Using Autodesk and Esri for Smart Cities

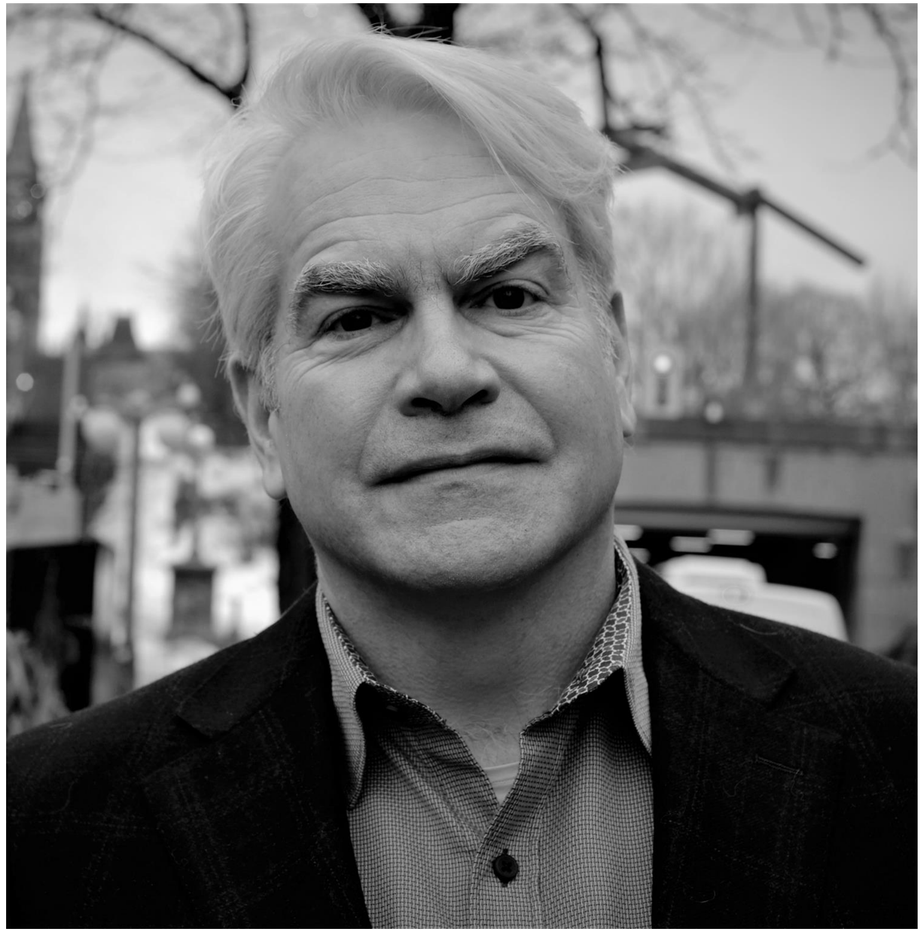
The Intersection of Engineering and GIS

Stephen Brockwell, Product Owner, Esri

Richard Horrocks, Product Engineer, Esri

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About the speaker

Stephen Brockwell, Product Owner, Esri

Stephen Brockwell started as an ArcInfo developer in 1987. Since then, he has held leadership positions in software engineering management, product management, and business development at Geovision, Autodesk, Brockwell IT Consulting, and, most recently, Esri, who acquired Brockwell IT in 2019. At Esri, Stephen is working to define the future of GIS-BIM integration for horizontal and vertical infrastructure for developers, engineering firms, and owner/operators with a focus on data and application integration, and transformative workflows across the full-stack architecture—from mobile to desktop to cloud.



About the speaker

Richard Horrocks, Product Engineer, Esri

Richard Horrocks focuses on AEC integration with BIM as a Product Engineer in the AEC team at Esri. Richard has extensive experience in the analysis and development of spatial data and GIS. Richard has a dynamic, multi-disciplinary, customer-focused approach to technology and infrastructure, with many years of experience in varying working environments. He is highly versatile and able to engage in any type of task, technology or technology usage, with extensive experience in the North America and Latin-America markets .

Objectives

- Talk about the fundamentals of Smart Cities
  - Opportunities
  - Limits
  - Pragmatic approaches

- Show a wide range of workflows that can be achieved today with Autodesk and Esri tools
  - These are by no means exhaustive



Challenges

- Aging infrastructure
  - Need for efficient design, creative financing, PPP
- Urbanization and Growth
  - Density, verticality
- Depletion of natural resources
  - Energy, mobility, construction revolutions
- Extreme weather events
  - Need for quick emergency response and prevention



Urbanization



30%

of the global population in urban areas in 1950



55%

of the global population in urban areas today



68%

of the global population will live in urban areas by 2050



90%

of this urbanization is set to take place in developing countries

Smart City Objectives



Smart City Fundamentals

Smart Cities start with smart people. Technology changes how we

plan, design, construct

manage policies, people, assets

engage and collaborate

Key elements

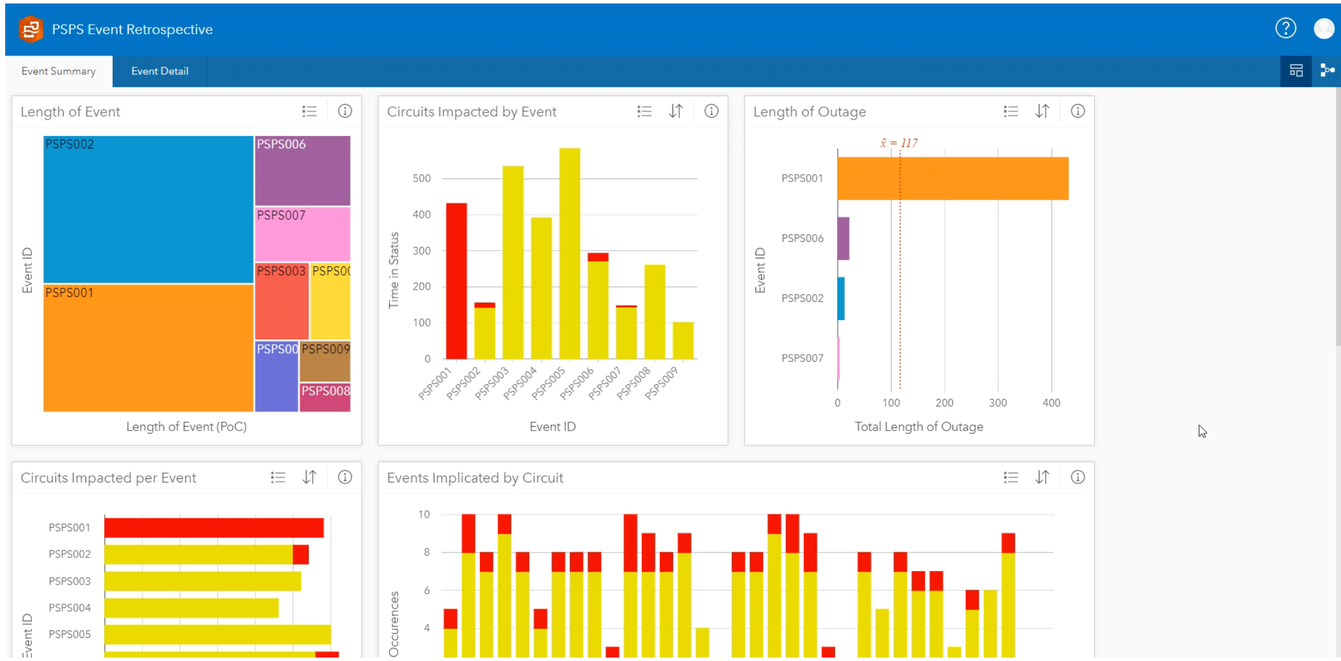
- Insight
- Transformation
- Prediction
- Consensus
- Governance

