

# Class summary

This unique class will review key workflows required to go from concept design proposals to detailed design cost estimates. Our mission is to create 2 concept-level designs for a new municipal spine roadway and trunk sewer and compare the cost of works for each scenario. We will start with a detailed look at InfraWorks 360 software and demonstrate the workflows required to build our 2 new proposals. Then we will connect our concept-level design to AutoCAD Civil 3D software to detail the roadway and sewer designs. We will look at the various quantity takeoff tools found in AutoCAD Civil 3D software and export both AutoCAD software and AutoCAD Civil 3D object data to formats that you can use for estimating. To complete the class we will introduce a new cloud-based cost-estimating system called AEC Tender. Using AEC Tender, we can connect to data extracted from our detailed design and generate detailed cost estimates for both scenarios within minutes using past project construction unit costs.

# CI10743 - From Concept to Cost Estimating Using InfraWorks 360

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# Key learning objectives

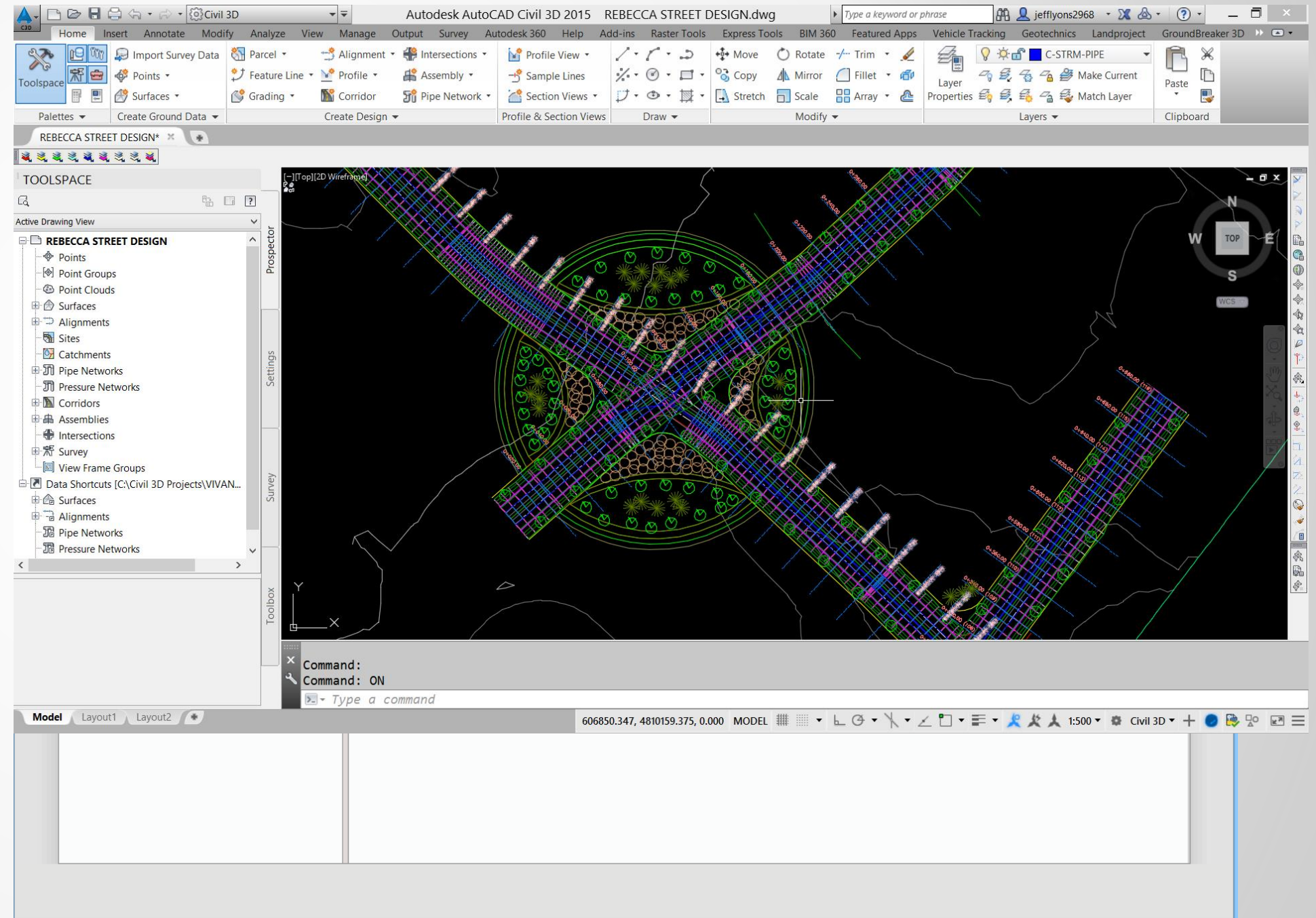
At the end of this class, you will be able to:

- Learning Objective 1 - Learn about building multiple concept design proposals using InfraWorks 360
- Learning Objective 2 - Learn how to connect concept design with AutoCAD Civil 3D
- Learning Objective 3 - Learn about AutoCAD Civil 3D Quantity Takeoff
- Learning Objective 4 - Learn about a new cost estimating system used to generate cost estimates from Quantity Takeoff data sets



