

From CAD to GIS: The value of spatially enabling utility and facility information

Justin Anderson – Esri Brian Baldwin – Esri Anthony Mennuti – Montclair State U Adeline Cochran – Montclair State U Larisa Kruger – The Ohio State U

The willingness to experiment with innovative approaches to GIS has yielded benefits for numerous field-based teaching and research activities across the university.

- Peter Knoop | University of Michigar

CAMPUS OPERATIONS WEBINAR SERIES – Session #1

Advancing GIS & The Science of Where

esri serving our users

Strong and Growing

...Working Together to Make a Difference

Engineering and Science Focused

Webinar Housekeeping

- Please enter your questions in the chat box
- Microphones will be muted
- Q&A session at the conclusion of the webinar
- Webinar & slides will be available
- Survey following the webinar

Spatially Enable Facilities Management for Your Campus Higher Education Webinar Series

March–April, 2021

Welcome to the 'Campus Operations' webinar series!

- From CAD to GIS: The value of spatially enabling utility and facility information
 - (March 18th at 1pm EST)
- **Configuring Solutions:** Building information and decision-making tools
 - (April 8th at 1pm EST)
- Smart Campus Operations: Integrating GIS with facility, work, and space management systems
 - (April 29th at 1pm EST)

Spatially Enable Facilities Management for Your Campus Higher Education Webinar Series



Your Geospatial Journey

Success can be realized at any phase!



Phase 4

Indoor Mapping

Navigation

3rd party integrations

From CAD to GIS: Outline

- Brian Baldwin Why & How Move to GIS?
- Anthony Mennuti Montclair State
 University
- Adeline Cochran Montclair State University
- Larisa Kruger The Ohio State University
- Resources
- Q & A

Spatially Enable Facilities Management for Your Campus Higher Education Webinar Series

March–April, 202

Why & How Move to GIS?

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Brian Baldwin

"Isn't GIS just a campus basemap...?"



GIS today

Racial and Ethnic Disparities



USC California

Water Management



Ref lector Set lector





Sidewalk Ramp Status



Campus Visualization



Emergency Routing

Geospatial Infrastructure Is Transforming Campus Operations





"How do I get started?"

- 1. Build a geospatial strategy
- 2. Data inventory
- 3. Data review
- 4. Data target
- 5. Data loading



- DIY
- Esri Business Partner
- Esri Professional Services



Anthony Mennuti & Adeline Cochran

Montclair State University

£A

Mapping the Future of Stormwater on Campus



March 18, 2021

About Montclair State

- Founded as the NJ State Normal School at Montclair in 1908.
- 21,005 total students
- 3,478 employees
- 252 acres spanning three municipalities & two counties





About University Facilities

- 338 full-time staff
- 77 building served & maintained
- 4.7 million GSF of residential, administrative, and auxiliary space.

The Way It Was

- Inconsistent CAD data
- Difficult to process updates
- Heavily reliant on a few staff who "know the system"
- No commonly accessible asset records.



Why & What We Changed

- NJDEP requirements for our Stormwater Pollution Prevention Plan (SPPP).
- Moving from paper into the digital world.
 - Already digitizing forms, why not the map?
 - Easier identification of facilities.
 - Shareability.
- Coincided with a few other "tech" projects.



The Plan & Challenges

- Funding was available!
- Drafting an RFP and going out to bid
 - Isolated areas of expertise PMs don't "speak GIS."
- Mystery areas that required field verification.
 - Several large construction projects since the last update.
 - Allowance for field work ~ 40% of project. Unknown unknowns.

Timeline

March 2015 - Drafted RFP

May 2015 - Out to Bid

July 2015 - Awarded Project

May 2016 - Project Completion

Budget:



The Process

- Define requirements.
- Gather all existing information.
- Identify conflicts & gaps.
- "How do we know what we know?"
- Deliverables: PDF, Excel, MXD,

Geodatabase.

Today's Results

- Plan managed by Environmental Health & Safety
- NJDEP now requires the map to be in GIS we were well ahead of the curve!
- Easier map updates for NJDEP compliance (avoiding fines!)
- Subscription to Nearmap for high-resolution aerial photos.



Feel Free to Reach Out!

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Larisa Kruger

The Ohio State University



CAD and Revit in GIS





Why do we want floorplans in GIS?







What will it provide us?

- Indoor asset tracking
- Planning
 - Space Utilization Across Campus
 - Swing Space
 - Future construction
- Indoor wayfinding
 - Students
 - Med center staff and visitors
 - Staff- Maintenance requests, new staff

What's the ROI?