(Dr. Kent Larson, Director, City Science, MIT Media Lab)



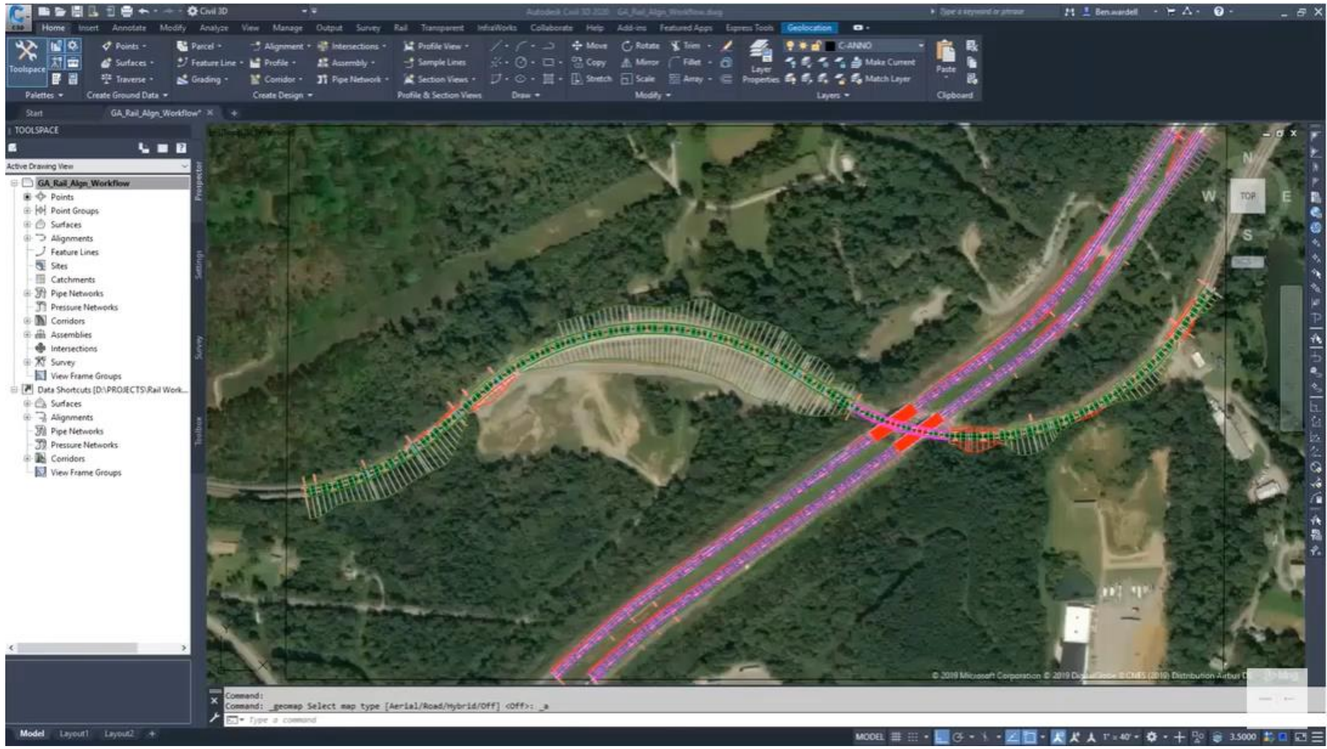
Insight

- Reliable data for the existing state
- Reliable situational data of the dynamic state
  - Economic
  - Transport
  - Land use
  - Trends
- Digital twin concept—and complexities
- Big data, machine learning, and AI to find patterns—sometimes unexpected



Transformation

- Engineering the future state with deep knowledge of the current state
- Generative design to use the best data available to drive engineering
- Collaborative sharing and communication of new designs with stakeholders



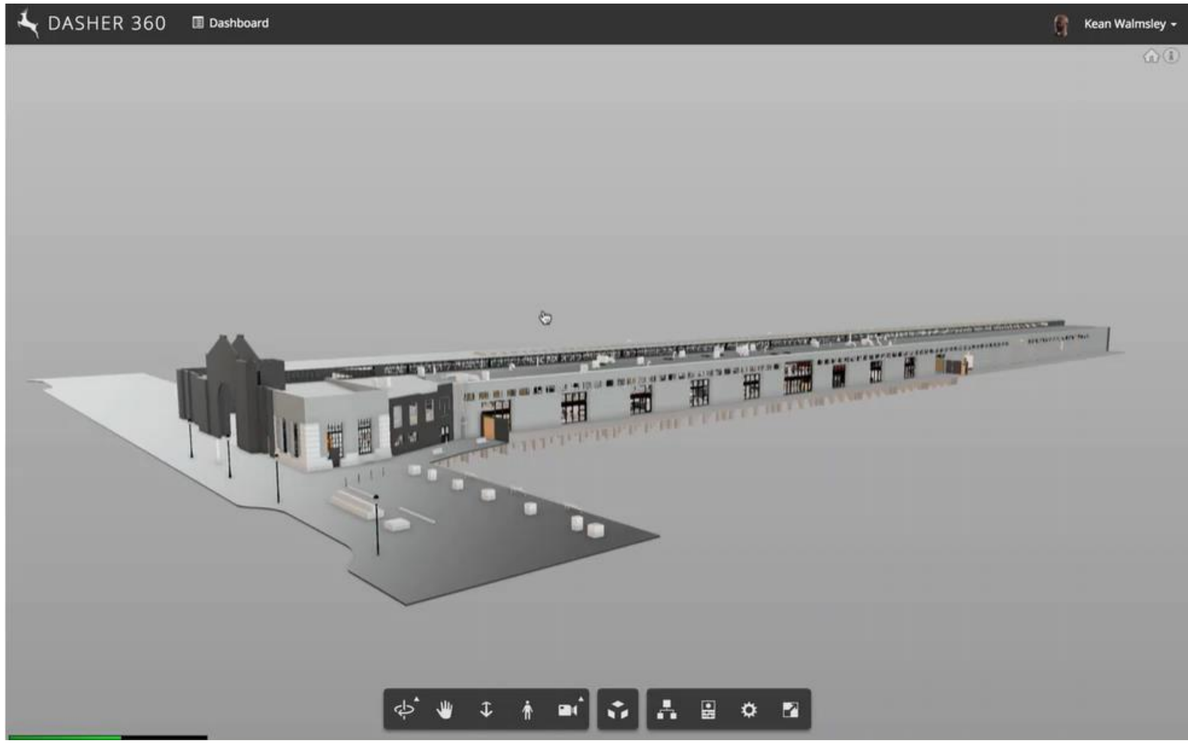
Prediction

- Agent-based simulation of new designs
- Generative design to use the best data available to drive engineering
- Agent-based simulation of change in context
- Collaborative sharing and communication of new designs with stakeholders