# THIS IS A 3 PART SESSION

1. PART A - Autodesk Infraworks 360 for Concept Design for Roads, Bridges and Streetscape
2. PART B – Intro to AEC Tender – Software-As-A-Service for Cost Estimating, Bid Preparation and Bid Analysis
3. Part C - Autodesk AutoCAD Civil 3D for Detailed Design QTO ready for Cost Estimating and Bid Preparation





# Our Primary Objective

- Create TWO (2) Concept Proposals for a Rapid Bus Transitway to improve Traffic Flow in the Downtown Core
- Determine Preliminary Costs for each Concept
- Provide Detailed Costs on selected Detailed Design







**Option A – By-Pass Downtown (Red)**  
**Option B – Rehabilitate Downtown (Blue)**

X: -79.670475 Y: 43.444065 Z: 86.882901 m

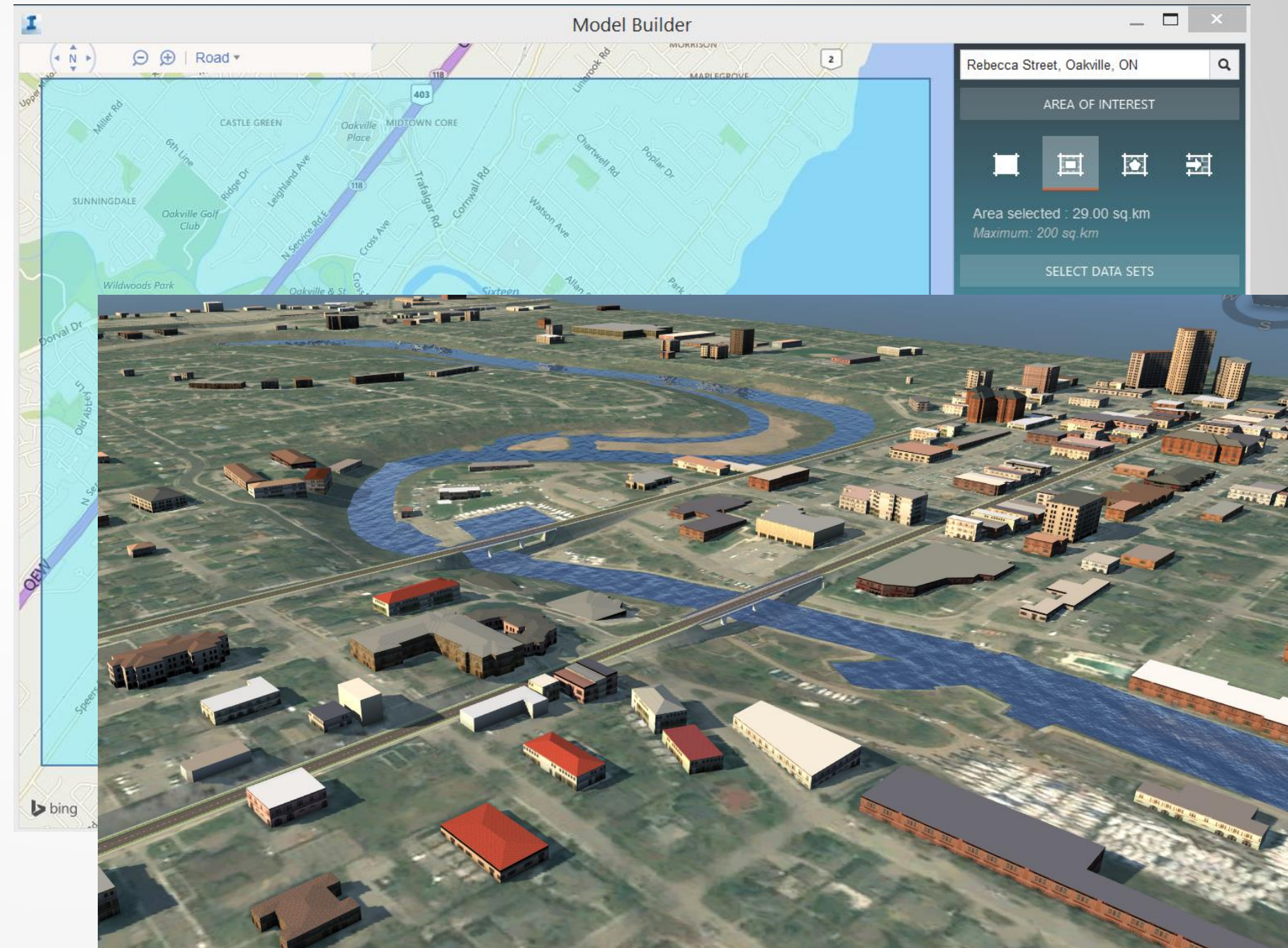


# Our Starting Point - Base Infracore Model

## Model Builder

- Zoom to Area
- Extract up to 200 sq.km
- 15 Minutes Later...

