Building Information Modeling (BIM)
at MMSD’s Water Reclamation Facilities

Emily Champagne, GISP
Geospatial Manager
Geospatial Services and Solutions Department
What is BIM?
What is a Digital Twin?
Background

MMSD had traditionally used 2D drawings and technology for design, construction, and building management.

Business Needs

• Identify and locate vertical assets and yard piping
• Survey grade master site plans
• Efficiently find current and accurate information about assets (disparate system silos)
• Access to asset information in the field (mobile-friendly)
• Ability to visualize how design projects affect other planned or current projects
What if MMSD does nothing?

- BIM adoption is gaining towards 90% use in AEC.
- AEC consultants are already creating 3D models for District WRF projects.

**If we do nothing . . .**

- MMSD will continue to store WRF data in disparate systems with no easy or consistent access to find information.
- MMSD will continue to have no consistent process to QC or update existing information.
- Employee succession = loss of institutional knowledge. This increasingly compounds the inefficiencies of finding current (or simply accurate) information about our assets at WRFs.

MMSD should be intentional and proactively plan for and implement BIM instead of *just letting it happen*. 
MMSD BIM Vision

Create a scalable and maintainable solution for sharing data that integrates with other systems

Goals:
• To improve decision making
• To increase efficient emergency response
• To support succession planning
• To determine the best solution that meets the functional requirements of major stakeholders and the project's objectives.
Roadmap to Digital Twin

**Phase 1**
Survey & Locate underground piping
GIS mapping

**Phase 2**
Exterior LiDAR scanning
Master Site Plan drawings
2D WRF GIS Application

**Phase 3**
BIM Needs Assessment and Recommendations Report

**Phase 4**
Pilot BIM Project

**Phase 5**
BIM Project
2 Buildings and Gallery

2023 Projects
3+ Buildings in progress

WRF Digital Twin

2012

Projects
3+ Buildings in progress
Vertical Asset Management

- Asset Management Inventory
- Reconcile
  - Fixed Asset number
  - P&ID number
  - Asset location
  - Grouped Assets
  - Operator CMMS Asset number
  - Transmittal number

<table>
<thead>
<tr>
<th>MMSD Asset ID</th>
<th>Asset Description</th>
<th>Asset Status</th>
<th>Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>146898</td>
<td>SWITCH, NETWORK, J234D1, J234D2</td>
<td>ACTIVE</td>
<td>BLDG224</td>
</tr>
<tr>
<td>146899</td>
<td>SWITCH, NETWORK, J234D2</td>
<td>ACTIVE</td>
<td>BLDG224</td>
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<tr>
<td>146886</td>
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<td>BLDG234</td>
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<tr>
<td>146868</td>
<td>PLC, RAS</td>
<td>ACTIVE</td>
<td>BLDG224</td>
</tr>
<tr>
<td>146867</td>
<td>PLC, WET WEATHER MASTER</td>
<td>ACTIVE</td>
<td>BLDG234</td>
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<td>146683</td>
<td>LDP, EAST PLANT RAS PUMPING</td>
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<td>BLDG22M</td>
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<td>146103</td>
<td>MDC, BLDG234 44A</td>
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<td>BLDG234</td>
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<td>145443</td>
<td>MOTOR, RAS PUMP 4 EAST</td>
<td>ACTIVE</td>
<td>BLDG234</td>
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</table>
8. Shared Parameter File

Revit enables the creation of custom fields that may be shared between projects and families and be scheduled and called out correctly through a function named “Shared Parameters”.

8.1 Shared Parameters in Models

Any project specific shared parameter file shall always start with the provided MMSD shared parameter file and all parameters unique to that project will be added to that file. The Project Shared Parameter file contains all family and project parameters, as well as all standard MMSD parameters. It is not necessary for all parameters to be present in all families. The shared parameter file is provided simply to facilitate adding parameters to families as needed.

8.2 Shared Parameters, Equipment Data & Asset ID

The provided MMSD shared parameter file contains parameters relating to MMSD record management systems. These parameters must be included in all project files and can be found in the MMSD Shared Parameter.txt file. All equipment deemed an asset by MMSD shall have standard parameters populated.

Table 7 – Parameters

<table>
<thead>
<tr>
<th>Identity Data</th>
<th>Data Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Category</td>
<td>Text</td>
</tr>
<tr>
<td>Asset Class</td>
<td>Text</td>
</tr>
<tr>
<td>Asset ID</td>
<td>Text</td>
</tr>
<tr>
<td>Asset Type</td>
<td>Text</td>
</tr>
<tr>
<td>Bi-Cycle</td>
<td>URL</td>
</tr>
<tr>
<td>P&amp;ID</td>
<td>URL</td>
</tr>
<tr>
<td>OnBase</td>
<td>URL</td>
</tr>
<tr>
<td>Collab</td>
<td>URL</td>
</tr>
<tr>
<td>GISPortal</td>
<td>URL</td>
</tr>
<tr>
<td>e-Build</td>
<td>URL</td>
</tr>
</tbody>
</table>

MMSD Asset Management Department assigns a unique Asset ID number to equipment managed in AssetView (Bi-Cycle). MMSD’s asset management software. These asset IDs can be found on equipment tags attached to assets in the field.
BIM Level of Detail (LOD)

<table>
<thead>
<tr>
<th>LOD 100</th>
<th>LOD 200</th>
<th>LOD 300</th>
<th>LOD 350</th>
<th>LOD 400</th>
<th>LOD 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbols</td>
<td>Generic placeholder/space allocation for different</td>
<td>Design ready modeled elements</td>
<td>Connections and interfaces between disciplines</td>
<td>Detailing and fabrication ready modeled elements</td>
<td>As-built</td>
</tr>
<tr>
<td>Approximate info attached</td>
<td>Manufacturer and/or model in terms of accurate dimensions and shape</td>
<td>Manufacturer and/or model in terms of accurate dimensions and shape</td>
<td>Manufacturer and/or model in terms of accurate dimensions and shape, cost &amp; installation info</td>
<td>Manufacturer, model, cost, installation, assembly, warranty, proper maintenance...</td>
<td></td>
</tr>
</tbody>
</table>
Revit Model
System Integrations

- Document Management (OnBase)
  - Construction Drawings
  - Record Drawings
  - Process O&M Manuals
  - Equipment O&M Manuals
- Asset Management (Bi-Cycle)
  - CMMS information
- P&IDs (Microsoft Sharepoint)

In Progress:

- ArcGIS
- GeoBIM
- CMMS information
- P&IDs (Microsoft Sharepoint)
BIM Pilot Evaluation

“These are excellent tools. As more buildings are added and as I get more familiar with navigation, it will only become more useful.”

“It was easy and simple, found the information I was looking for in a couple of mouse clicks, it was extremely helpful.”

Current State average: 7 hours
BIM Viewer average: 1.25 hours

550% longer time to locate asset under current methods vs. using BIM viewer
Conclusions

Continuation of the same workflows within silos of departments and databases (the status quo) is not an option for MMSD’s Water Reclamation Facilities.

BIM has already become the standard tool to conduct business in construction and is rapidly transforming AEC operation lifecycles as more organizations migrate to a Digital Twin.

Implementing and applying BIM to vertical assets allows MMSD to utilize its current investment in technology and database systems.
Thank you

Emily Champagne, GISP
echampagne@mmsd.com
414.225.2180
Geospatial Manager
Milwaukee Metropolitan Sewerage District (MMSD)