Digital Twin

- In theory a complete digital model of the aspect of the city that is being considered smart
  - Need not be everything
- Cost of capture
  - Scanning and ML/AI extraction
  - Citizen capture
- Sensors and instrumentation
- Social media feed integration
- Third-party (Power BI, Tensor Flow)
- DASHER 360 Example
- ArcGIS Urban





Focus on Outcomes

- Technology enables stakeholders to make smart decisions
  - smarter engineering optimizing transportation
  - situational awareness increasing safety
  - Identify outbreaks of disease and improve health
  - patterns of movement that are diminish commerce
- Outcomes are always local
- Existing conditions—zoning biases, political history must guide implementation
- A Smart City is a collaborative human undertaking between smart stakeholders



Deloitte Smart City Report

- Compelling need—commit to projects citizens understand and benefit from
- Portfolios of projects—avoid the megaproject
- Agile for smart cities—incremental success
- Persistent overcommunication
- Results—measures and constituent engagement
  - Your measures can’t indicate success when citizens are storming the walls

See the report here.



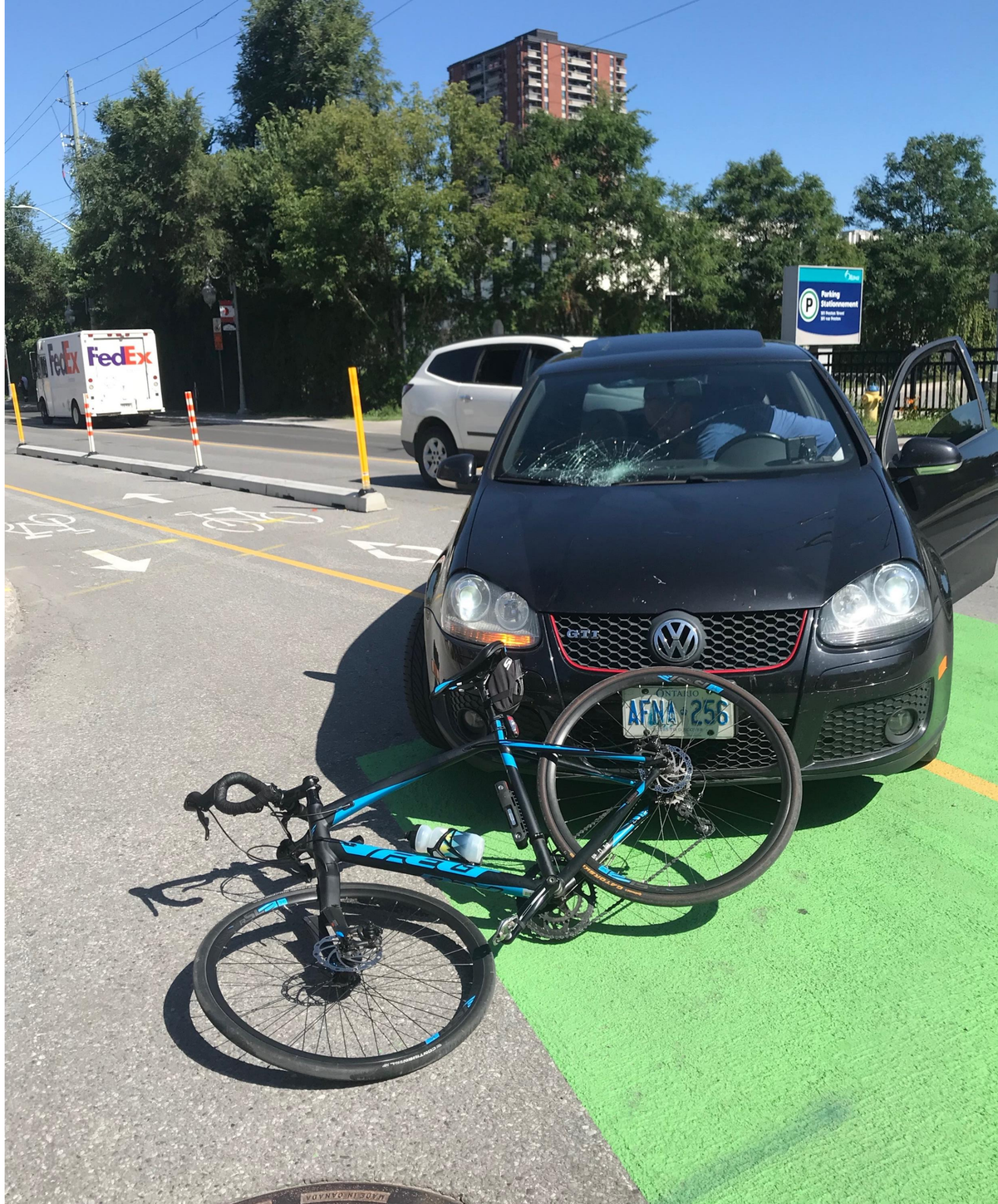
Recent Not Genius Cities

- LRT Project
- Exterior water fountains in unsheltered stations
- Doors that won’t close
- Unplanned capacity at bus egress and LRT ingress
- How could this not have been identified as an issue in the design process?



Less than Genius Cities

- Multimodal transportation nightmares
- Perfect candidate for citizen reporting
- Clearly there was an incident—how did information flow?
- What other concerns with this design?