Our Basic Model Starting Point with Elevation Model, Roads, Imagery, Buildings, Water

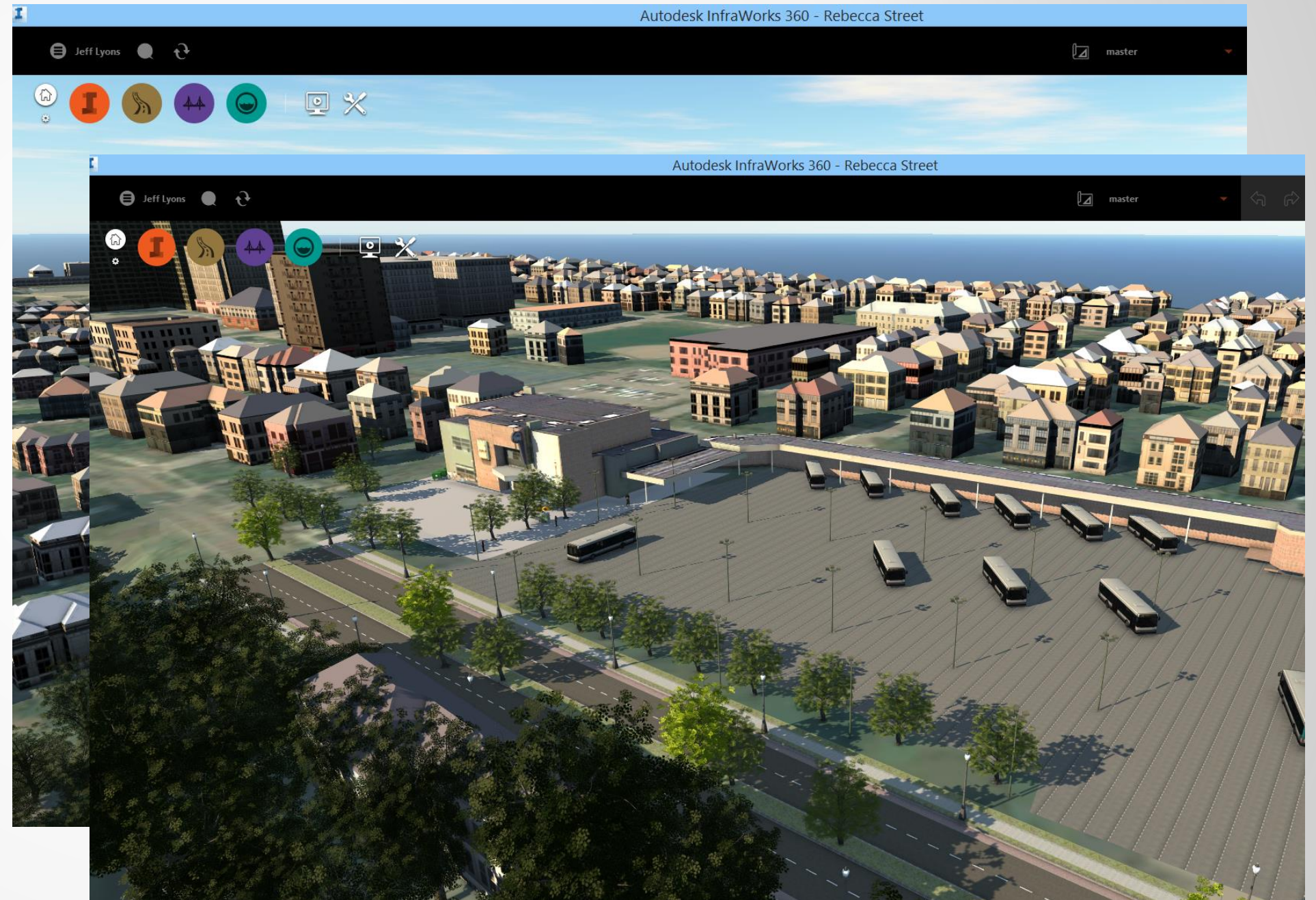


[Click Image to Watch Video](#)



# Augment Base Model with GIS Data...

- Buildings (Polygons)
- Buildings (Models)
- Trees
- Signage
- Traffic signals
- Lighting
- Point Clouds





# Create the Model and Augment it with City Data

Autodesk InfraWorks 360

Jeff Lyons

My Models

Model BuilderNewOpenDateNameAuthorsearch...

Neuschwanstein Castle Bavaria

9/8/2015 by Markus Briglmeir

Roads Tutorial (September 2015)

8/31/2015 by Autodesk InfraWorks 360

Moscow

8/31/2015 by Autodesk InfraWorks 360

OttawaSouth

8/29/2015 by Me

Tutorial (September 2015)

8/25/2015 by Autodesk InfraWorks 360

Dubai Marina Palm (Sept 2015)

8/19/2015 by Autodesk InfraWorks 360

Tokyo

8/13/2015 by Markus Briglmeir

Unionville Demo

8/12/2015 by Markus Briglmeir

Specialize

19 days remain

Autodesk® InfraWorks 360

Subscription

Roadway Design for InfraWorks 360

Trial

Bridge Design for InfraWorks 360

Trial

Drainage Design for InfraWorks 360

Trial

Preview

Bridge Line Girder Analysis

Corridor Optimization

Land Areas & Grading Behaviors

Road Component Model

Suitability Maps

These services are previews only and experimental in nature, therefore not officially supported.