- Improved asset management
- Increased visualization of patterns and space usage
- Faster, more efficient service for our users
- Cost savings; reducing response time to incidents

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Geospatial Strategy

- Document
 - Goals
 - Architecture
 - Processes
- Collaborate/Partners
- Communicate
- Revise

THE OHIO STATE UNIVERSITY ENTERPRISE GIS INITIATIVE

MISSION

To promote, integrate, standardize and advance the utilization of geographic information systems (GIS) for administrative, management, and service-related purposes throughout The Ohio State University.

NEED

A need exists to provide cartographic, analytic and data management support to a variety of partners within The Ohio State University. This will be cultivated through the strategic coordination of development, maintenance, sharing and use of geospatial data and applications. Collaboration will address campus-wide needs and will be critical to avoid costly duplication of effort and future incompatibilities in developing an enterprise GIS. This approach to GIS implementation will help fulfill the One University framework. Initially the system will cover university owned facilities on main campus; future expansion will include all OSU campuses.

GOALS

- Assess GIS needs across campus
- Cultivate a strategic plan for campus-wide GIS coordination, including identification of common data and technology needs
- Develop a GIS advisory committee to foster communication and collaboration throughout the campus community
- Use standardized technologies and techniques in order to ensure more seamless technology integration.
- Develop system architecture to maximize the interoperability of existing and future data in CAD, Revit, GIS and other business systems and programs.
- · Establish a central repository for all geospatial data and applications
- Define standards and procedures for geospatial data creation, sharing, discovery, access, use and maintenance
- · Document methods, workflows and development
- Develop a data dictionary
- Create and maintain metadata
- Create and support custom applications and tools to facilitate the use of geospatial information across campus; to include desktop, browser and mobile applications
- Provide guidance, expertise, and oversight for data production and acquisition
- Use GPS data collection as well as CAD and other resources to produce the most accurate information

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Datum Work Pla...

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Build Circulation Model Room &... Opening

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Properties

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Data Inventory

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A-GLA7

- S-COL

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- What data do we have?
- Accessible, Standardized, Organized?
- Partners? lacksquare

Type a



OSU has a dual environment CAD & BIM





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Data Review

- Plan
- Status of CAD's
- Clean Up Historic and Existing CAD's
- Establish and Enforce Standards on all Deliverables
- Automate







Why Standards?

Improve project planning, communication and schedule

- Improve coordination between architectural, structural & mechanical systems
- Increase quality of Construction Documents
- Maintain consistency and accuracy of "as-built" conditions
- Critical for data translation and automation to other systems
- Establish use of model and data during building lifecycle
- Decrease cost of managing information

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Facilities Operations and Development Project Closeout Standards

	Schedule of	f Value Percent Tab	le	
Total Project Cost	\$200,000 - 3.9M	\$4M-20M	\$21M-100M	Over \$100M
Percent of Contract Value	5%	4%	3%	1-2%

6. File Naming Convention & Format: Overall Requirements for Deliverables

- All PDFs submitted to the university, regardless of type, shall be
 - The most recent version of Adobe Acrobat
 - Unlocked and not password protected
- All AutoCAD *.DWG files shall be
 - Currently available file format version minus 1
 - All externally referenced dwg or other vector format drawing files, blocks shall be bound to their respective drawings. If copyrights prohibit this, such reference files shall not be used on the project.
 - Use standard fonts included with AutoCAD
 - Each title block must be intact
 - No drawing information outside the title block borders
 - Shall strictly adhere to the current published AIA guidelines for layering standards.

6.1 File Naming Convention & Format

Item numbering corresponds with deliverables listed in the Contract Completion Checklist. The Contract Completion Checklist shall be established by the Close Out Coordinator after the Pre-Close Out Meeting The Ohio State University

Data Target

- Standards
- ESRI Interior Space
 Data Model- modified
- Layers, Attributes
- Pilot- Feasible,

Sustainable, Automate

Timeline

												-
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Γ
OSU Began Considering BIM												
OSU & Consultants Began Conversations												
Scope Definition												
Funding Approved												
Standards & Process Development												
WMC Base Model Development												
WMC Additional Model Development												
BIM for Design & Construction Feasibility Study												
RFP for BIM Standards & Guideline Project												
University Base Model Development												
BIM Standards & Guideline Project												
BIM Standards & Guideline Implementation												