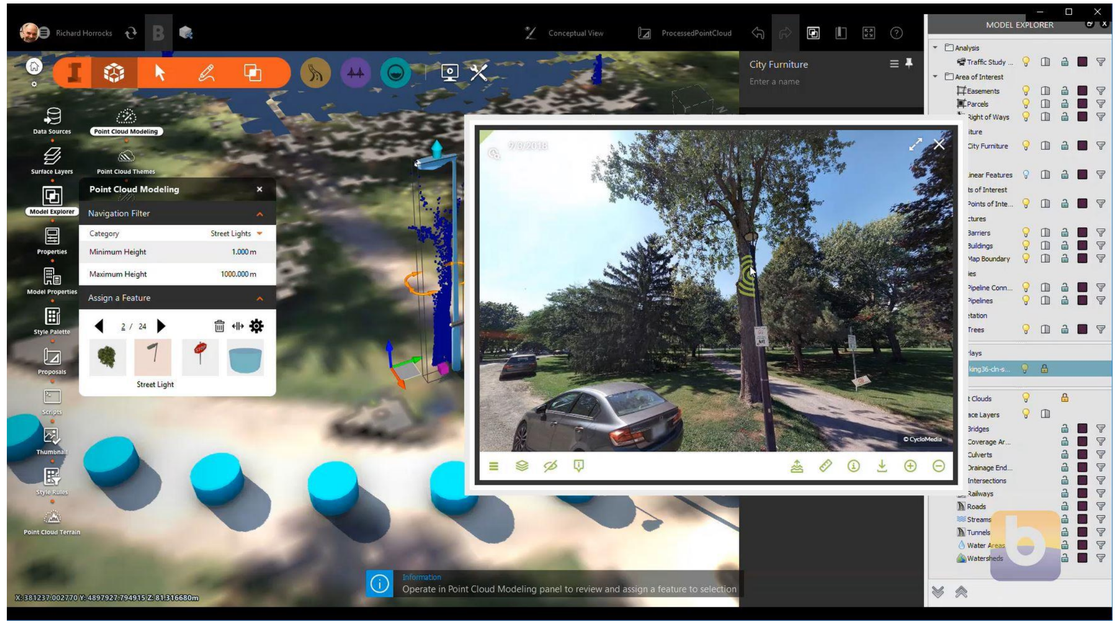
Smart cities need to be efficient but also preserve opportunities for spontaneity, serendipity, and sociability. If we program all of the randomness out, we'll have turned them from rich, living organisms into dull mechanical automatons

Anthony Townsend, *Smart Cities: Big Data, Civic Hackers, and the Quest for A New Utopia*

Anthony Townsend is Senior Research Scientist at New York University's Rudin Center for Transportation Policy and Management

City of Kingston Project

- City of Kingston data collection strategy
- State-of-the-art data enhances planning and design using the integrated workflows
- The creation of a 3D model for planning and design
- City of Kingston implementing a municipal BIM strategy leading in Canada



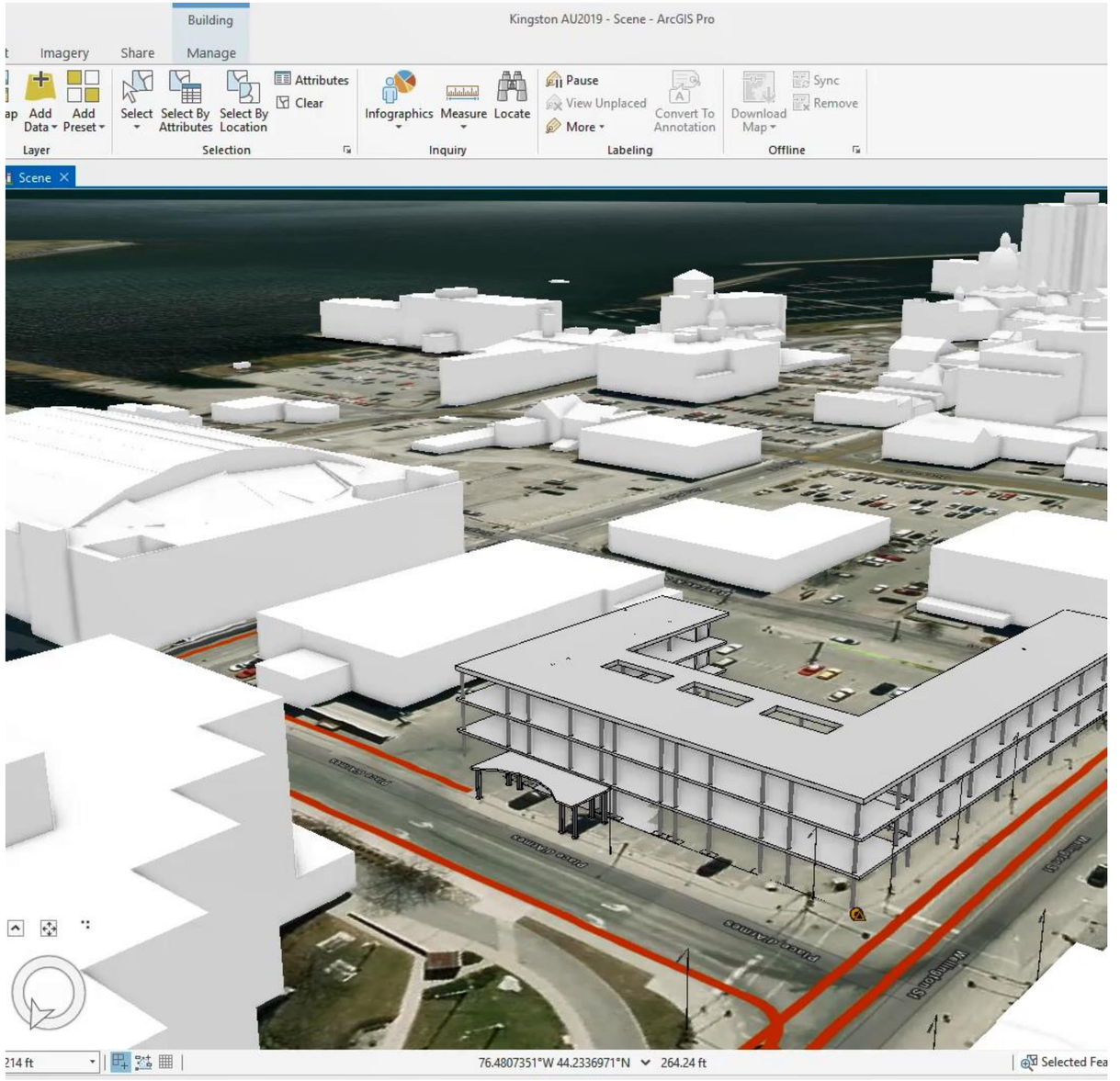
Short Demos of Workflows

Georeference Buildings in ArcGIS Pro

ArcGIS Pro allows users to load IFC and Revit models to geodatabases where they are equal partners in geospatial workflows, including geoprocessing tools.

The Building Scene Layer allows users to have specific building-oriented visualizations and workflows.

Geolocating the building is a relatively easy process with a simple user experience.