User Feedback Agreement

Get the Base Model using Model Builder



# Option A – Construct a Downtown By-Pass

## Key Design Scope:

- 2.5km of Development
- Mill and Overlay Current Street
- Road Section Expansion to accommodate Rapid Bus Corridor
- Expand Existing Bridge
- 12 New Station Stops

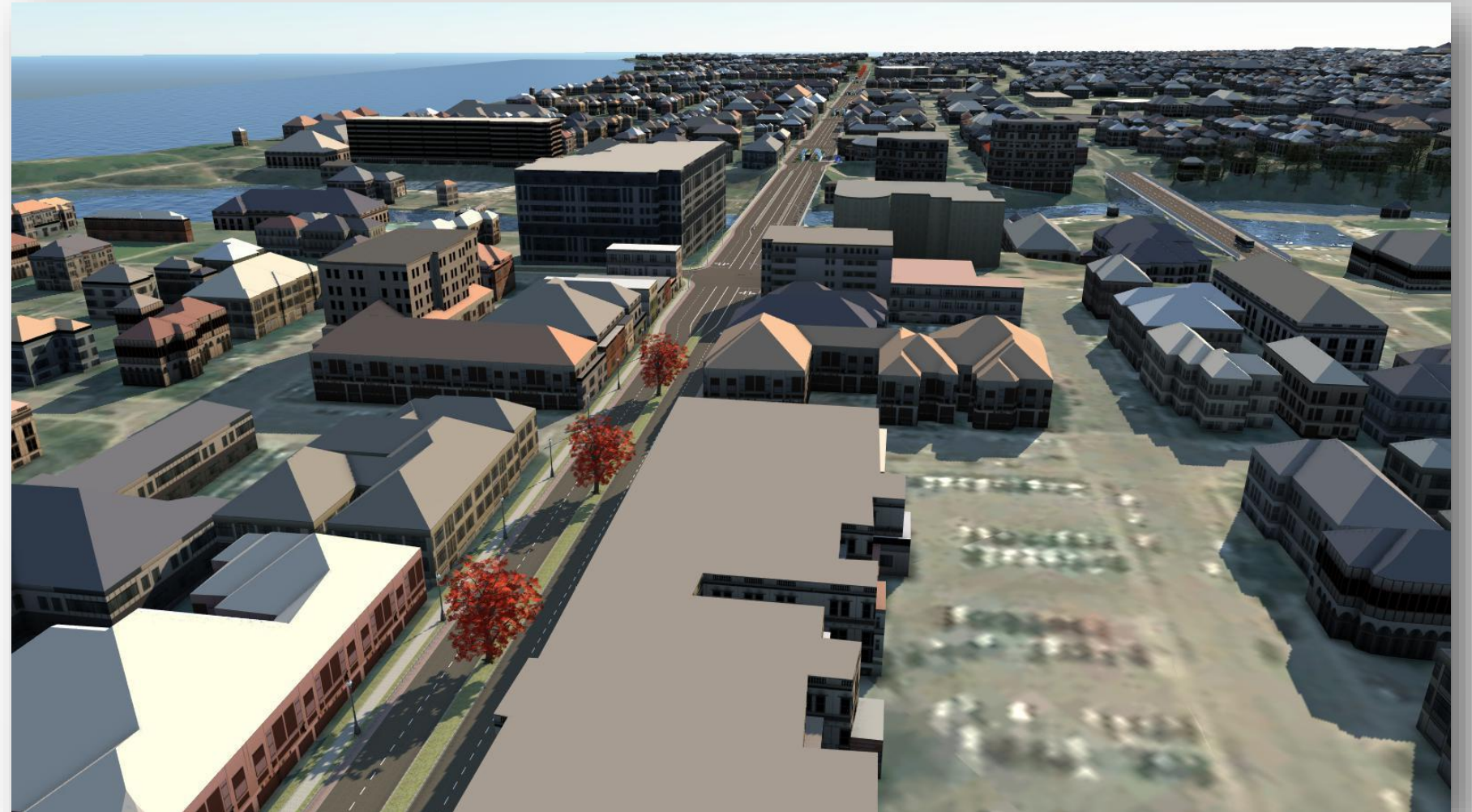




# Option B – Rehabilitate Downtown Core and Improve Traffic

## Key Design Scope:

- 3.5km of Development
- Downtown Rehabilitation with Streetscape
- Side Street Rehab
- Partial Rapid Bus Expansion of Right of Way
- Full Bridge Replacement
- 8 New Station Stops





