Data-driven decision making is an approach to business governance or operations which values decisions supported with verifiable data. The success of the data-driven approach is reliant upon the quality of the data gathered and the effectiveness of its analysis and interpretation.
DATA DRIVEN DECISION MAKING

Why?

2017 Infrastructure Grades

- AVIATION: D
- BRIDGES: C+
- DAMS: D
- DRINKING WATER: D
- ENERGY: D+
- HAZARDOUS WASTE: D+
- INLAND WATERWAYS: D
- LEVEES: D
- PARKS AND RECREATION: D+
- PORTS: C+
- RAIL: B
- ROADS: D
- SCHOOLS: D+
- SOLID WASTE: C+
- TRANSIT: D−
- WASTEWATER: D+

America’s Cumulative Infrastructure Grade
- A: EXCEPTIONAL
- B: GOOD
- C: MEDIocre
- D: POOR
- F: FAILING

Ohio Department of Transportation
DATA DRIVEN DECISION MAKING

Why?

Chart 2. The Real Value of the Gas Tax has Declined by about 36 percent Since 1994

Nominal and Inflation Adjusted (2013 Dollars) Gas Tax Rates, 1933-2013

Source: IRS and Author’s Calculations

TAX FOUNDATION
Why?

86.4% of people will believe any data you put in a PowerPoint slide, even if you just totally made it up to prove your point.

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DATA DRIVEN DECISION MAKING

ODOT’s Approach

http://www.dot.state.oh.us/assetmanagement/
DATA DRIVEN DECISION MAKING

- Business Intelligence
- Information Discovery
- Capacity Building Systems
- Foundational Systems
DATA DRIVEN DECISION MAKING

Strategic Maturity

Business Intelligence

Information Discovery

Capacity Building Systems

Foundational

ESRI Roads & Highways

ELLIS

EIMS

SMS
DATA DRIVEN DECISION MAKING

Strategic Maturity

Business Intelligence

Information Discovery

- ESRI Collector
- MS2 Traffic Counts
- EIMS

Capacity Building

- ESRI Roads & Highways
- ELLIS
- EIMS
- SMS

Foundational

OHIO DEPARTMENT OF TRANSPORTATION
DATA DRIVEN DECISION MAKING

- Transportation Information Mapping System (TIMS)
- MS2 Traffic Counts
- Pathweb

ESRI Collector

- MS2 Traffic Counts
- EIMS

ESRI Roads & Highways

- ELLIS
- EIMS
- SMS

Information Discovery
Capacity Building
Foundational
DATA DRIVEN DECISION MAKING

Strategic Maturity

Transportation Asset Management Decision Support Tool (TAMDST)

Transportation Information Mapping System (TIMS)

ESRI Collector

ESRI Roads & Highways

MS2 Traffic Counts

MS2 Traffic Counts

ELLIS

EIMS

EIMS

Pathweb

Information Discovery

Capacity Building

Foundational

Business Intelligence
TAMDST

- University of Toledo prototype
- Cross-asset analysis
- Enable performance based, data driven planning
Technology

- HTML
- Custom App
- Power BI
- TIMS
- SQL Server
- ArcGIS
WORKSHOPS, INPUT, AND WIREFRAMES

- Roles
- Access
- Technical Appetite for Users
- Workflow in Asset Management
- Usage Patterns
- Framework Priorities
DATA DRIVEN DECISION MAKING

Database – Sourced from TIMS
Database – Sourced from TIMS

Advantages

• SQL Server already in-house
• Data aggregated to comfortable reporting format
• Segmentation of linear and point assets native to each dataset
DATA DRIVEN DECISION MAKING

Database – Sourced from TIMS

Disadvantages

• Atomic data isn’t present, limits data aggregation levels
• Segmentation rules differ per table, creating challenges to compare and report
• Different data cleaning rules per table
Database – Sourced from TIMS

Why?