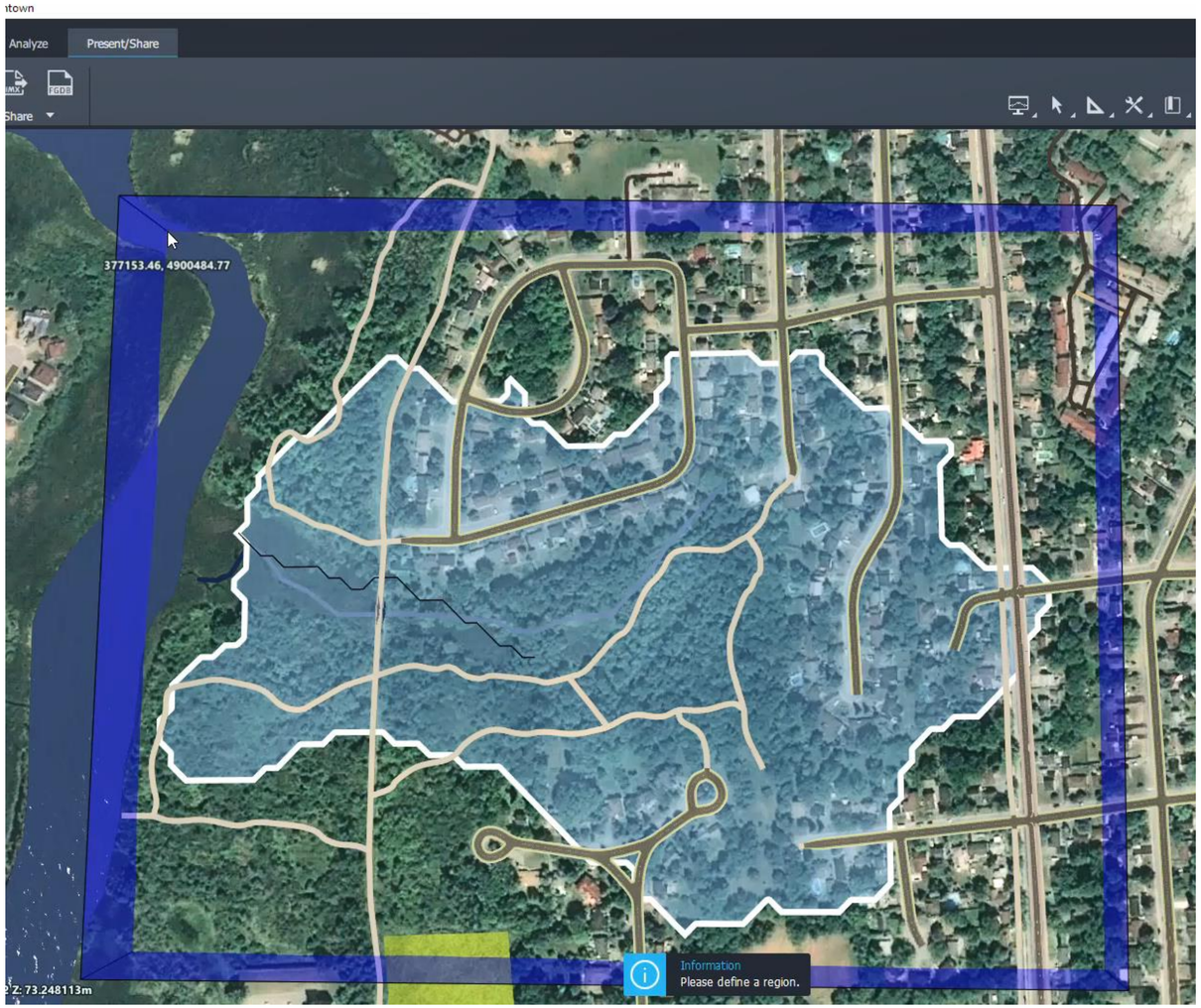


Watershed Generation and Publishing

- Autodesk Infraworks users can access extensive water feature data from the Living Atlas and use these resources to develop detailed models of water networks.

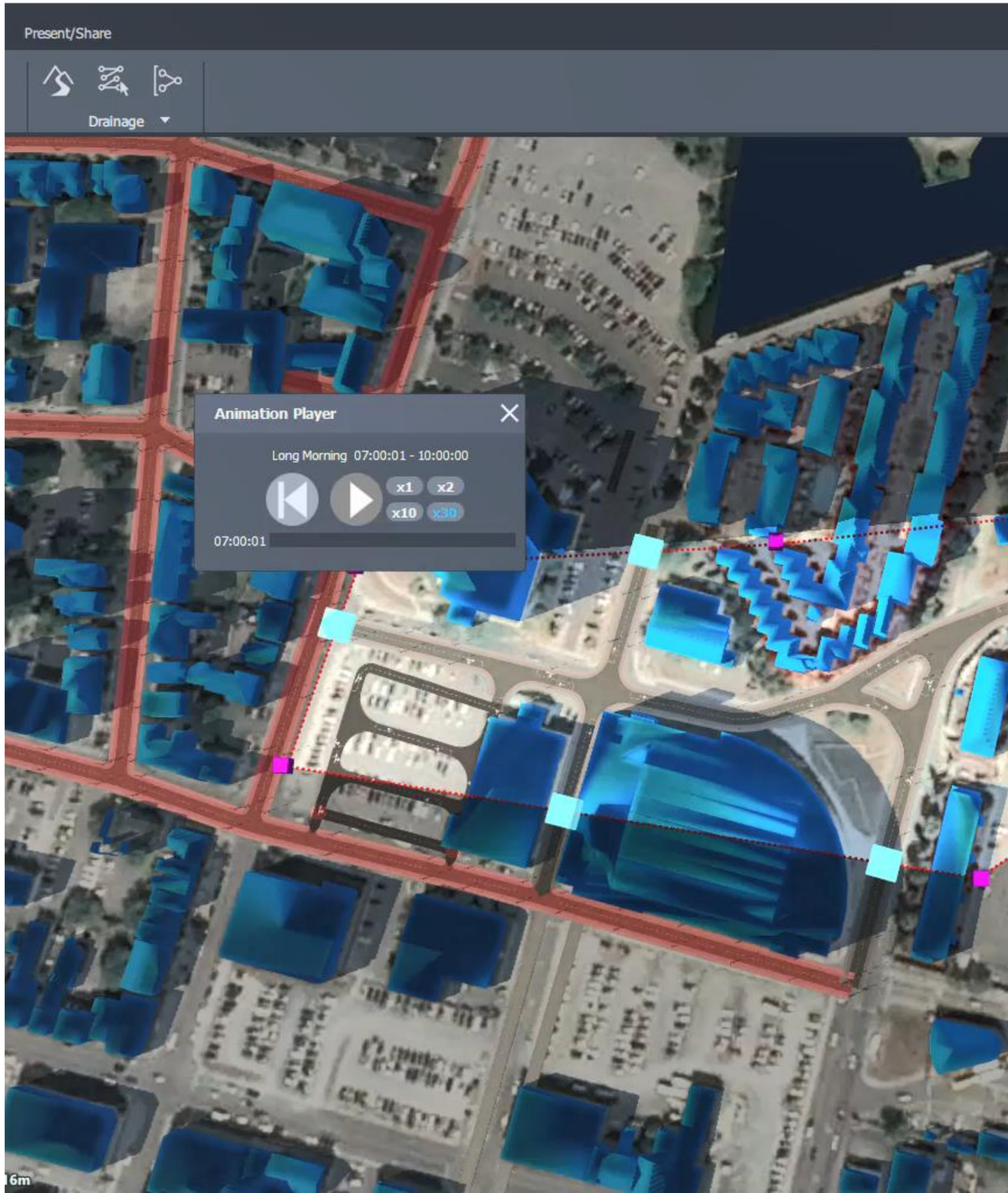
- The watershed for any location can be generated by Infraworks using topographical data.