# Common to Both Proposals

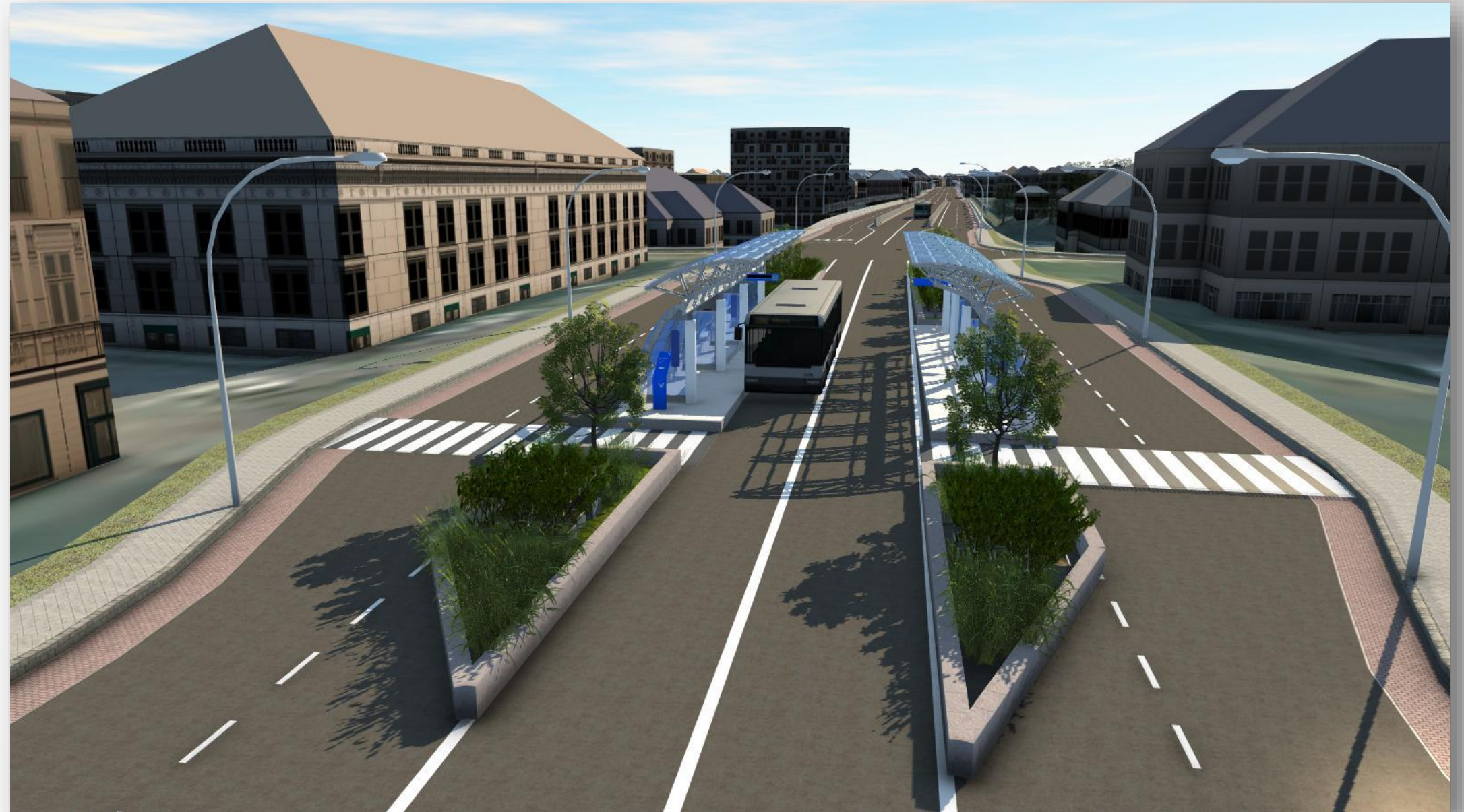
- Water, Sewer, Storm
- Utility Engineering
- Landscaping
- Signalization
- Lighting