Original design embedded TAMDST in TIMS as new module

Complexity & functional needs changed design to stand alone app, with TIMS integration point

TIMS integration & current ODOT warehouse maturity resulted in data sourcing model
Database – Other Challenges

TIMS data availability vs. DST needs

• New datasets needed created / sourced for project

• Resource availability to create
DATA DRIVEN DECISION MAKING

WELCOME TO TAMDST

The Transportation Asset Management Decision Support Tool (TAM DST) is a web-based application for accessing and reporting on Ohio Department of Transportation assets. It lets you extract relevant transportation information for display on a map and in reports.

Whether you use a desktop computer or a tablet, or do your best work from maps, tables, or graphs, TAMDST has it all ... everything you need to make well-informed decisions!

Getting started is as simple as 1 – 2 – 3 – 4.

Just go to the green title bar at the top of the screen and select the following:

1. **PREFERENCES**
   Pop up the Preferences window and decide what type of asset data you want available.
   **NOTE:** You typically will do this infrequently.

2. **FILTERS**
   Pop up the Filters window to narrow down the assets you want to work with.

3. **CONDITION MAP**
   Display the Map page and zoom and pan, turn assets on or off, select assets and get information about them.

4. **REPORTS**
   Display the Reports panel and select a report to generate, restrict the data you want to see in the report, and drill-down for more details.
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DATA DRIVEN DECISION MAKING

ASSET TYPES
Select a checkmark to enable an asset data.
- PAVEMENT
- BRIDGE
- CULVERT
- BARRIER

REPORT TYPES
Select a checkmark for the reports you want to generate.
- INVENTORY
- CONDITION
- PERFORMANCE
- INVESTMENT
- MAINTENANCE
- PLANNING

TOOLTIPS
Show tooltips throughout the application? ✓
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DATA DRIVEN DECISION MAKING

FILTERS

Use these filters to choose what data will be available in the reports.

LOCATION

DISTRICT
- All (Basic filtering)
- DEL
- FAY
- FRA
- MAD
- MAR
- MRW
- PIC
- UNI

COUNTY
- All (Basic filtering)

ROUTE NUMBER
- All (Basic filtering)

NLFD
- All (Basic filtering)

CHARACTERISTICS

SYSTEM
- All (Basic filtering)
- IR
- SR
- US

PRIORITY SYSTEM
- All (Basic filtering)
- G
- P
- U

JURISDICTION
- All (Basic filtering)
- IR270
- IR670
- IR70
- IR71
- SR100
- SR104
- SR138
- SR142

RATING
- All (Basic filtering)

ASSET INSPECTOR
- Assets selected from the Asset Inspector.

BEGIN LOG
- Input log

END LOG
- Input log
DATA DRIVEN DECISION MAKING

WELCOME TO TAMDST

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DATA DRIVEN DECISION MAKING

Identify assets draw box

Dynamically segment features along route

Filter reports to correspond with assets selected in map

ODOT TAMDST
Transportation Asset Management Decision Support Tool

CONDITION MAP

FILTERS REPORTS CONDITION MAP PREFERENCES

ASSET INSPECTOR

FILTER BY SELECTED ASSET(S)

Bridge

Bridge - Fair/Satisfactory (6)

SCORE 6
NLFDID: SFRASRD0315**E
COUNTYCODE: FRA
DISTRICTCODE: 6
ROUTESYSTEMCODE: SR
ROUTENUMBER: 00315
PRIORITYSYSTEMCODE: P
CTL_BEGIN: 2.77
CTL_END: 2.77
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### Asset Valuation

Shows high-level totals of interest by asset type for the current reporting year only.

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Total</th>
<th>Valuation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAVEMENT</strong></td>
<td>6,256 miles</td>
<td>$3,269,892,500 in Total Lane Miles</td>
<td>84.20 Avg. PCR</td>
</tr>
<tr>
<td><strong>BRIDGE</strong></td>
<td>689 bridges</td>
<td>$1,192,205,375 in Total Bridge Deck Area</td>
<td>9.537,643 Deck Area</td>
</tr>
</tbody>
</table>

![Graph showing the total assets and their valuation]

**Selected Filters**

- NLFD = Multiple Selected
- District = 005
- County = FRANKLIN
- Route System = Multiple Selected
- Route = Multiple Selected
- Jurisdiction = State
- Priority System = Multiple Selected
- Functional Class = Multiple Selected
- Maint
DATA DRIVEN DECISION MAKING

INVENTORY SUMMARY
Shows total numbers and costs of all selected assets for the current reporting year only in both graphical and tabular form, grouping results as specified.

