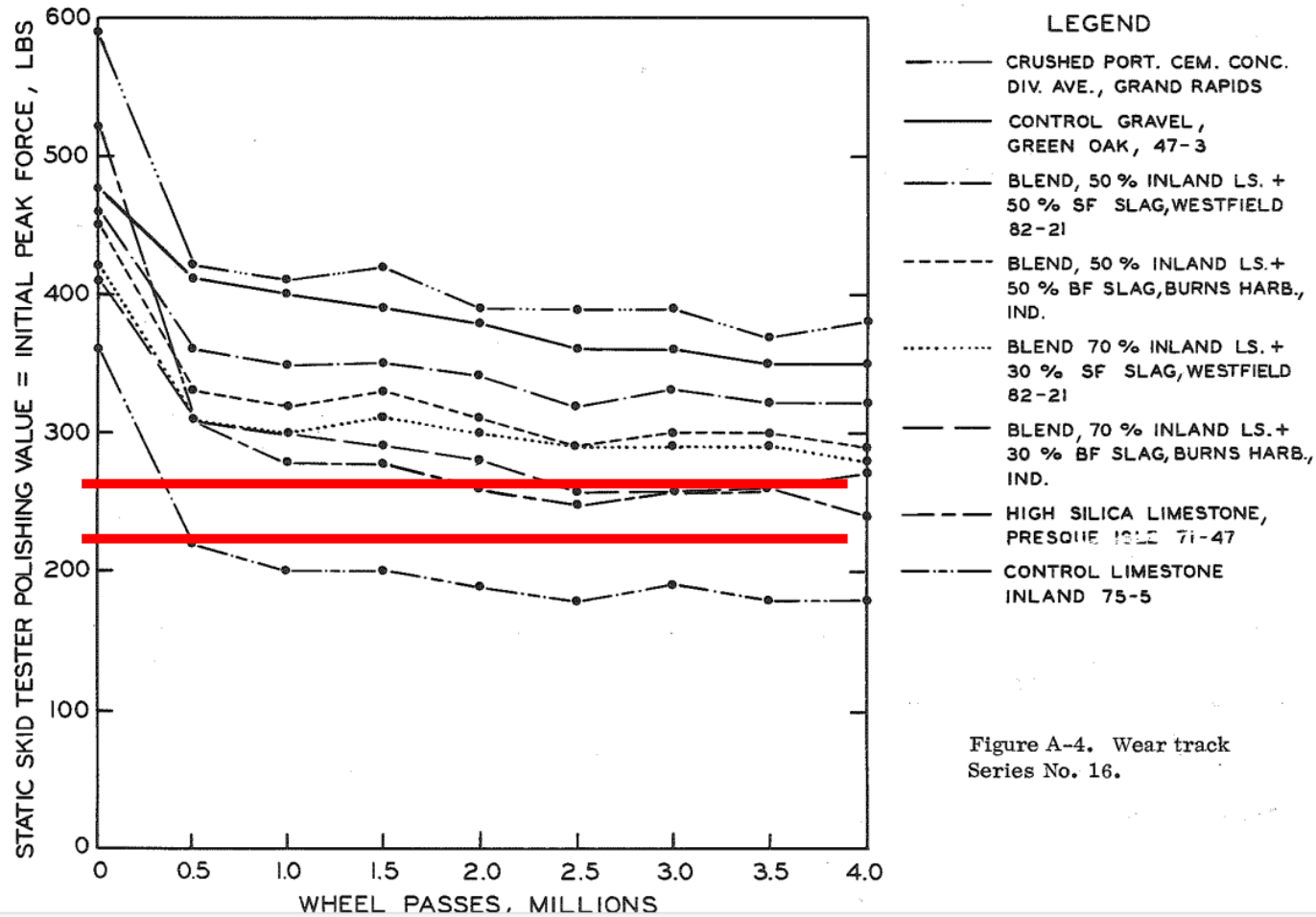


Figure A-4. Wear track Series No. 16.