BuildingInteriorSp	ace	BuildingInteriorSpace
SPACEID	String	SPACEID
FLOORKEY	String	FLOORKEY
SECTIONKEY	String	SECTIONKEY
BUILDING	String	BUILDING
FLOOR	String	FLOOR
SHORTNAME	String	SHORTNAME
LONGNAME	String	LONGNAME
DESCRIP	String	DESCRIP
SPACETYPE	String	SPACETYPE
ACCESSTYPE	String	ACCESSTYPE
CEILINGHEIGHT	Double	CEILINGHEIGHT
BASEELEV	Double	BASEELEV
FLOORAREA	Double	FLOORAREA
CAPACITY	Integer	CAPACITY
SPACEFORM	String	SPACEFORM
SPACEFUNC	String	SPACEFUNC
SPACEUSE	String	SPACEUSE

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Data Loading

- Students
- CAD and Revit Prep
- Documentation
- FME
- AGOL
- OSU GIS Maps

How to Georeference Building Floorplans

Create a World File

- 1. Open K:\AP\Applications\GIS\Projects\BIMandCADconversion\Mxd\graphics_10.7.mxd
- 2. Double check that the coordinates are set to Ohio State Plane South by right clicking in the

Current coordinate system:

data frame and clicking on the coordinate system tab

NAD_1983_StatePlane_Ohio_South_FIPS_3402_Feet WKID: 3735 Authority: EPSG

(This is because we only moved to UTM after we had already georeferenced most of our buildings in Ohio state plane south. Floorplans are reprojected when copied to SDE.

- 3. Open K:\AP\FITS_Floor Plans and choose the campus your building is located in.
- 4. Open the building folder and check to see if there is a wild file associated with each dwg.

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	🚰 4-H Center (0191) - Fifth Floor.dwg	7/25/2017 6:29 PM	DWG F				
	4-H Center (0191) - First Floor.dwg	7/25/2017 6:29 PM	DWG F				
	4-H Center (0191) - Fourth Floor.dwg	7/25/2017 6:29 PM	DWG F				
	4-H Center (0191) - Roof.dwg	7/25/2017 6:30 PM	DWG F				
	4-H Center (0191) - Second Floor.dwg	7/25/2017 6:29 PM	DWG F				
	4-H Center (0191) - Third Floor.dwg	7/25/2017 6:29 PM	DWG F				
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7	Search and zoom to th	e building	to be	georeferenced			
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10. Click "Fit To Display"

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### **Georeference CAD DWG**

# in ArcMap or ArcPro



# **CAD to GIS**



## Save World File and Run CAD FME Models

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# **BIM (Revit) to GIS**













# Coordinates and Elevation from ArcMap

### **Enter Coordinates in Revit**





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Suite Workflows	Saves the project as a gbXML file.	SU Owned SUMC Main Campus
Publish •	Saves the conceptual energy model as a gbXML file.	uilding GSF: 223220 umber of Floors: 8
Print +	Saves an IFC file.	
	ODBC Database Saves model data to an ODBC database.	
O Livensing ,	Saves animations or image files.	
Close	Saves a schedule or Room/Area report.	

**Export to IFC** 

### **Run FME Models**



29







# FME for InteriorSpace Polygons for CAD and Revit

Rooms







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### **Interior Space- Polygons**



### **Graphics-Lines (Context)**



## **Used in Web Applications and Desktop**

- Display floors around campus
- Find detailed information about a room
  - Organization
  - Department
  - College
  - Room Type
  - Display building assessments and assets
  - - Interior Finishes
    - Exterior
    - Life Safety
    - Accessibility

FunctionSub Room Type

- •Capacity
- •Room Number/Space ID

- •Plumbing
  - •HVAC
- •Electrical
- •Shut off Valves
- •Fire extinguisher locations

### **Categorization & Query of Space Utilization**





# **2.5D Applications- Internal Assets**

# **Building Shutoff Valves**

Released in January 2018 Savings of \$133k upfront, \$88k annual

173 valves112 photos



ouncy type	Default value for items be	-		
Notes	Rm.131			
Valve ID	Not Entered			
ValveSubType	Water, Domestic Cold	-		
Building ID Link	39			
SPACEID	039-0B-0018			001
FLOOR	Basement - No outside ex	-		E
ROOM	0018			R S
Attachments:	B-4386-8254-	3	x	



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# Interior Wayfinding







#### From CAD to GIS:

The value of spatially enabling utility and facility information

Brian Baldwin

### Actions

- Contact account managers
  - Where do I start?
  - What's my licensing?
- Survey
  - Let's talk!
- Questions/Issues:
  - Justin Anderson justin_anderson@esri.com







Justin Anderson justin_anderson@esri.com

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