Inventory Summary Asset Totals Chart: District Code (X-Axis) and Directional Miles (Y-Axis) and Total (Legend)

View exported data on map

Group (X-Axis)
- County
- District Code
- Priority System
- Route Number
- Route System

Series (Legend)
- Total
- Urban Area

Inventory Summary Count and Valuations Table: District Code (Columns) and All Counts and Valuations per Asset Type (Rows)

<table>
<thead>
<tr>
<th>Group Types</th>
<th>District Code</th>
<th>006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRIDGE</td>
<td># of Bridges</td>
<td>689</td>
</tr>
<tr>
<td></td>
<td>Deck Area (sq ft)</td>
<td>5,937,643</td>
</tr>
<tr>
<td>PAVEMENT</td>
<td>Centerline Miles</td>
<td>5,875.84</td>
</tr>
<tr>
<td></td>
<td>Directional Miles</td>
<td>6,256.22</td>
</tr>
<tr>
<td></td>
<td>Lane Miles</td>
<td>2,615.91</td>
</tr>
</tbody>
</table>

Selected Filters
DATA DRIVEN DECISION MAKING

Modify graph views

View data based on Centerline, Directional or Lane Miles
DATA DRIVEN DECISION MAKING

INVENTORY SUMMARY
Shows total numbers and costs of all selected assets for the current reporting year only in both graphical and tabular form, grouping results as specified.

Inventory Summary Asset Totals Chart: District Code (X-Axis) and Directional Miles (Y-Axis) and Total (Legend)

Inventory Summary Count and Valuations Table: District Code (Columns) and All Counts and Valuations per Asset Type (Rows)

Selected Filters
DATA DRIVEN DECISION MAKING

Additional slicers for refining data

<table>
<thead>
<tr>
<th>Direction</th>
<th>Functional Class</th>
<th>Maintenance Auth</th>
<th>NHS Description</th>
<th>No of Lanes</th>
<th>Ownership</th>
<th>Pavement Type</th>
<th>Area Type</th>
<th>Urban Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>

Inventory Detail

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>NLFD</th>
<th>CTL Begin</th>
<th>CTL End</th>
<th>Asset Count / Length in Directional Miles</th>
<th>No of Lanes</th>
<th>Direction</th>
<th>Jurisdiction</th>
<th>No of Lanes</th>
<th>Ownership</th>
<th>No of Lanes</th>
<th>Urban Area</th>
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<tr>
<td>PAVEMENT</td>
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<td>0.00</td>
<td>0.80</td>
<td>0.80</td>
<td>6</td>
<td>UP</td>
<td>State</td>
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<td>FRA</td>
<td>P</td>
<td>Composite</td>
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<tr>
<td>PAVEMENT</td>
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<td>0.80</td>
<td>0.80</td>
<td>6</td>
<td>DOWN</td>
<td>State</td>
<td>006</td>
<td>FRA</td>
<td>P</td>
<td>Composite</td>
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<td>CULVERT</td>
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<td>0.24</td>
<td>1.00</td>
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<td>P</td>
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<tr>
<td>PAVEMENT</td>
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<td>0.50</td>
<td>3.40</td>
<td>2.60</td>
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<td>Composite</td>
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<td>1.19</td>
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</tr>
</tbody>
</table>
Data Driven Decision Making

Condition Summary
Shows high-level condition scores for all selected assets based on general inspection scores (pcr/ga), for the current reporting year only. The data on the report can be grouped.

Score Distribution By: District Code

Condition Count by Rating Group and District Code
Right-click Count values to get complete drillthrough options
DATA DRIVEN DECISION MAKING

ODOT TAMDST
Transportation Asset Management
Decision Support Tool

REPORTS

CONDITION SUMMARY
Shows high-level condition scores for all selected assets based on general inspection scores (PCR/ga), for the current reporting year only. The data on the report can be grouped.