# MDOT's Aggregate Wear Index, AWI value

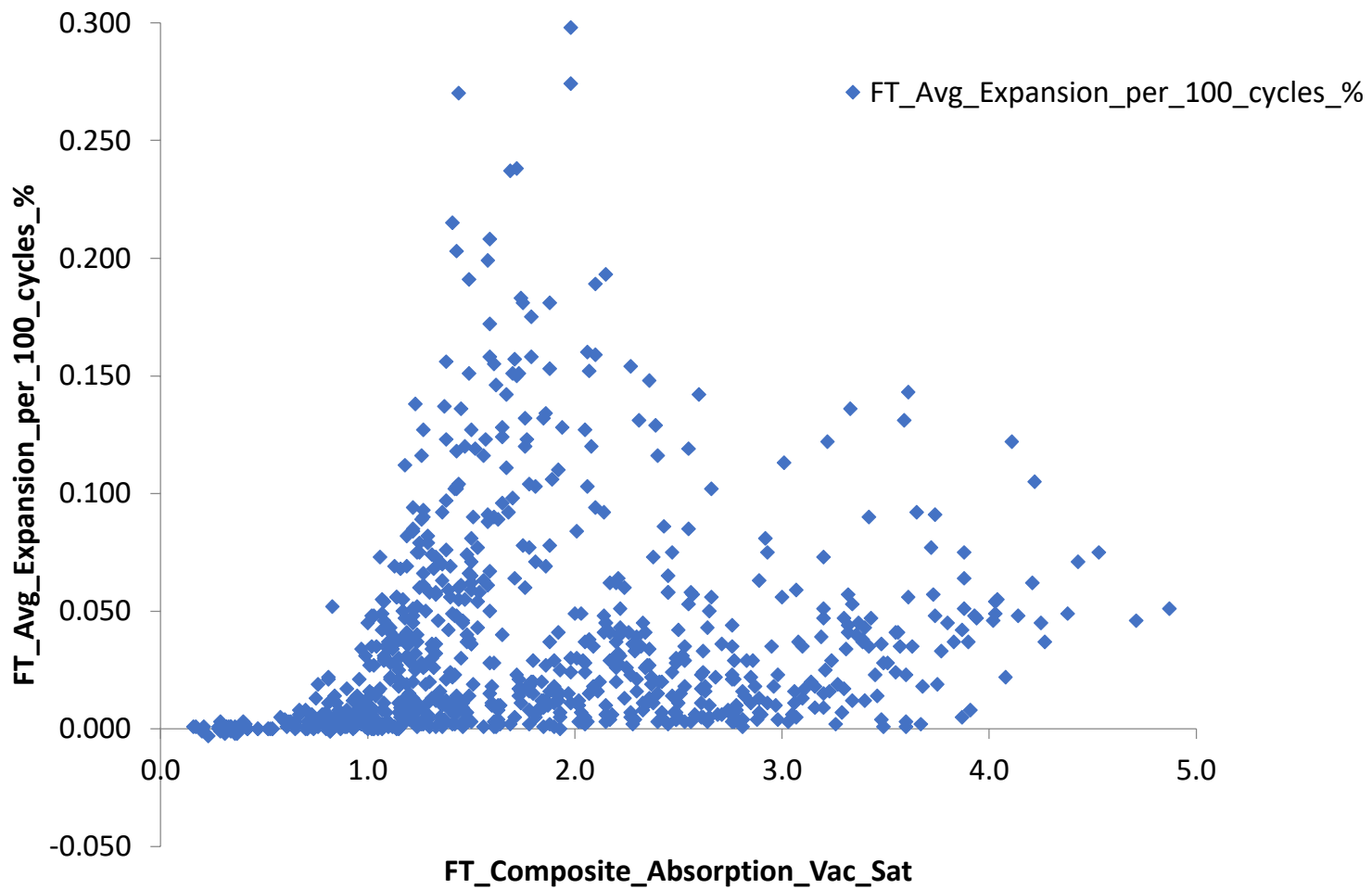


260

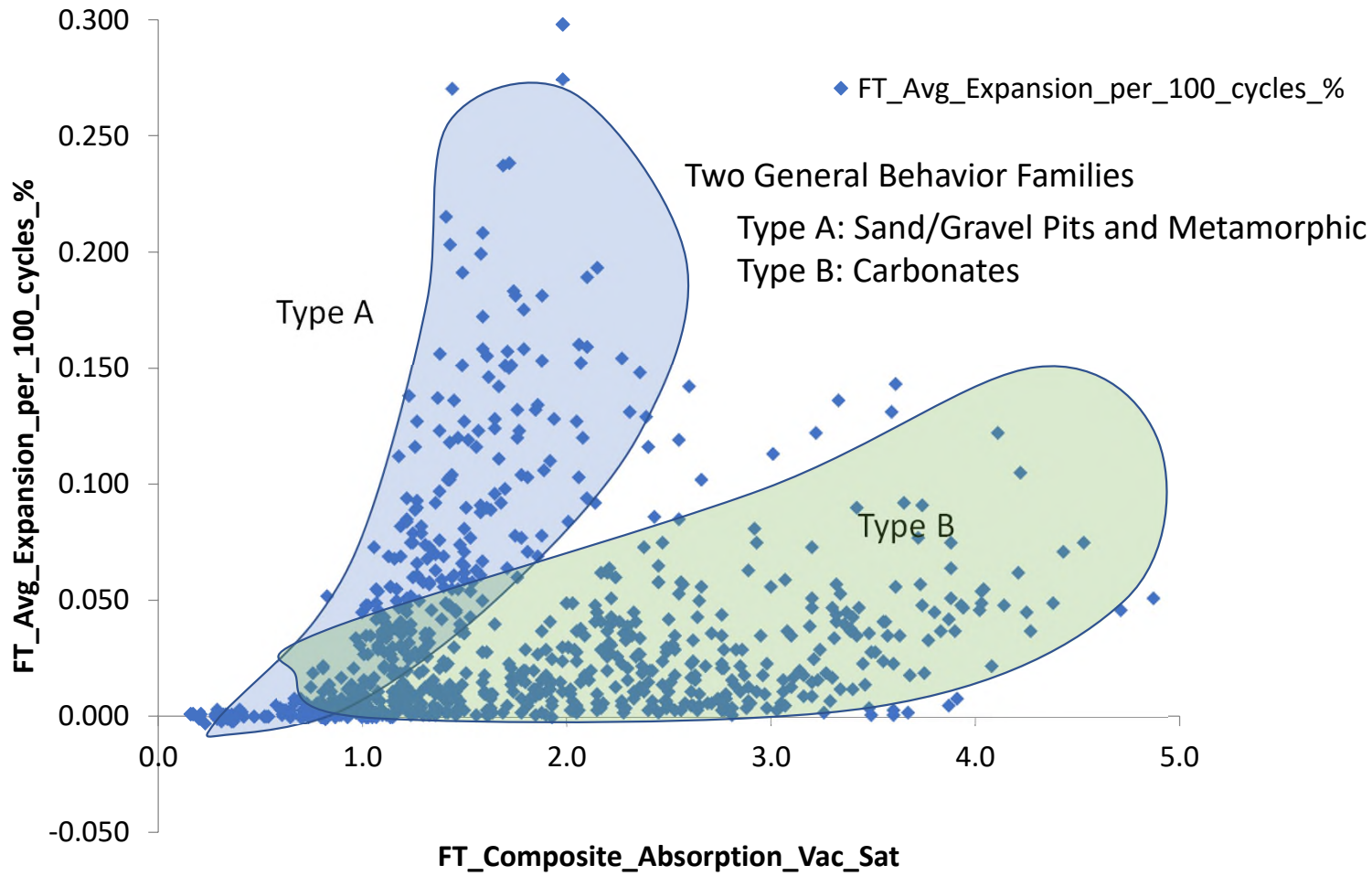
220



25+ Years of MDOT Freeze-Thaw Testing Data

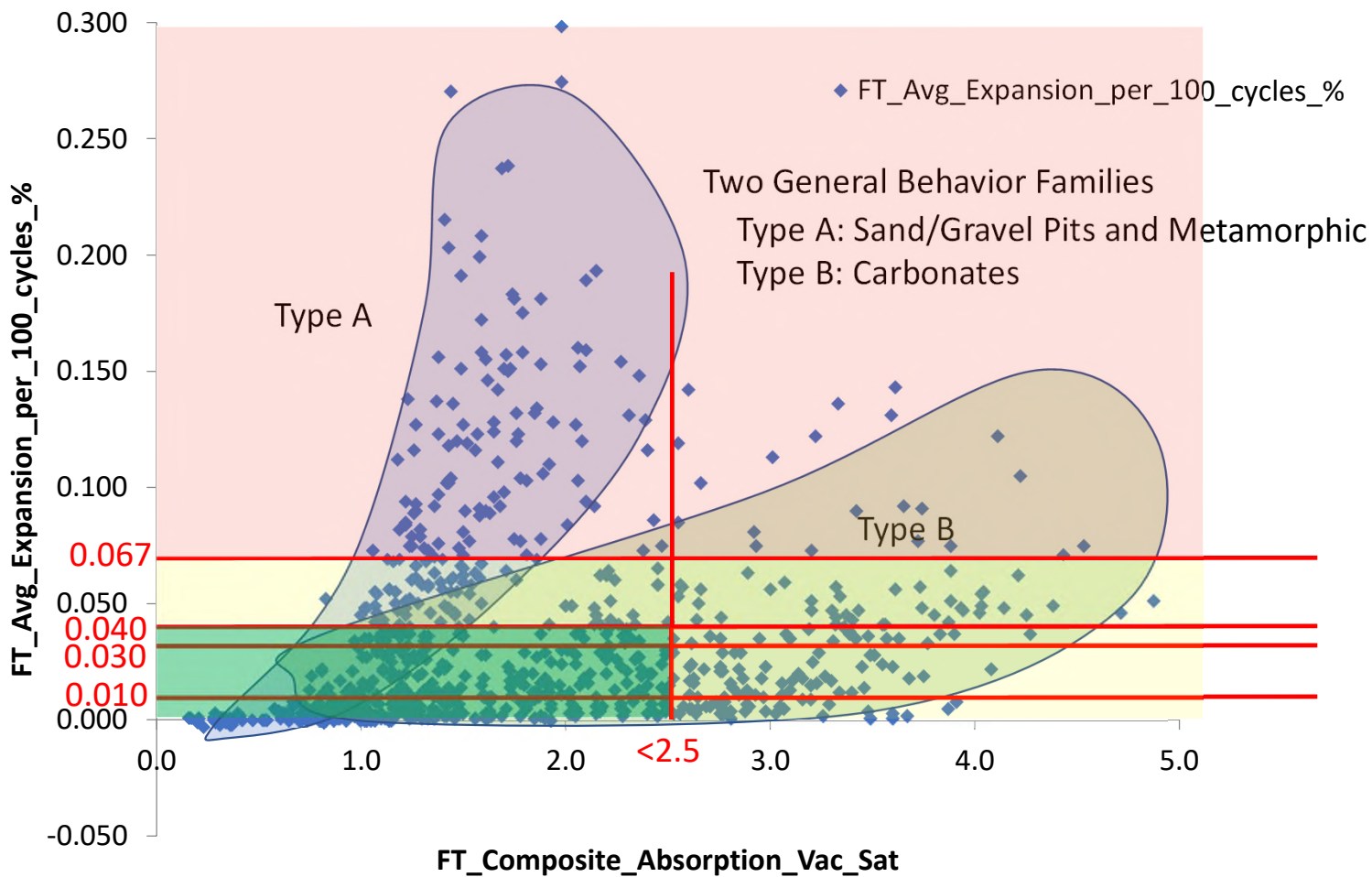


### 20+ Years of MDOT Freeze-Thaw Testing Data

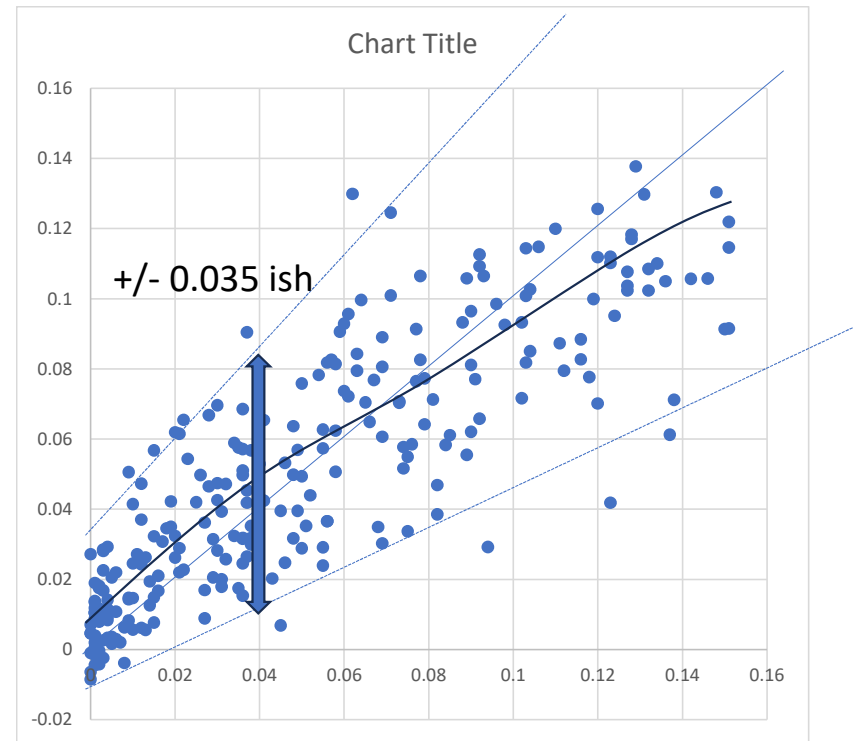




### 20+ Years of MDOT Freeze-Thaw Testing Data



SUMMARY OUTPUT		Type A: mostly SG, IM				
<b>Regression Statistics</b>						
Multiple R	0.851064754					
R Square	0.724311215					
Adjusted R Square	0.713929629					
Standard Error	0.022967151					
Observations	249					
<b>ANOVA</b>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	9	0.331221	0.036802	69.76884	7.55E-62	
Residual	239	0.12607	0.000527			
Total	248	0.457291				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-3.361409894	1.555995	-2.1603	0.031744	-6.42663	-0.29619
FT_Composite_Chert	0.008817457	0.002315	3.809528	0.000177	0.004258	0.013377
FT_Composite_Sum_of_Soft_&_Chert	0.007232109	0.00404	1.789937	0.07473	-0.00073	0.015192
FT_Composite_Absorption_24hr	0.051933969	0.017123	3.032966	0.002689	0.018202	0.085666
FT_Composite_Absorption_Vac_Sat	-1.031003017	0.460695	-2.23793	0.026148	-1.93854	-0.12346
FT_Composite_OD	0.209358813	0.655577	0.31935	0.74974	-1.08209	1.500806
(3-OD)^-0.5	-0.230879018	0.222093	-1.03956	0.299594	-0.66839	0.20663
(VacSat)^.5	3.481837326	1.442877	2.413122	0.01657	0.639457	6.324217
OD/VacSat	0.272291802	0.106413	2.558819	0.01112	0.062664	0.481919
(1+Sum)*VacSat	-0.004935132	0.002291	-2.15406	0.032235	-0.00945	-0.00042