# Part A: Building the Key Infraworks Proposal Objects

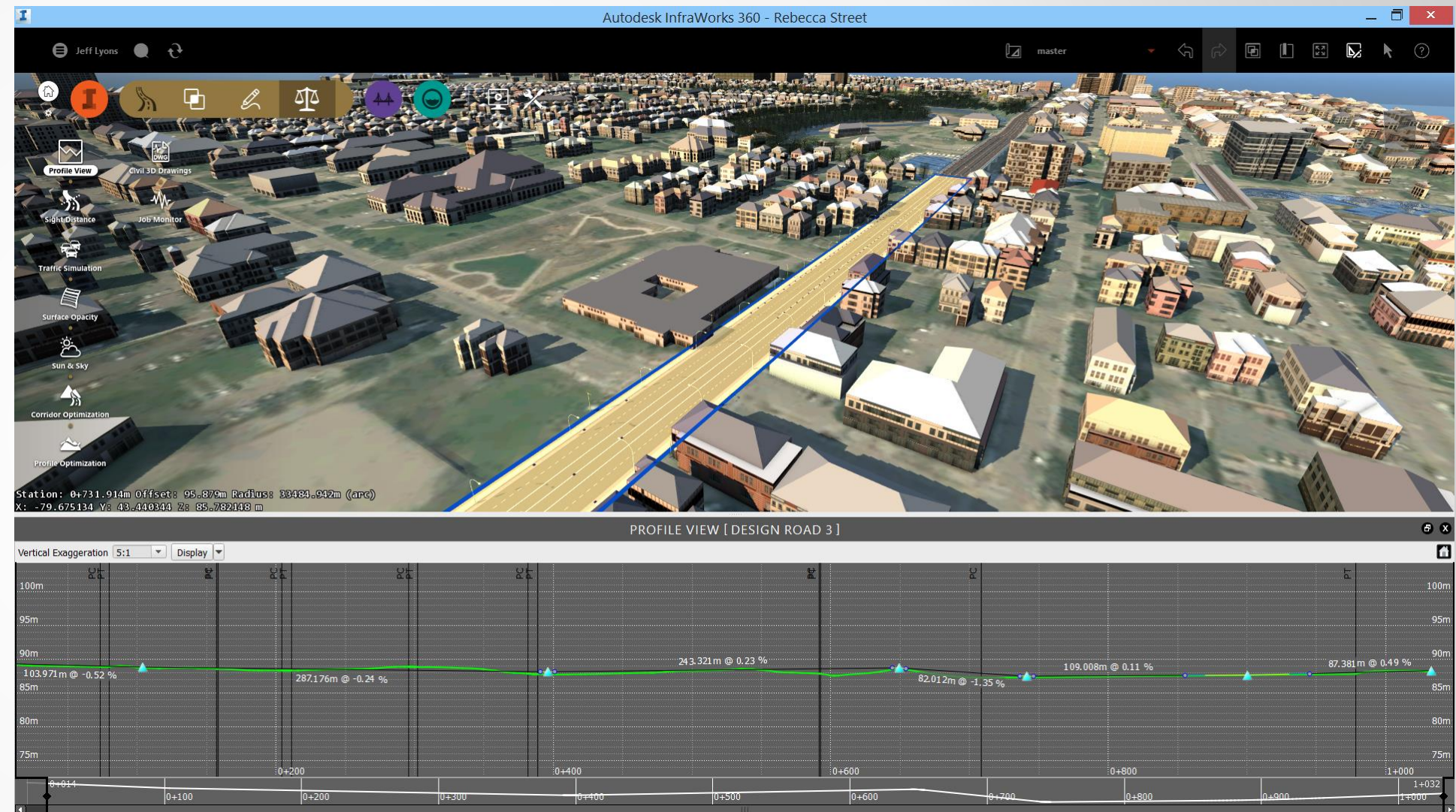
- Roads
- Bridge
- Rapid Bus Transit Stations
- Landscaping
- Street Features