- The resulting watershed can be shared with ArcGIS users using the publishing feature of the Connector for ArcGIS.



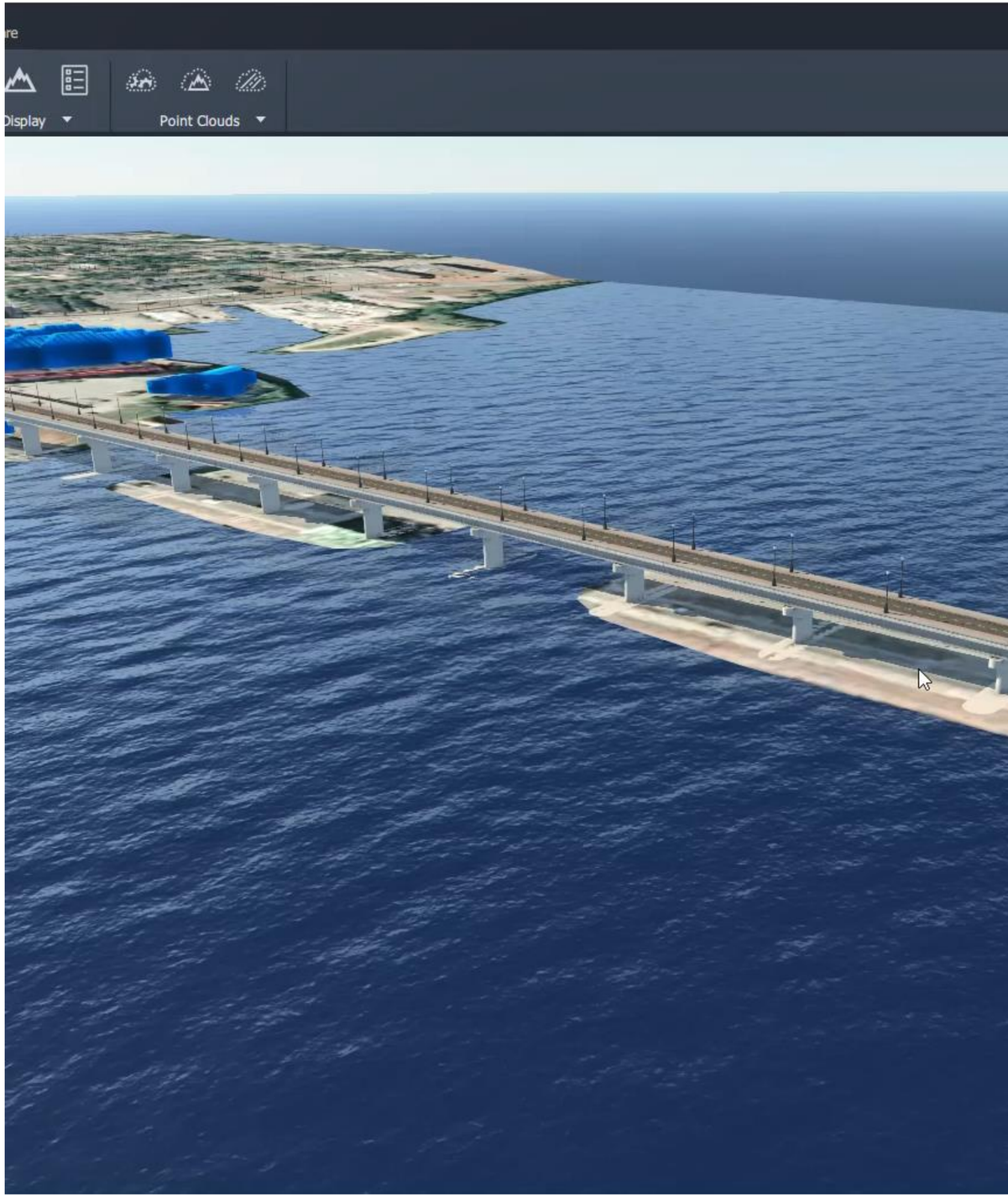
ArcGIS Road Segments and Simulation in Infraworks

- Road network data stored in the Living Atlas, or from proprietary customer sources can be used to generate rich transportation models.
- New transportation designs can be evolved from GIS data.
- The transportation simulation tools in Infraworks can then perform agent-based simulation on the design for stakeholder engagement and to ensure design objectives are assessed early in the design process.



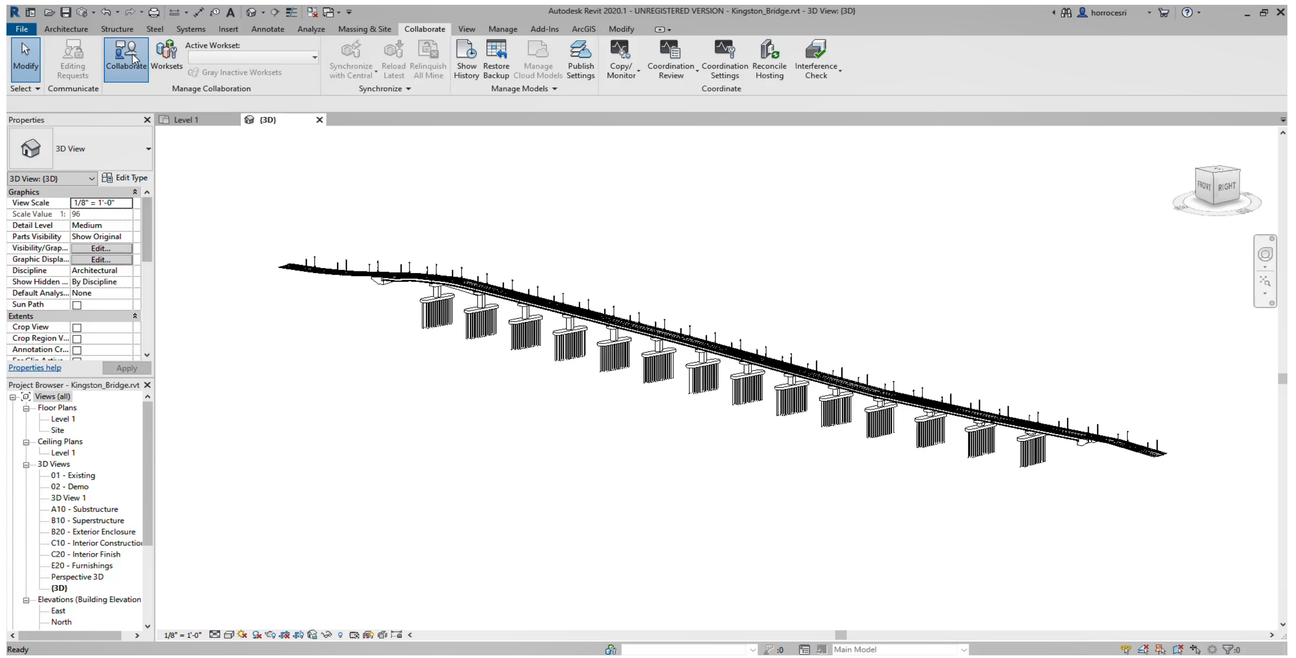
Bridge Design in Infraworks Using Roads from ArcGIS