If:  $OD > 2.72$  and  $OD/VacSat > 3.4$ , and  $soft+chert < 2\%$

Then: No Test, just call it “ $<0.010\%$ ”

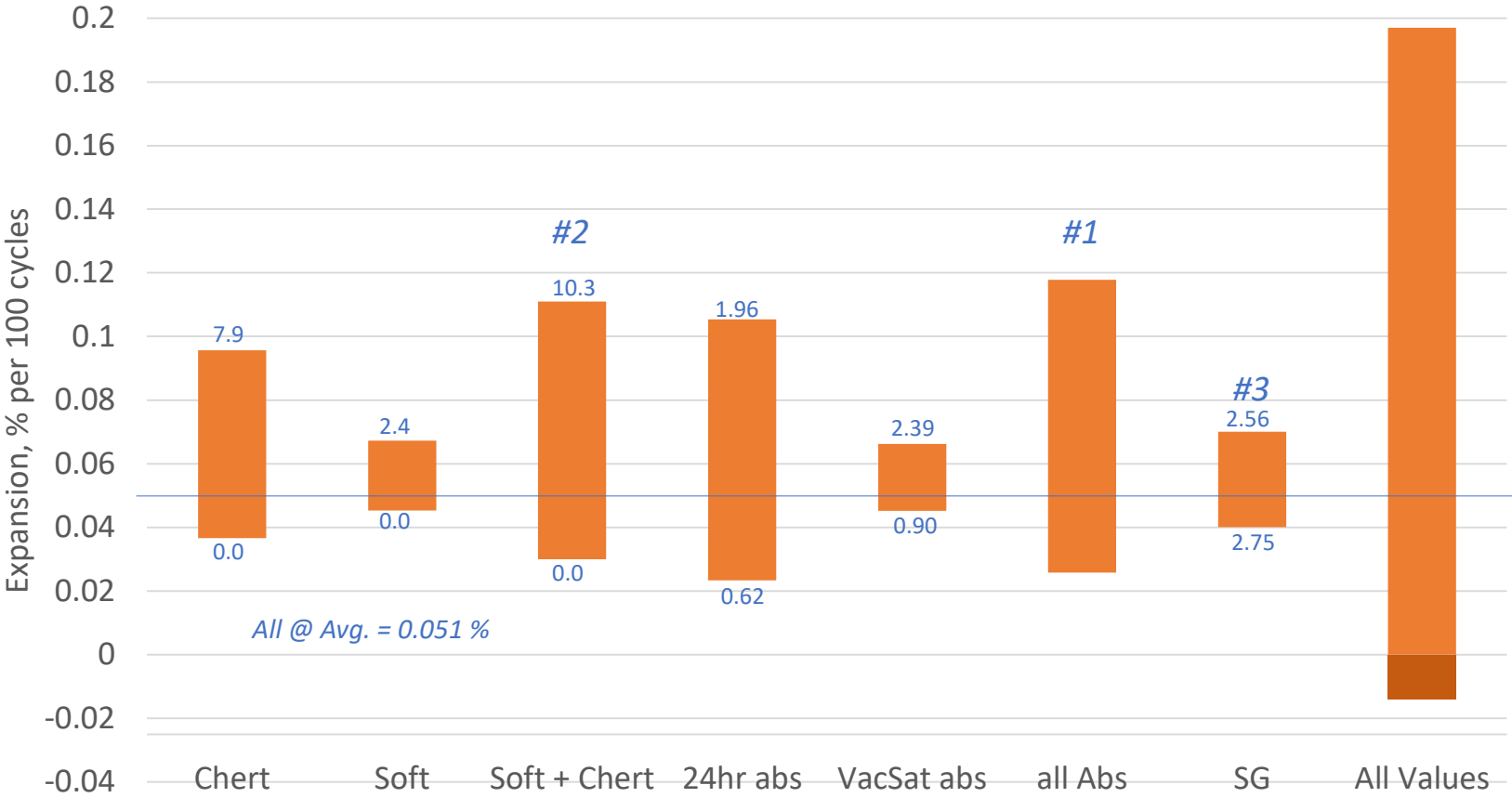
Else: Use Equation

What is the model missing?

It needs a “% carbonate” parameter. We have this from petrographic AWI determinations.



### Sand and Gravel Model Sensitivity Analysis

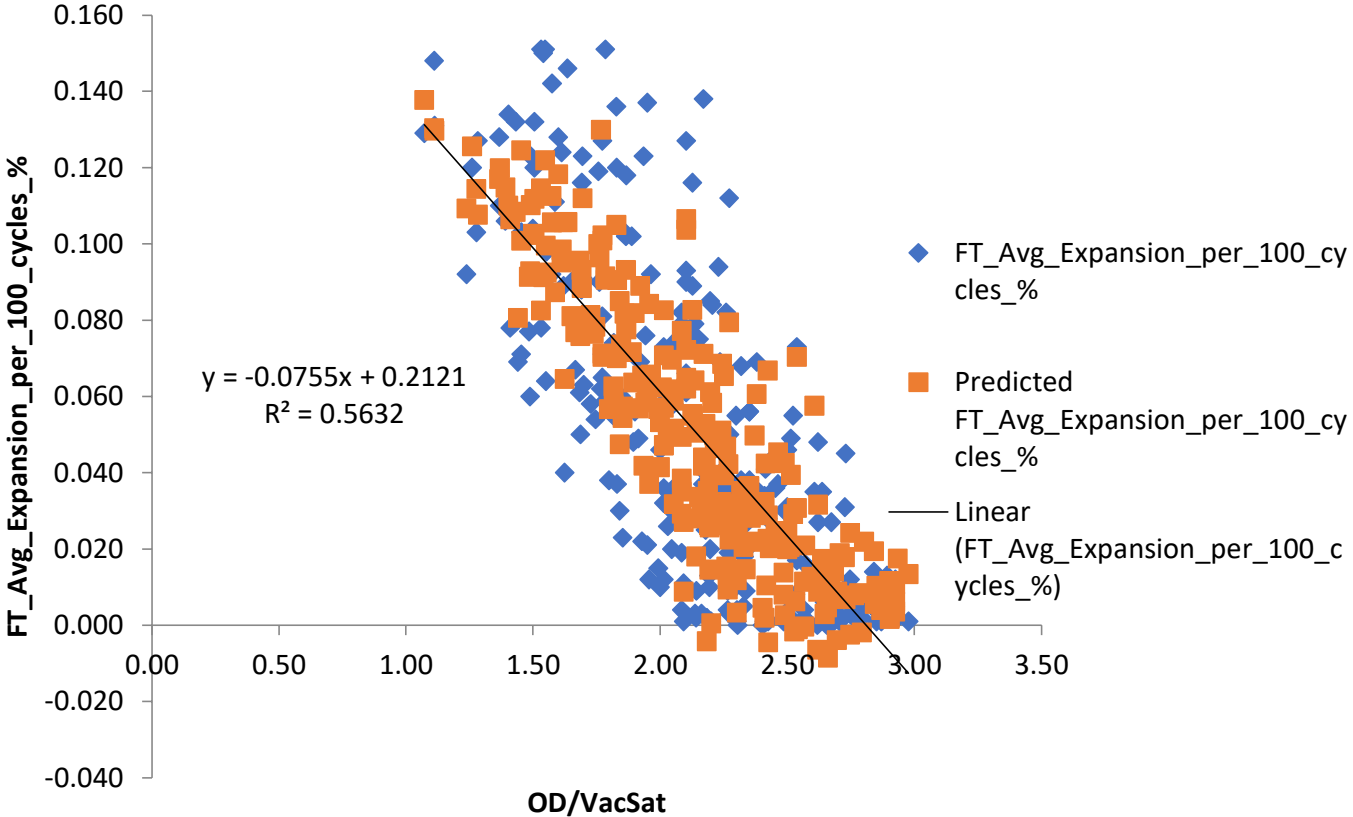


### Pearson Correlation Coefficients for the Sand & Gravel Data Set

	<i>FT_Avg_Expansion_per_100_cycles_%</i>	<i>Chert</i>	<i>Soft_&amp;_Chert</i>	<i>Absorption_24hr</i>	<i>Absorption_Vac_Sat</i>	<i>OD</i>
FT_Avg_Expansion_per_100_cycles_%	1					
FT_Composite_Chert	0.650200279	1				
FT_Composite_Sum_of_Soft_&_Chert	0.654469328	0.925497	1			
FT_Composite_Absorption_24hr	0.73808504	0.407676	0.464806444	1		
FT_Composite_Absorption_Vac_Sat	0.739250837	0.432705	0.494892729	0.937682041	1	
FT_Composite_OD	-0.642672637	-0.37508	-0.406222638	-0.700118491	-0.729685976	1
(3-OD)^-0.5	-0.639057089	-0.39173	-0.41622741	-0.670896252	-0.700193528	0.994156
(VacSat)^.5	0.746215108	0.447698	0.505476242	0.936732219	0.997751096	-0.72472
OD/VacSat	-0.750467176	-0.48264	-0.523735139	-0.911746273	-0.967619987	0.719969
(1+Sum)*VacSat	0.714978444	0.853251	0.95023771	0.634083098	0.685649869	-0.53412