Score Distribution By: District Code

Interactive to filter further

Asset Count by Rating Group and District Code
Right-click Count values to get complete drillthrough options

Group Type: District Code
Group: 006
Rating Type: Very Good

<table>
<thead>
<tr>
<th>AssetName</th>
<th>Count / Approx Miles</th>
<th>Percentages</th>
<th>Count / Approx Miles</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIDGE</td>
<td>153</td>
<td>22.21%</td>
<td>153</td>
<td>22.21%</td>
</tr>
</tbody>
</table>
### CONDITION DETAIL

Provides more condition detail about assets that have a condition rating, for the current reporting year only.

#### Total Assets per Rating Category Chart

<table>
<thead>
<tr>
<th>Rating Category</th>
<th>Bridge</th>
<th>Culvert</th>
<th>Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>0.10%</td>
<td>0.52%</td>
<td>0.85%</td>
</tr>
<tr>
<td>Very Poor</td>
<td>0.16%</td>
<td>0.17%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Poor</td>
<td>52.19%</td>
<td>33.47%</td>
<td>25.36%</td>
</tr>
<tr>
<td>Fair/Satisfactory</td>
<td>32.01%</td>
<td>25.33%</td>
<td>22.71%</td>
</tr>
<tr>
<td>Good</td>
<td>0%</td>
<td></td>
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</tr>
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</table>

#### Total Assets per Rating Category Table

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Count / Miles</th>
<th>Rating Category</th>
<th>Closed</th>
<th>Very Poor</th>
<th>Poor</th>
<th>Fair/Satisfactory</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge</td>
<td>56.00</td>
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<td>8.13%</td>
<td>116.00</td>
<td>16.84%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culvert</td>
<td>6.00</td>
<td></td>
<td>0.36%</td>
<td>3.00</td>
<td>0.18%</td>
<td></td>
<td></td>
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#### Asset Score and Subscore Rating Values

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<th>Corrugation Value</th>
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</table>

0 Bridges, 0 Culverts, 0 Pavements have no score.
DATA DRIVEN DECISION MAKING

DISTRESS DISTRIBUTION
Displays the values that make up the pavement condition rating (PCR) for selected pavement segments.

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<thead>
<tr>
<th>Type of Miles</th>
<th>Distress Code(s)</th>
<th>Distress Type(s)</th>
<th>Pavement Type(s)</th>
<th>Rated Year(s)</th>
<th># of Distressed Miles</th>
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<td>All</td>
<td>Composite</td>
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% Miles per Rating Group

Assets per Rating Group:
Expand All Down to lowest level and Right-click Score values to get complete drillthrough options

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<th>HF</th>
<th>HO</th>
<th>ME</th>
<th>MF</th>
<th>MO</th>
<th>LF</th>
<th>LF</th>
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View exported data on map
## Poor Condition List

Shows detailed information about assets with a poor condition rating, for the current reporting year only.

Specify poor-condition rating range (minimum and maximum) for each type of asset:

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<tr>
<th>Asset Type</th>
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<td>Culvert</td>
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<td>(Multiple Selections)</td>
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### Poor Condition List

Right-click Score values to get complete drillthrough options

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### Selected Filters

View exported data on map
# DATA DRIVEN DECISION MAKING

## CONDITION HISTORY GRID

Displays yearly condition rating scores for road sections and their assets over a specific range of years.

**Score Selection:** Pavement Rating

**Rated Year(s):** 1985 2015

### Condition History Grid

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</table>

*View exported data on map*
DATA DRIVEN DECISION MAKING

CONDITION HISTORY GRID
Displays yearly condition rating scores for road sections and their assets over a specific range of years.