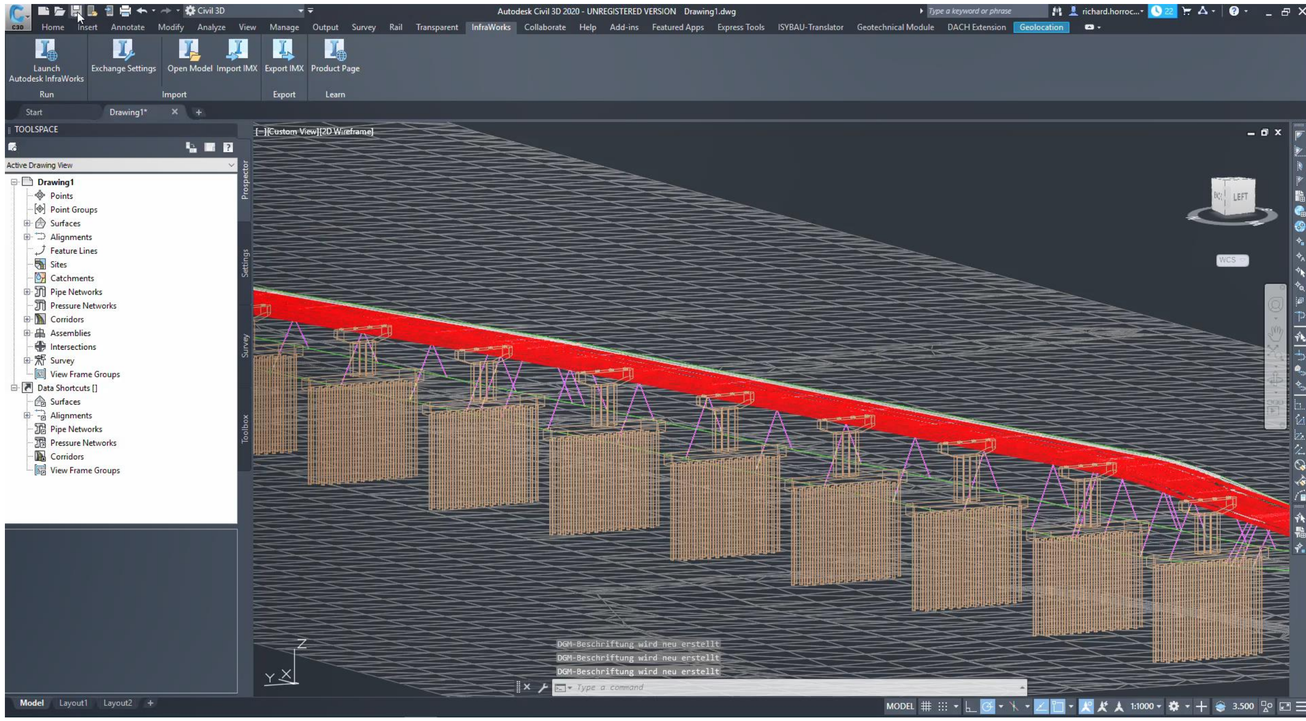
- Using transportation data from GIS, Infraworks designers can create complex bridge models.



Bridge Collaboration with Revit and Civil3D

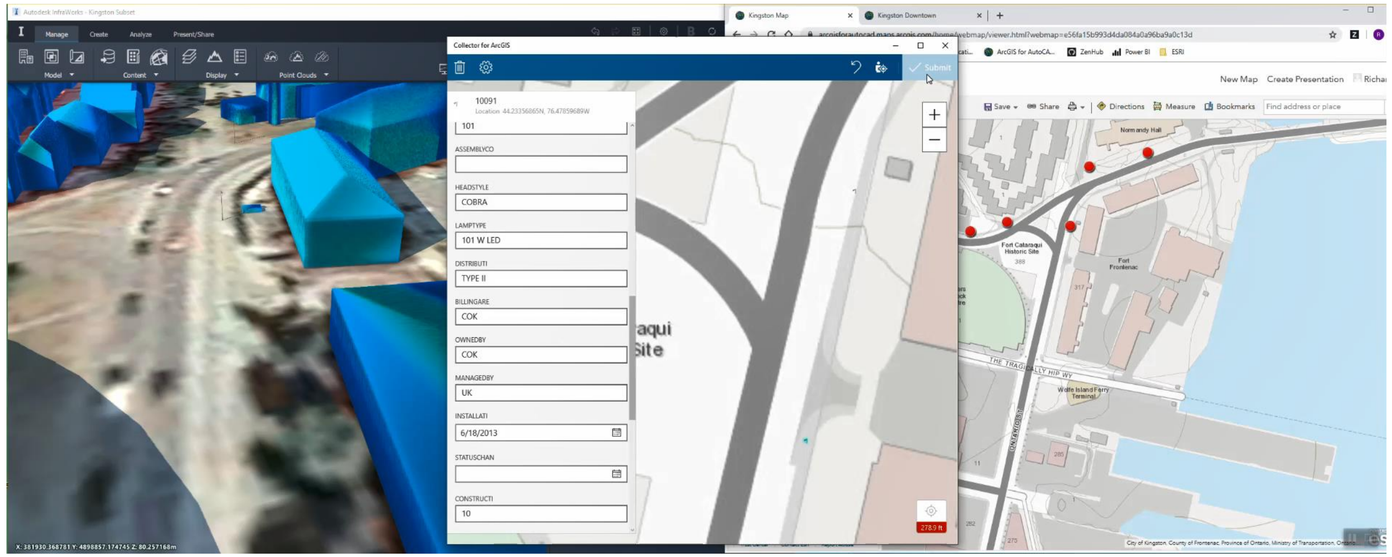
- Models created with Infraworks can be shared with both Civil3D and Revit for engineering detailing and construction design.