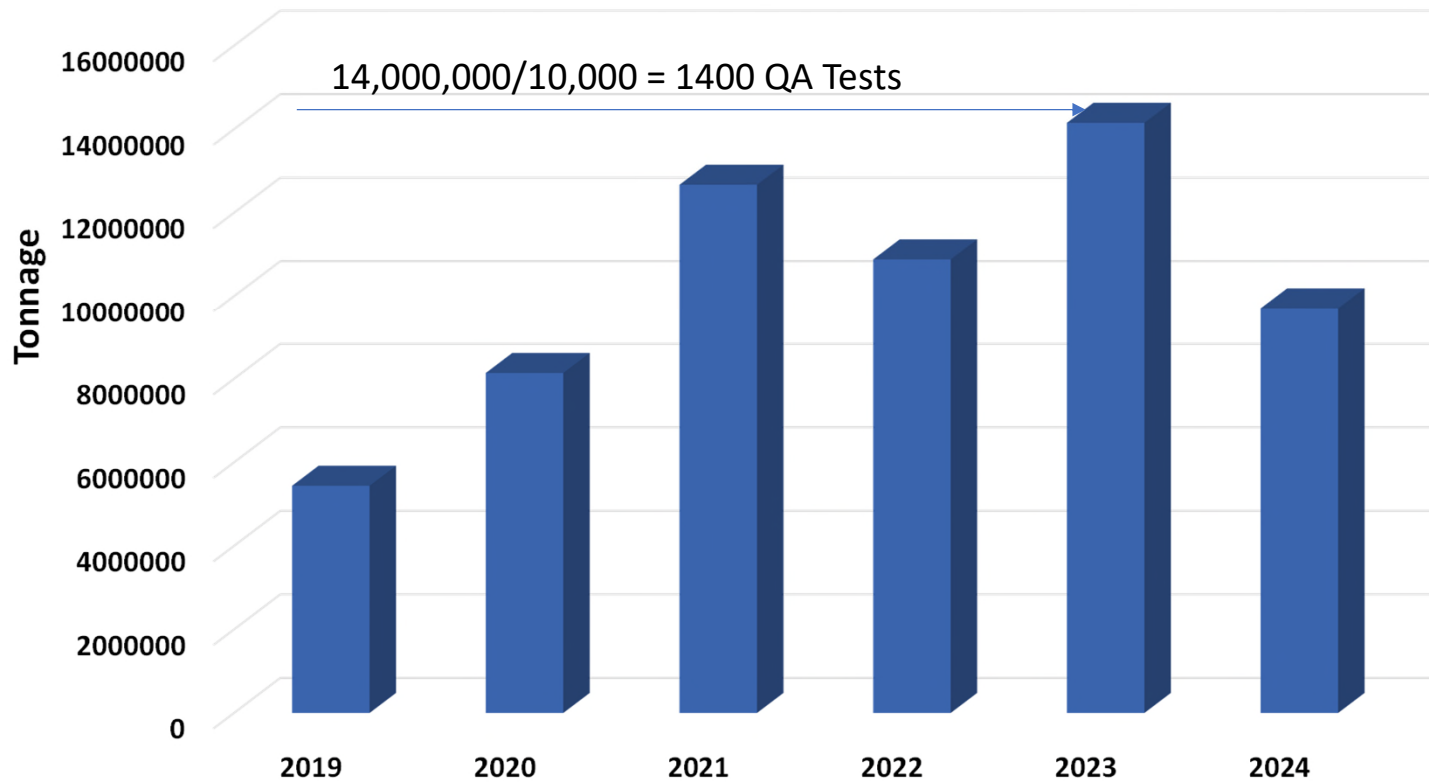


# OD/VacSat Line Fit Plot



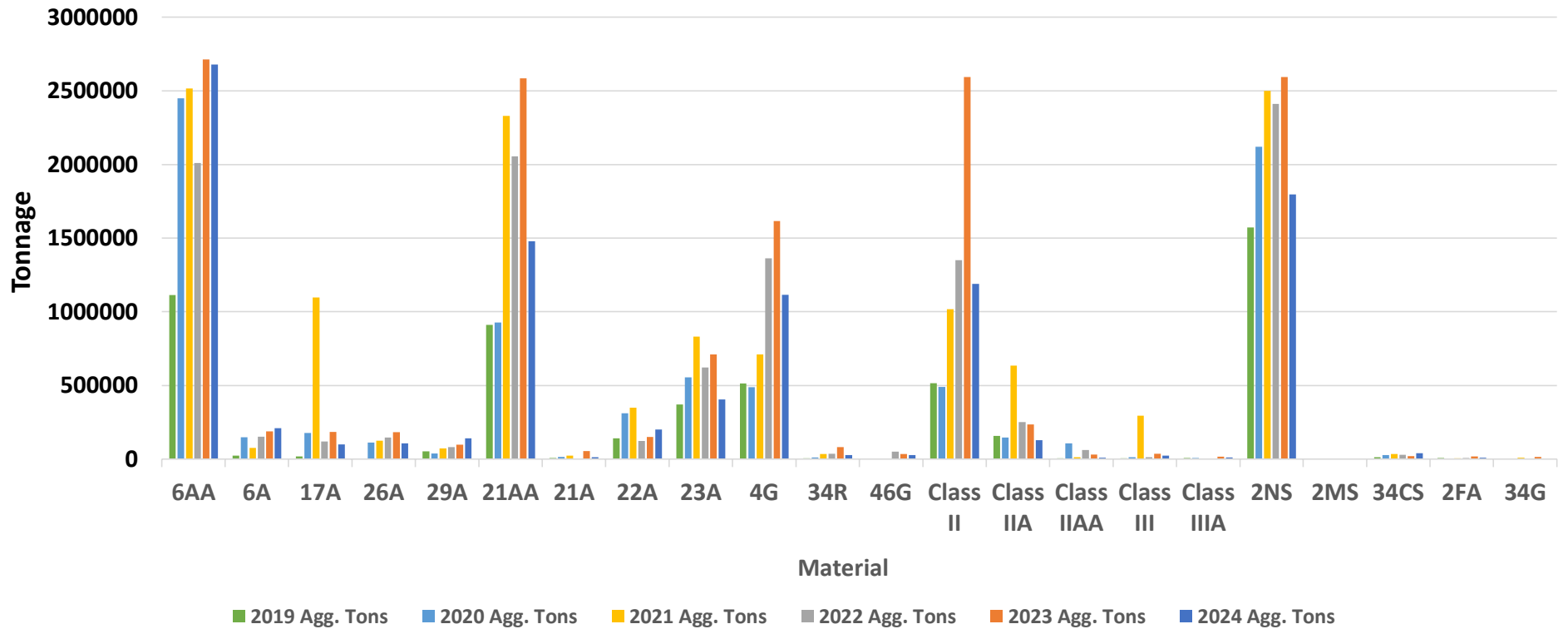
### TOTAL ANNUAL AGGREGATE TONNAGES REPORTED BY REGISTERED PITS AND QUARRIES FOR STANDARD MDOT AGGREGATE

"OTHER" aggregates (BACKFILL-SELECT, 4G-MOD...) reported = additional 7-15 percent of values shown