DRILLTHROUGH: Plot Condition Grid Details

This report is filtered to the Pavement Rating Score Selection

Score Over Time
Score Selection: Pavement Rating

Asset: Specific Score History
<table>
<thead>
<tr>
<th>NLID</th>
<th>CTL Begin</th>
<th>CTL End</th>
<th>RatedYear</th>
<th>Direction Code</th>
<th>Score Selection</th>
<th>Distress Code</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFRA1R00070**C</td>
<td>4.68</td>
<td>5.26</td>
<td>1985</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>74.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1986</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>74.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1987</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>64.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1988</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>62.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1989</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1990</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1991</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>94.00</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1992</td>
<td>UP</td>
<td>Pavement Rating</td>
<td>N/A</td>
<td>98.00</td>
</tr>
</tbody>
</table>

Score Selection:
Pavement Rating

View exported data on map
DATA DRIVEN DECISION MAKING

ODOT TAMDST
Transportation Asset Management Decision Support Tool

REPORTS

PREDICTED PCR
Shows the predicted condition of pavement for a specific year in the future.

Predicted Score Distribution Per Year (Weighted for Type of Miles)

Predicted PCR Average

<table>
<thead>
<tr>
<th>Year</th>
<th>Predicted PCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>83.17</td>
</tr>
<tr>
<td>2018</td>
<td>87.26</td>
</tr>
<tr>
<td>2019</td>
<td>88.95</td>
</tr>
<tr>
<td>2020</td>
<td>89.55</td>
</tr>
</tbody>
</table>

Mileage by Predicted PCR Year and Predicted PCR Category

<table>
<thead>
<tr>
<th>Rating Category</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Poor</td>
<td>84.54</td>
<td>137.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td>149.76</td>
<td>109.13</td>
</tr>
<tr>
<td>Fair/Satisfactory</td>
<td>76.43</td>
<td>79.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td></td>
<td>175.60</td>
<td>237.88</td>
</tr>
<tr>
<td>Very Good</td>
<td></td>
<td></td>
<td>160.39</td>
<td>301.83</td>
</tr>
<tr>
<td>New</td>
<td></td>
<td></td>
<td>144.67</td>
<td></td>
</tr>
</tbody>
</table>

Predicted PCR and Upcoming Project per Segment:

<table>
<thead>
<tr>
<th>NLFD</th>
<th>Priority System Code</th>
<th>CIL Begin</th>
<th>CIL End</th>
<th>Direction Code</th>
<th>Pavement Type</th>
<th>Lanes</th>
<th>Upcoming Project Year</th>
<th>Upcoming Treatment</th>
<th>Score Selection</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFRAIR90000709140001</td>
<td>P</td>
<td>0.00</td>
<td>3.40</td>
<td>DOWN</td>
<td>Composite</td>
<td>6</td>
<td>2017</td>
<td>Unknown</td>
<td>Pavement Rating</td>
<td>82.00</td>
<td>80.00</td>
<td>95.00</td>
<td>92.00</td>
</tr>
</tbody>
</table>
DATA DRIVEN DECISION MAKING

ASSET EXPENDITURE
Provides total expenditure costs for a set of assets determined by report-level filters, over a specific range of years.

Capital Expenditures: $2.97bn
- *ELLIS data 2002 and forward

Maintenance Costs: 411.67M
- *prior to 2002

Historic Capital Costs: 6.99M
- *Prior to 2002

Total Expenditures: [1985 to 2025]

Selected Year Maintenance Expenditures per Project Category

Selected Year Capital Expenditures per Treatment Type

Selected Historic Project Year Capital Expenditures

Average PCR by Year

Selected Filters
Report List

- Inventory Summary
- Inventory Detail
- Condition Summary
- Condition Detail
- Condition Map
- Poor Condition List
- Distress Distribution
- Treatment Performance
- Asset Expenditure

- Rehabilitation Candidates
- Planned Expenditure
- Recommended Treatments
- Scoping Report
- Grid Report
- Project History
- Ready to Pave
- Gap Projects
- Labor/Materials/Equipment
Next Steps

• Wrap up development --> production
• User feedback, modifications
• Data Governance

Most likely have impact on TAMDST
What?

**Data-driven decision making** is an approach to business governance or operations which values decisions supported with verifiable data. The success of the data-driven approach is reliant upon the quality of the data gathered and the effectiveness of its analysis and interpretation.
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