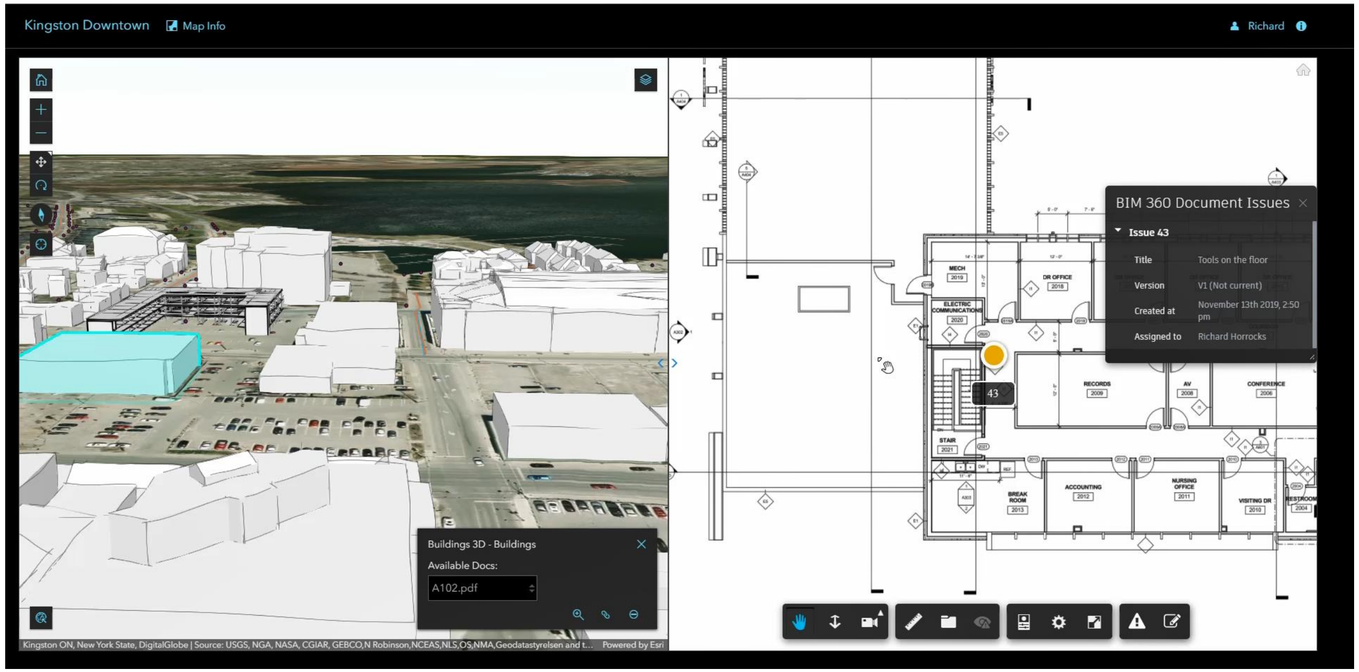
Collector for ArcGIS and Infraworks

- ArcGIS Collector and QuickCapture can update geospatial data from the field with photos and GPS.
- Autodesk products using the Connector for ArcGIS can access these data sources on-demand and bring in-the-field changes to ensure the latest data is available for design.
- Autodesk users can also update GIS data or publish their designs to the geospatial cloud.
- Engineers and designers can get access to the best available data as they need it.
- GIS Professionals can get access to the latest designs published directly to the geospatial cloud.



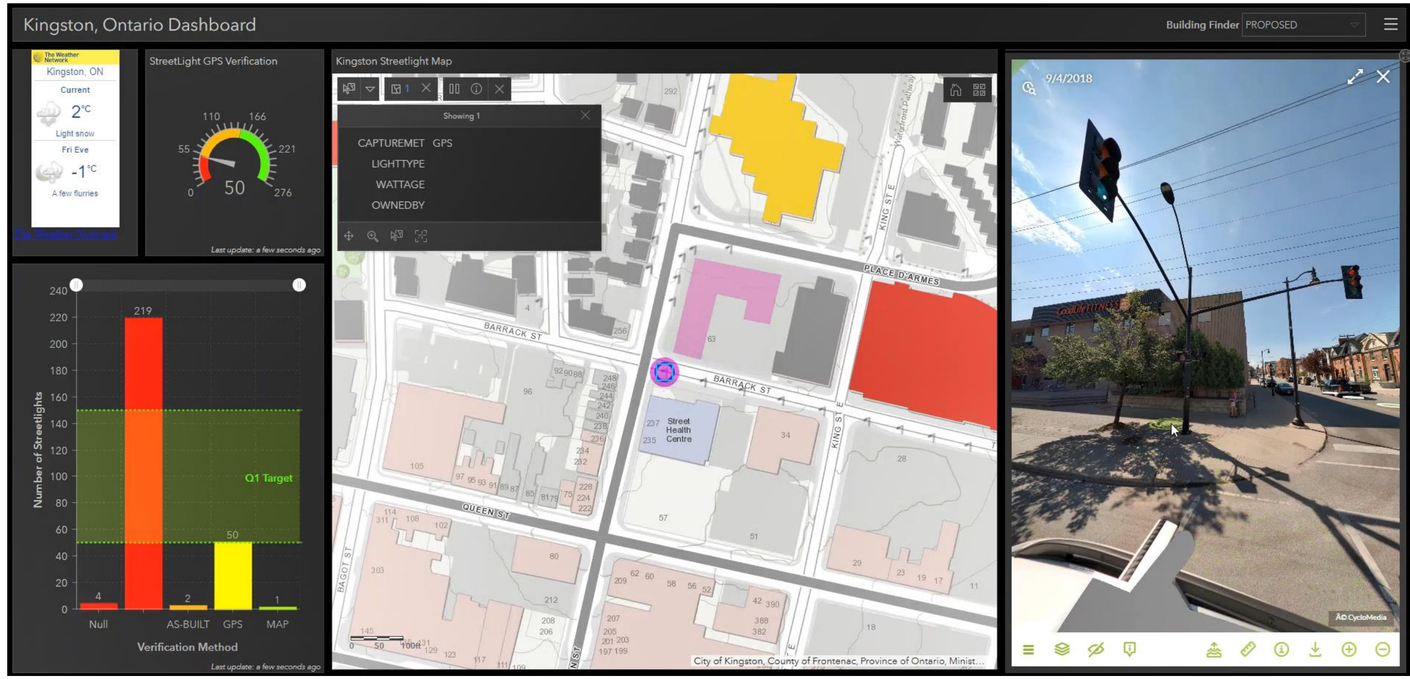
ArcGIS and BIM360 Web Applications

- Using standard web development approaches, developers can create rich user experiences that take advantage of the viewing capabilities of both ArcGIS, for the global scale, and BIM360 for the detailed model, sheets, and issues for projects.



Dashboards

- The Operations Dashboard for ArcGIS allows users to integrate data from many sources to provide real-time data visualization in an active context.
- Users can filter data based on numerous parameters and get asset-specific information.
- With relatively simple development, web pages using external content can be configured to link rich external information including panoramic imagery, and BIM360 documentation.



Conclusion

- Establish success on small projects that shape the process
- Megaprojects have risk
  - Time and resources wasted
  - Trust broken
- Meaningful, measurable impacts on quality of life must be the goal

- Esri-Autodesk collaboration is changing the way we approach design





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