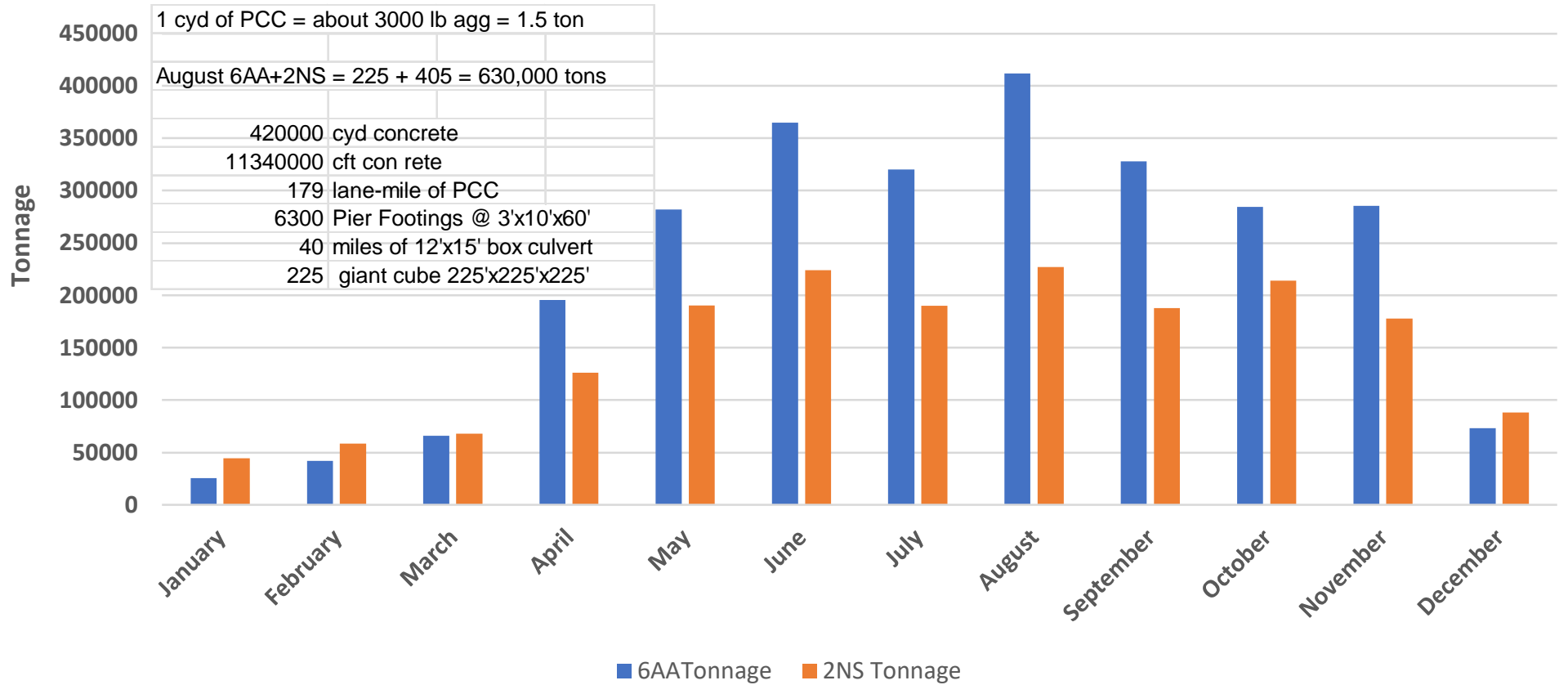


COMPARISON CHART OF TONNAGES REPORTED BY PITS AND QUARRIES FOR COMMON STANDARD MDOT AGGREGATE SERIES/CLASS



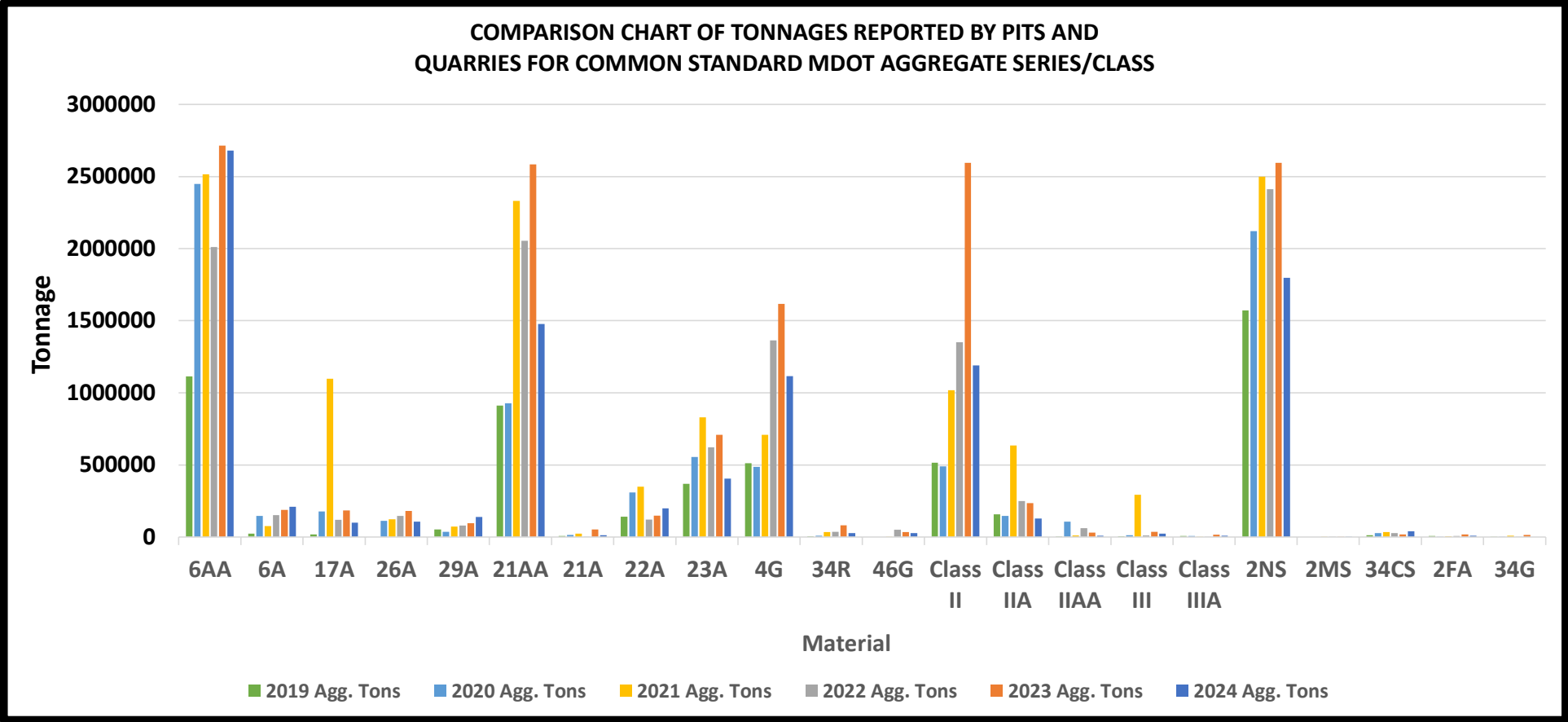
Reported Aggregate Use

## 2024 Monthly Tonnages for MDOT 6AA and 2NS





# Lansing Agg Quality Unit – Tracking Macro Trends







# Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries - 2025

AASHTOWare  
“Black Box” software  
Sort of

# Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries