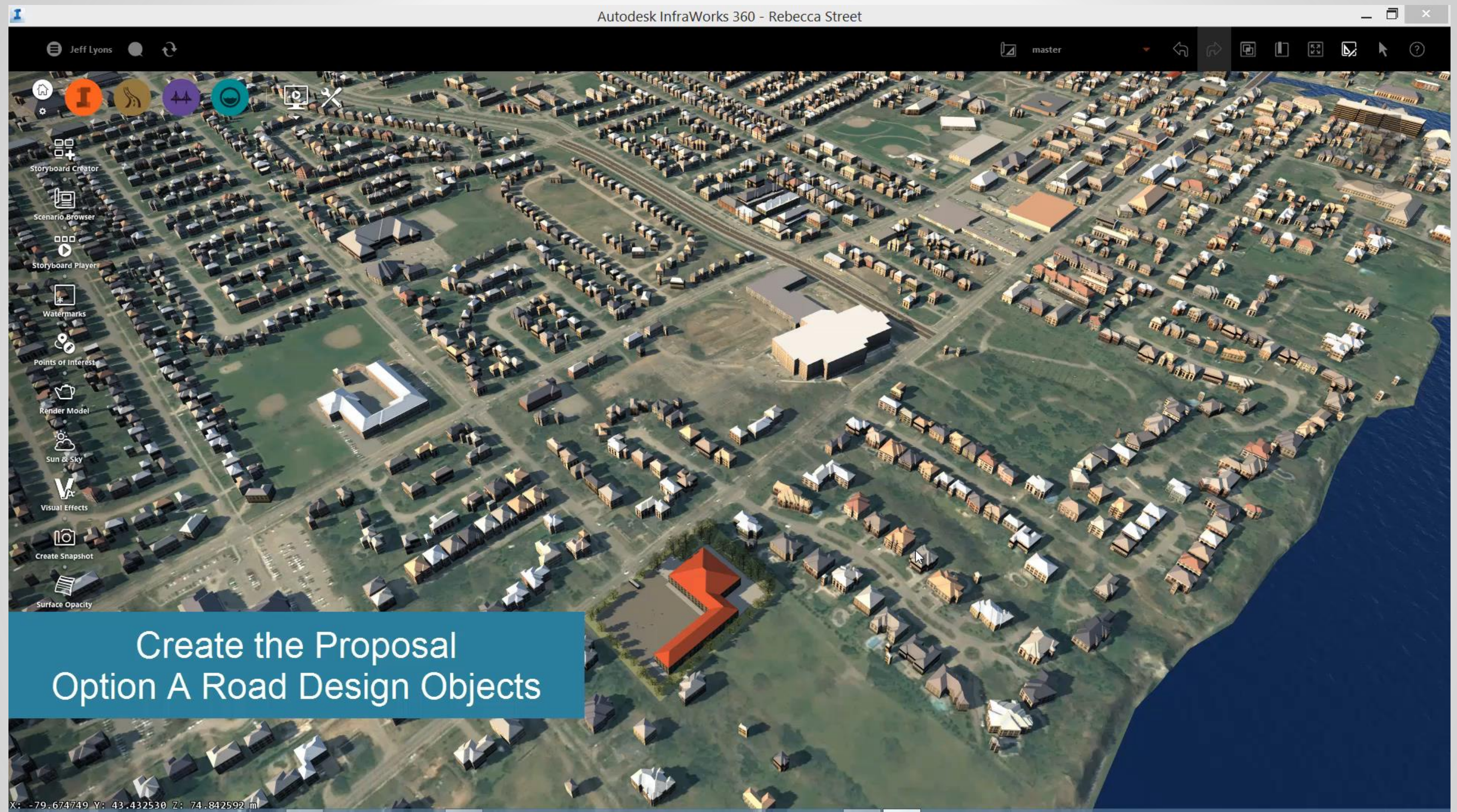
# Adding Conceptual Roads

- Infraworks 360
  - Draping the Road on Surface Model
  - Stylization to Control Components
- Infraworks 360 Roadway Design
  - Complete Vertical Design Profile Editing
  - Profile Optimization (Cloud Credits)
  - Quantity Takeoff and Section Reports
  - Component Road Stylization (Sandbox)



[Click Image to Watch Video](#)