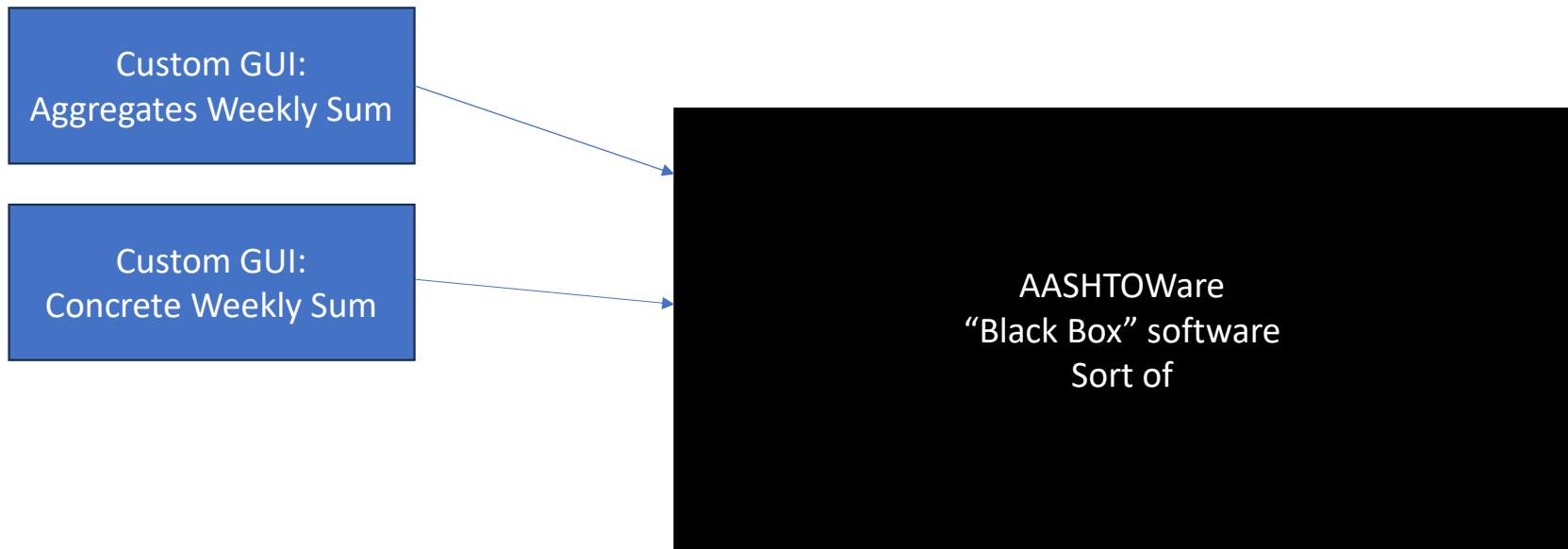
Custom GUI:  
Aggregates Weekly Sum



AASHTOWare  
"Black Box" software  
Sort of

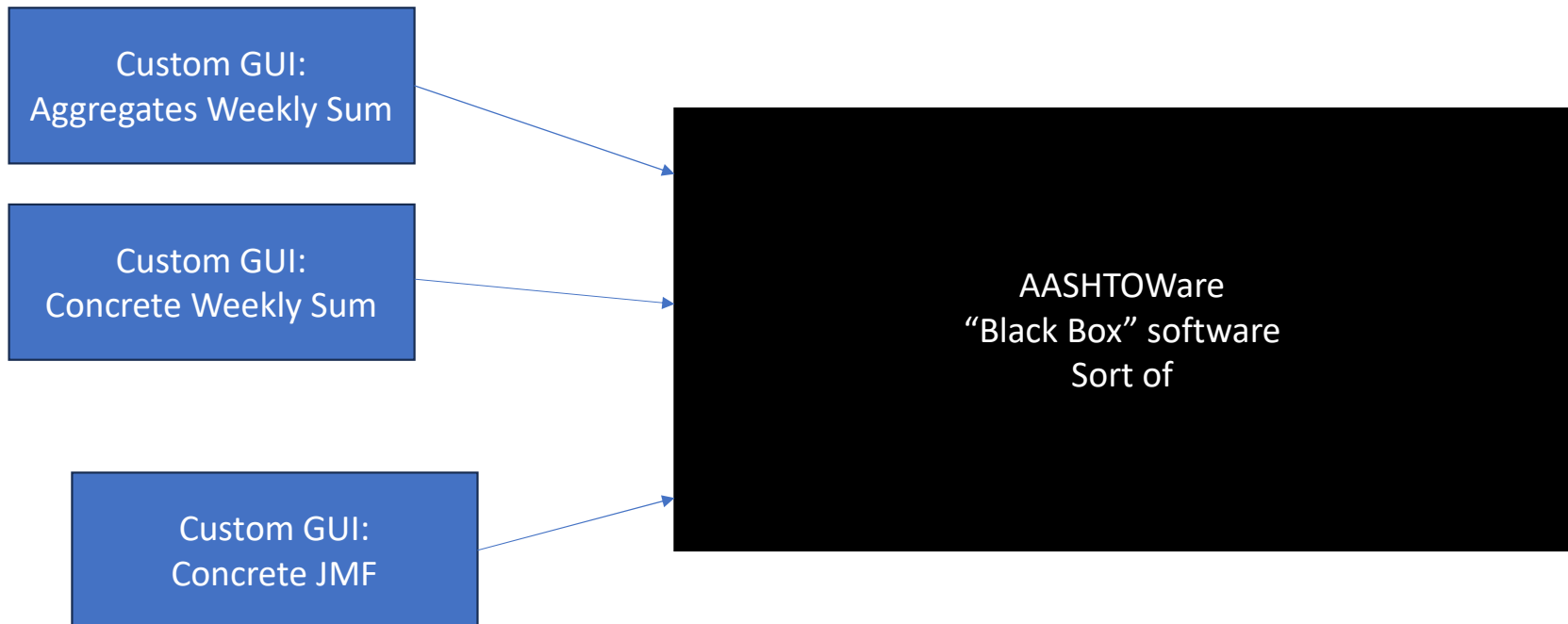
How does MDOT get  
Suppliers shipping data  
into AASHTOWare?

# Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries

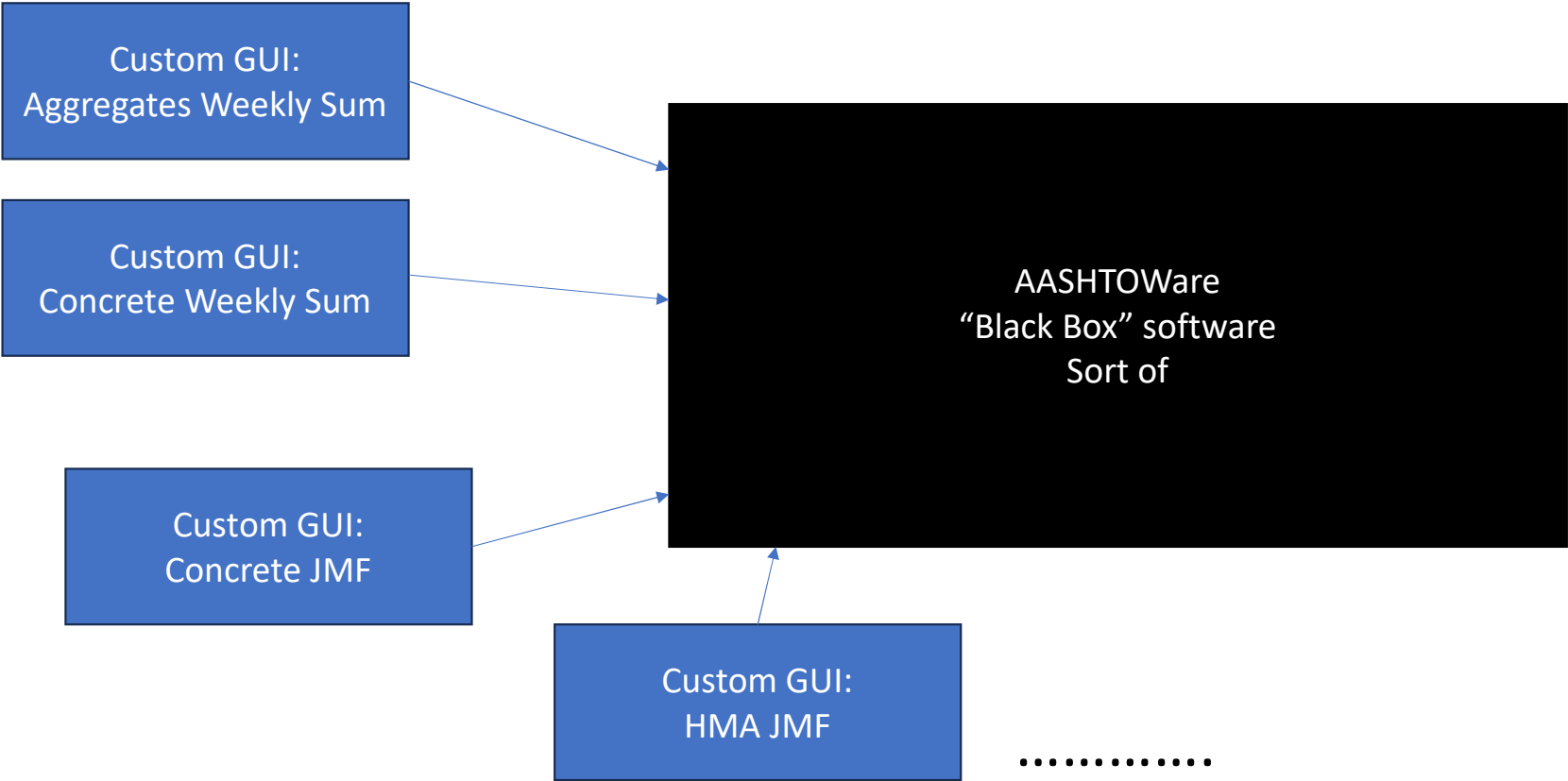




# Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries



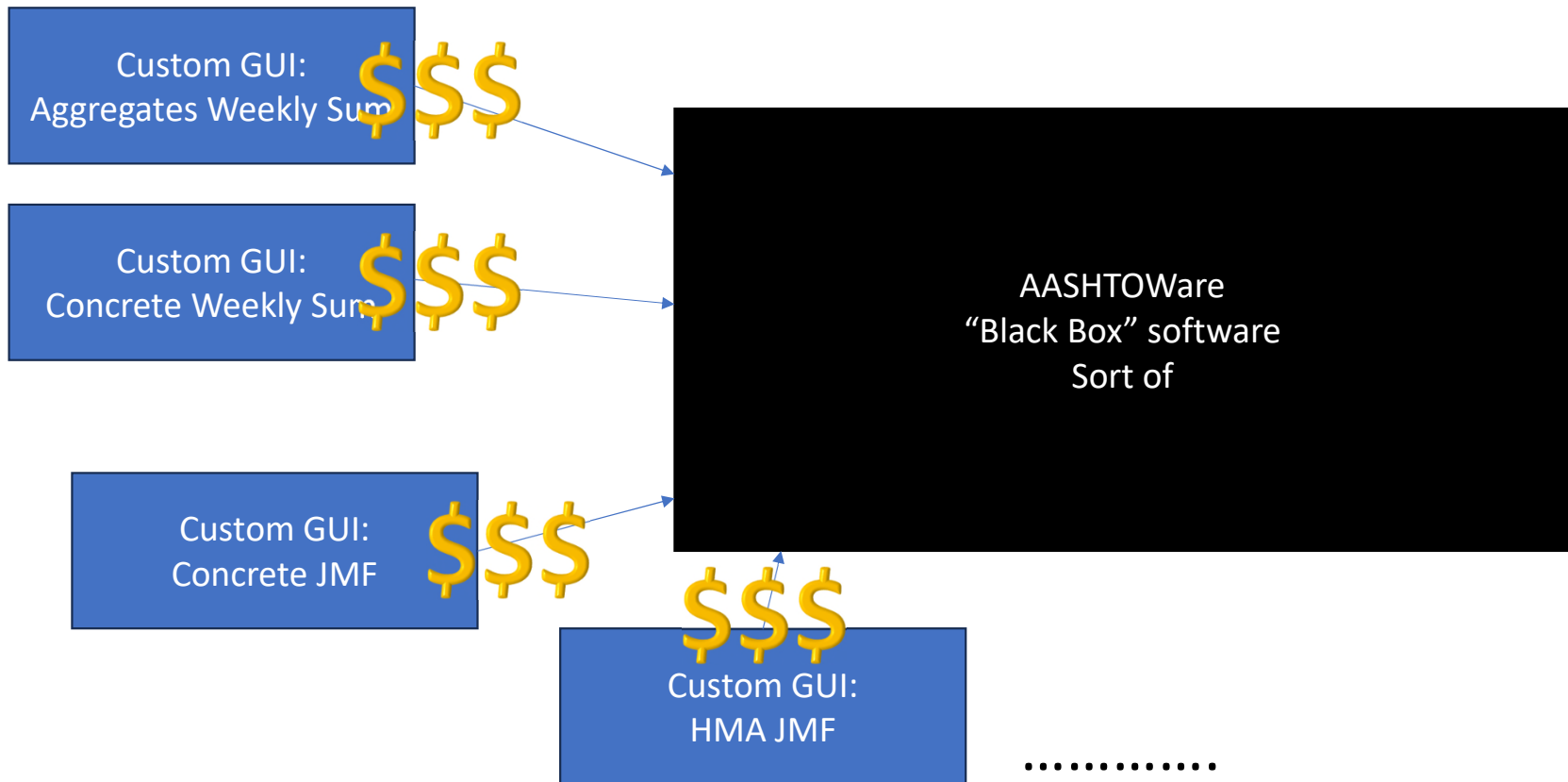
# Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries



Optional for now

MDOT Data Entry

Mandatory Direct Data Entry into AASHTOWare for Weekly MDOT Shipping Summaries





# Standardized Format for Weekly Shipping Summaries

## MDOT Weekly Aggregate Summary Report

Supplier Name:  
 Michigan Aggregate Source ID (ASI) #:  
 Address:  
 Contact Name:   
 Contact Phone #  
 Contact E-mail:

SUPPLIER'S UNIQUE SHIPMENT TRACKING DATA (optional)		DATE OF SHIPMENT	ORIGIN SOURCE ASI AND AGGREGATE SERIES/CLASS SHIPPED		FOR MATERIAL SHIPPED TO AN MDOT REGISTERED DOCK / YARD		FOR MATERIAL SHIPPED TO A CONCRETE PLANT FOR MDOT MIXTURES		FOR MATERIAL SHIPPED DIRECTLY TO AN MDOT PROJECT JOB NUMBER		QUANTITY SHIPPED	
TRACKING NUMBER	TRACKING NAME	SHIPPED DATE	SOURCE ASI NUMBER	AGGREGATE SERIES/CLASS	COMPANY NAME	ASI NUMBER	COMPANY NAME	CONCRETE PLANT	CONTRACTOR	JOB NUMBER	QUANTITY TONNAGE	QUANTITY CUBIC YARDS

Use official Aggregate Source ID Numbers for docks, yards, pits, quarries, furnaces: like 57-0025SG....

Use the MDOT Job Numbers when associated with an MDOT Construction Contract directly.

# Quarried Carbonates: Managing "Objectionable Seams and Layers"

SHALE !! In my Carbonate







SHALE !! In my Carbonate





SHALE !! In my Carbonate



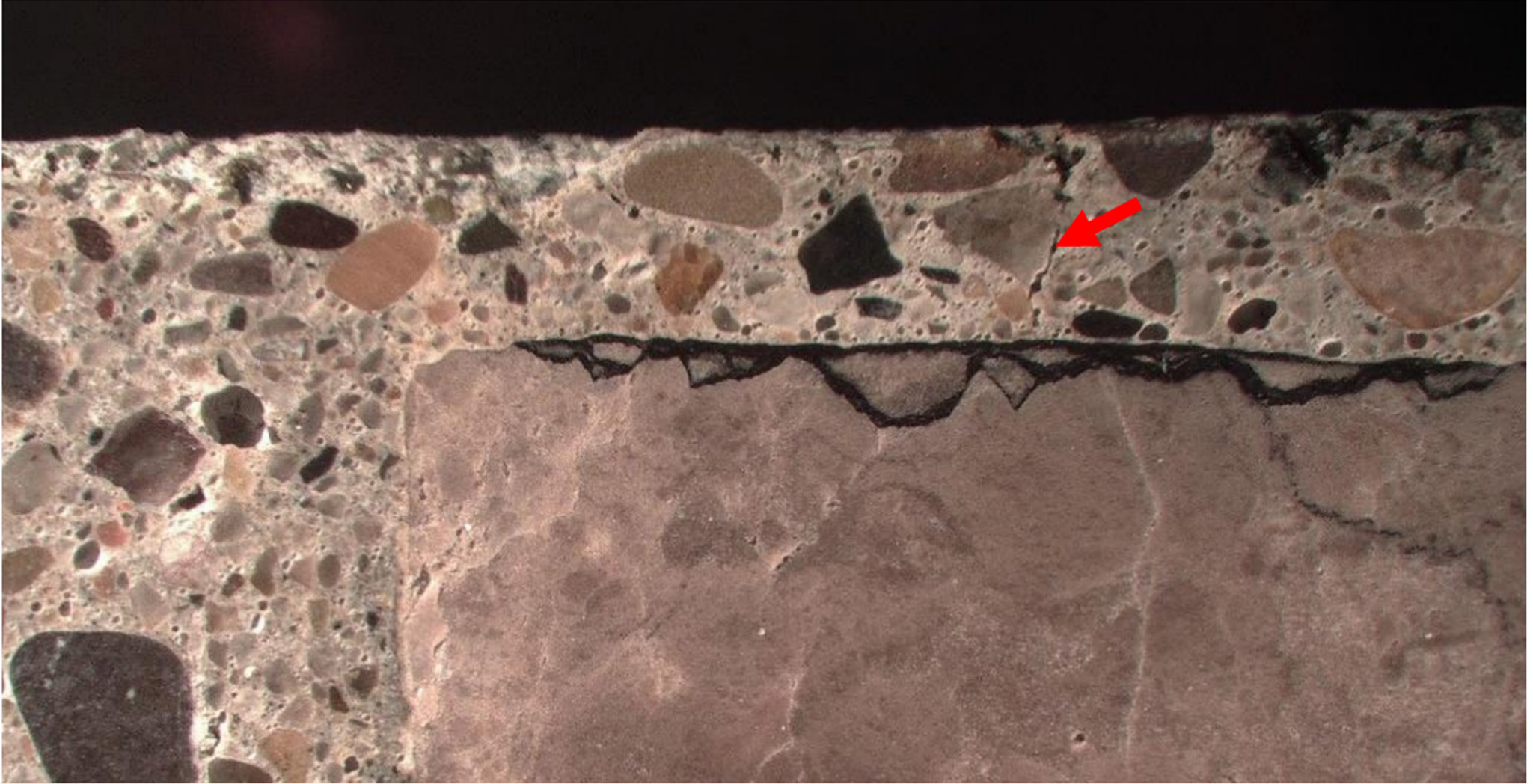


SHALE !! In my Carbonate



SHALE !! In my Carbonate



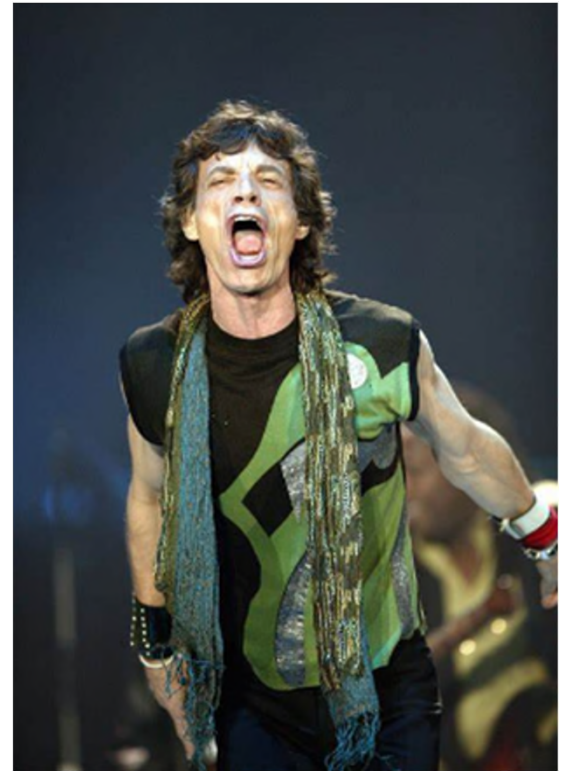






Rip Rap Weathering









SHALE !! In my Carbonate *Shattered Shattered*





# AASHTOWare Updates

Dan Burns, PE

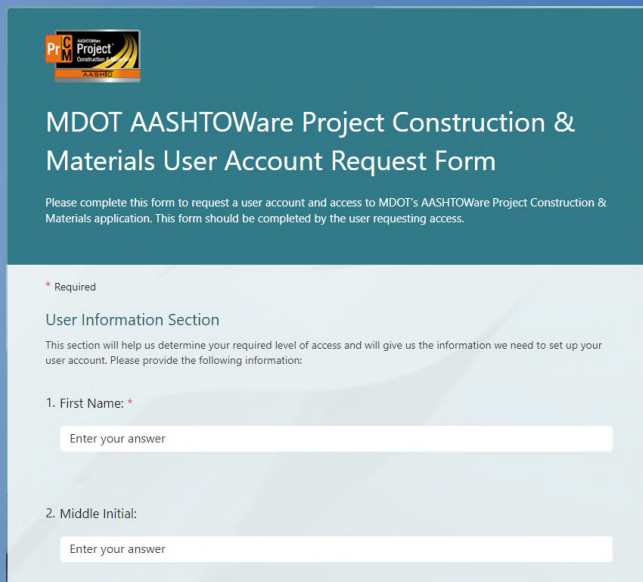
MDOT-CFS – Construction Technology Engineer

# Construction Implementation Timeline



MDOT Let Local Contracts: April 2025 Letting!

# User Access (Construction)



**MDOT AASHTOWare Project Construction & Materials User Account Request Form**

Please complete this form to request a user account and access to MDOT's AASHTOWare Project Construction & Materials application. This form should be completed by the user requesting access.

\* Required

**User Information Section**

This section will help us determine your required level of access and will give us the information we need to set up your user account. Please provide the following information:

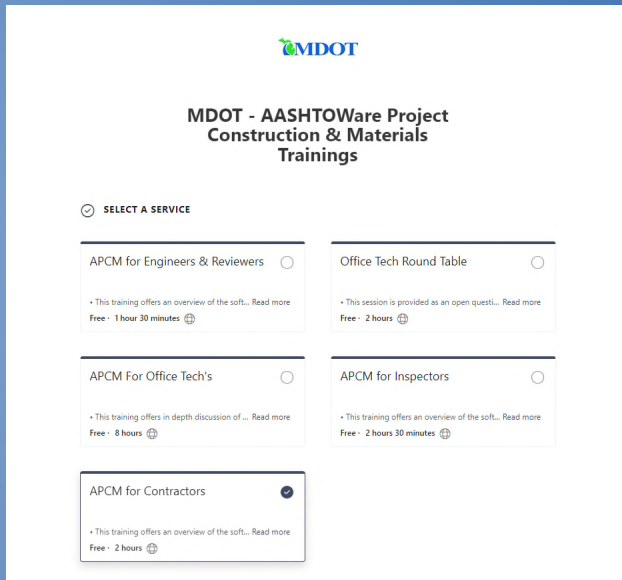
1. First Name: \*

2. Middle Initial:



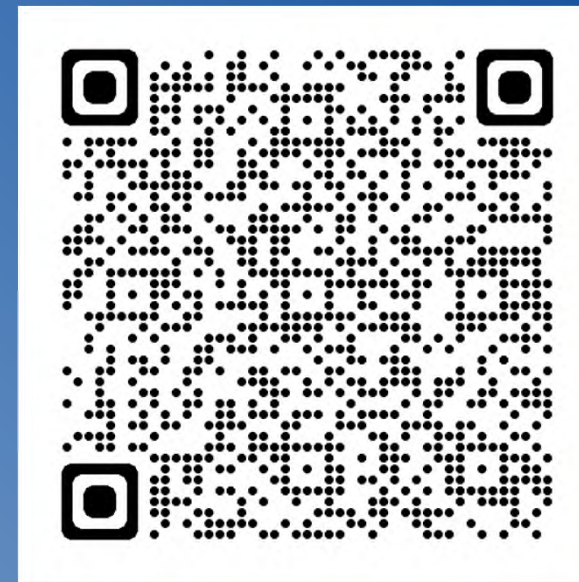
<https://forms.office.com/g/C93kGcuuDB>

# Trainings



The screenshot shows the MDOT website's training selection interface. At the top, the MDOT logo is displayed. Below it, the heading reads "MDOT - AASHTOWare Project Construction & Materials Trainings". A section titled "SELECT A SERVICE" contains five training options, each with a radio button and a brief description:

- APCM for Engineers & Reviewers**: This training offers an overview of the soft... Read more. Free - 1 hour 30 minutes.
- Office Tech Round Table**: This session is provided as an open quest... Read more. Free - 2 hours.
- APCM For Office Tech's**: This training offers in depth discussion of ... Read more. Free - 8 hours.
- APCM for Inspectors**: This training offers an overview of the soft... Read more. Free - 2 hours 30 minutes.
- APCM for Contractors**: This training offers an overview of the soft... Read more. Free - 2 hours.



<https://outlook.office365.com/owa/calendar/APCMTrainings@StateofMichigan.onmicrosoft.com/bookings/>



# New Contractor Training Offerings



- Partnership between MDOT, Fishbeck and InfoTech



[Michigan APCM for Contractors](#)

# 5.02 Upgrade & Future Enhancements

## 5.02 – Updates

- APR-21093 - Make Lump Sum Item Estimate Payments for a Specific Dollar Amount or a Specific Quantity
- APR-15003 - Provide Method To Print A Page
- APR-27833 - Rounding Error Locking Payment Estimate And Not Creating Project Vouchers
- APR-16152 - Allow User-Generated Quantity-Based Item Pay Estimate Adjustments To Be Made Permanent
- APR-26692 - Item Overrun Exception did not create a Pay Item Adjustment on Contract

## Upcoming updates – Release TBD

- APR-28791 - Allow Multiple Administrative Offices on same contract and same level with overlapping dates

# APCM Wiki – Monthly Updates

- Construction Technology News section of the wiki contains monthly announcements and lists updates made to the system.
- Posted to wiki and emailed out via listserv on the day of implementation.

## Construction Technology News

### December 19, 2024

As we bring 2024 to a close, we have a few report updates and a few other things to share with you for the December release train. The Construction Technology Unit wishes everyone a safe and happy holiday season!

#### Announcements

- For the week of Christmas, estimates will be due to Finance by Noon on Monday, December 23rd, as payments staff will be out of the office on Tuesday and Wednesday. Estimates submitted for final approval after this deadline will be processed the following week.
- For the week of New Years Holiday, estimates will be due to Finance by Noon on Monday, December 30th, as payments staff will be out of the office on Tuesday and Wednesday. Estimates submitted for final approval after this deadline will be processed the following week.
- Please mark your calendars, a required technical upgrade is coming to FieldNet next month. The upgrade will occur January 24th, 2025 from 5:00pm to 6:00pm. The update requires a new agency configuration file to be loaded along with a few other steps. Detailed directions and the new configuration file will be distributed separately.

#### Report Updates

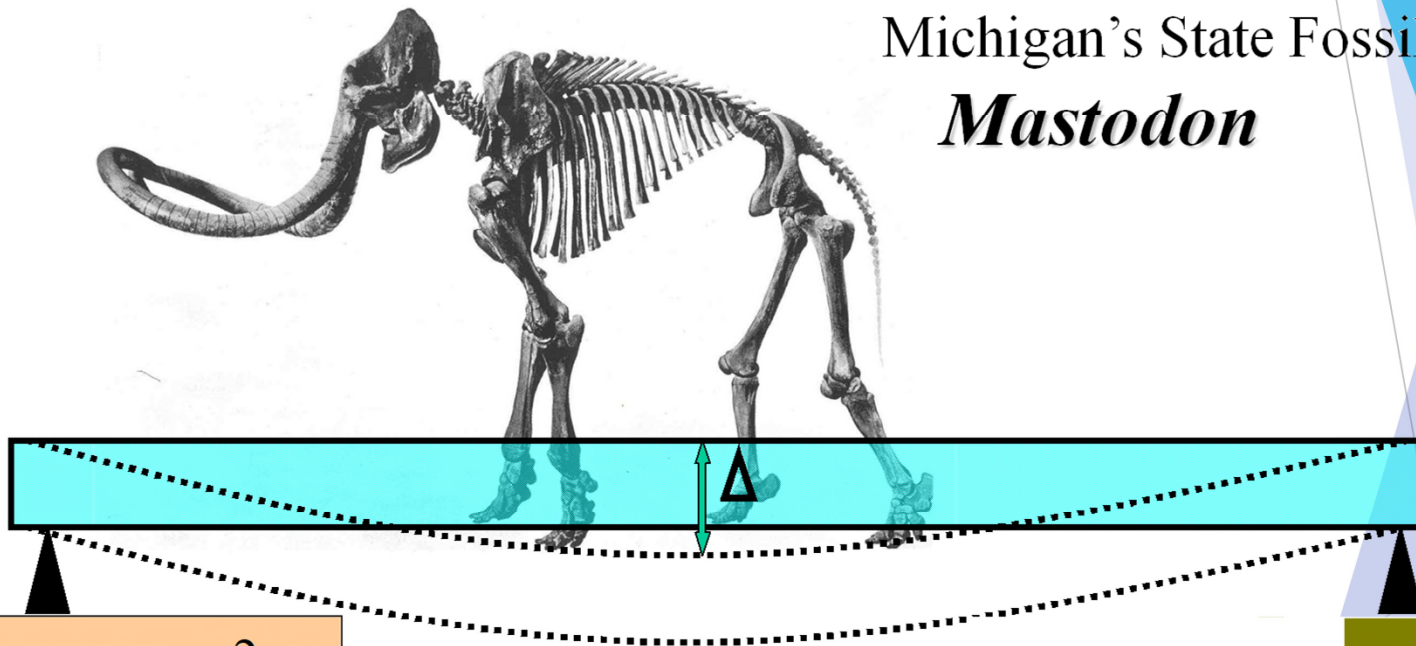
- **Change Order Report** – The attachments area of the report has been updated to include hyperlinks for easy access to DWR attachments.
- **Payment Estimate Exception Report** – The report has been updated to include the contractor associated with the item exception.
- **DWRs by Contractor Report** – This report was created to show the DWRs that are associated with specific contractors.
- **Project Category Level Contract Item Status XLS Report** – This report was created and is similar to the Contract Item Status Report XLS, but is broken down by project and category.

To view previous news articles, visit the [Construction Technology News Archive](#).



# Open Discussion

Michigan's State Fossil:  
*Mastodon*



$$M = EI \frac{d^2 z}{dx^2}$$