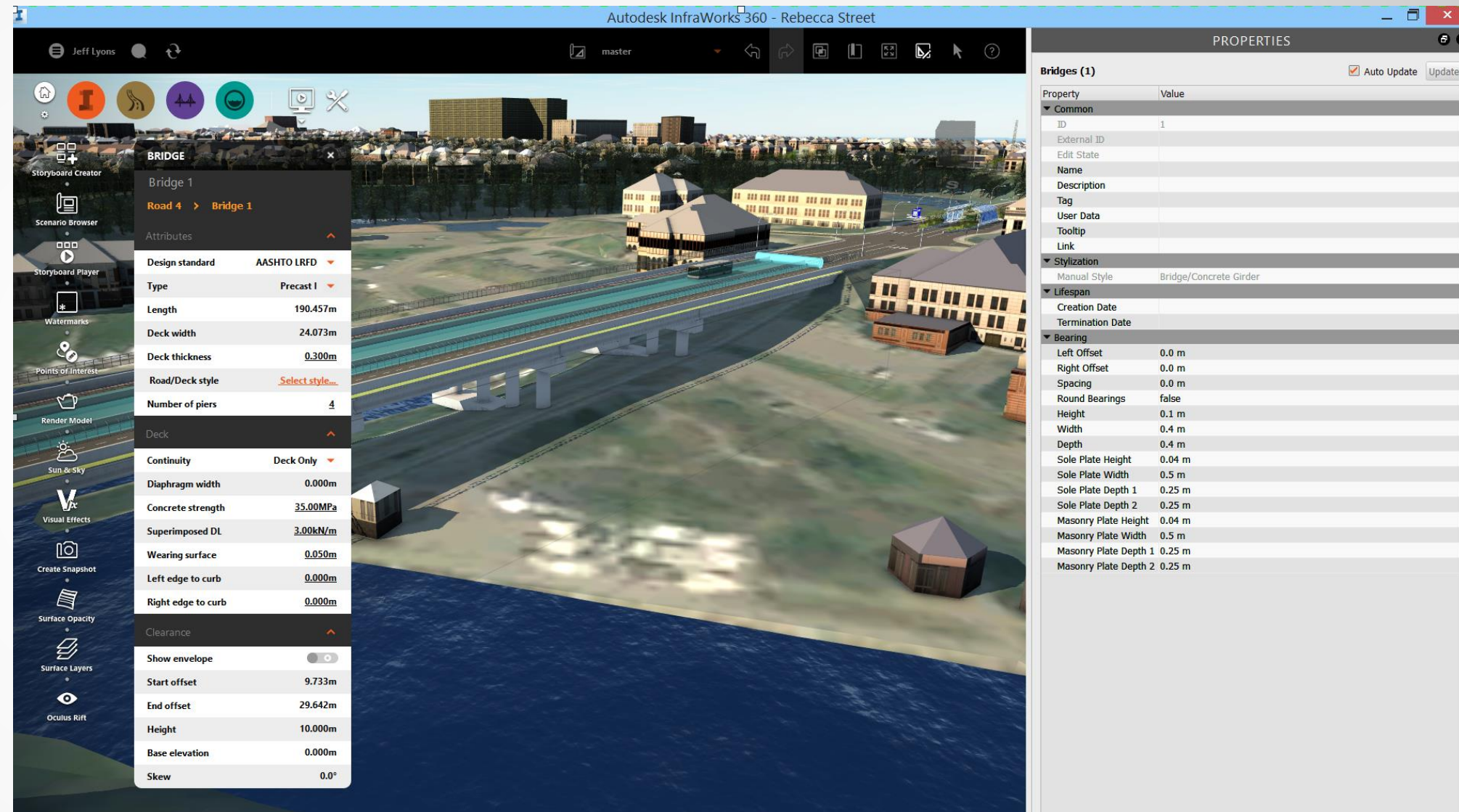






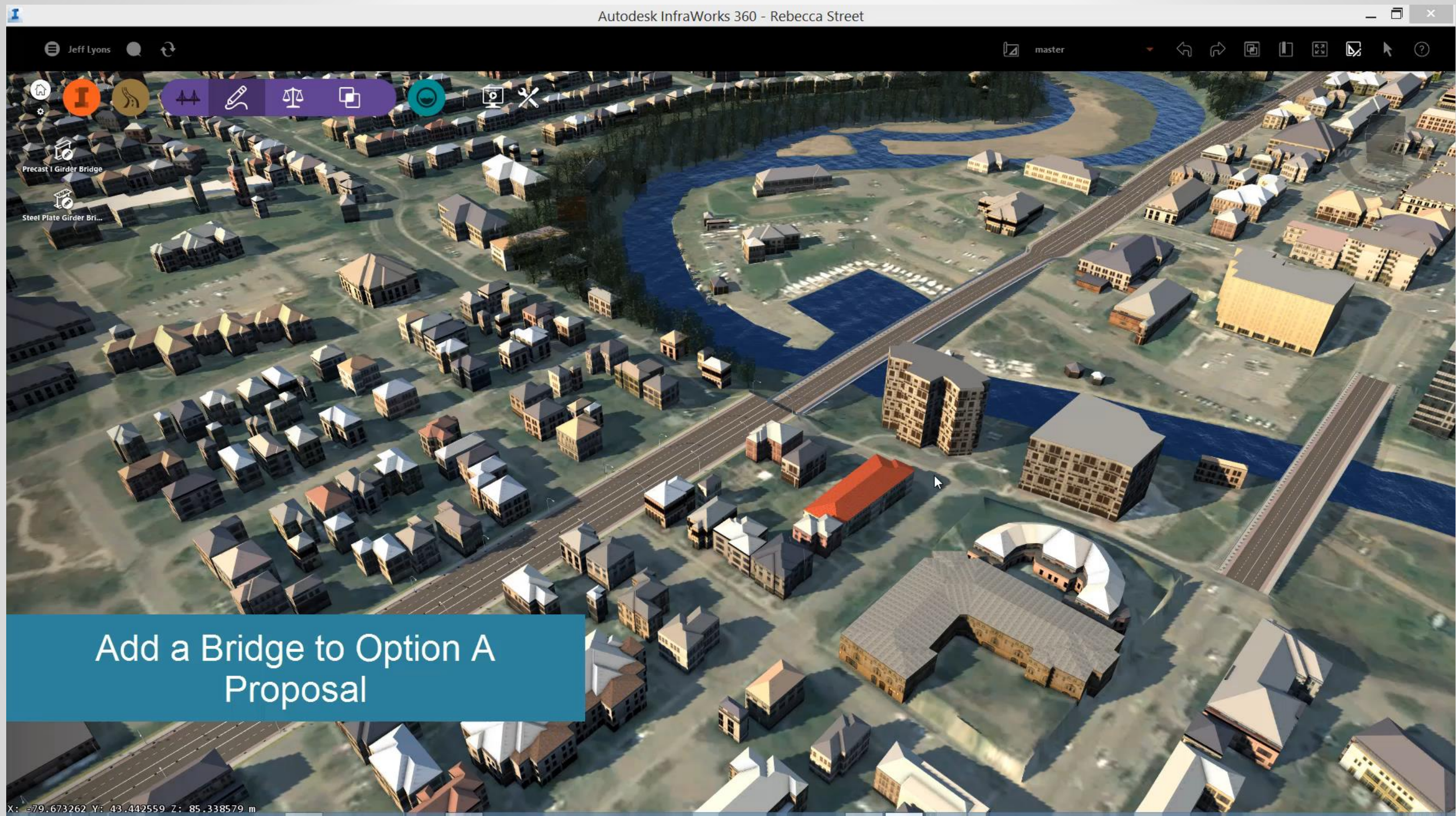
# Adding Conceptual Bridge

- Infracore 360
  - Splitting the Road Feature
  - Stylization to Control Bridge Visualization
  - No Underground Design
- Infracore 360 Roadway Design
  - Complete Dynamic Bridge Component Design
  - Underground Design
  - Bridge Quantities for Concrete and Steel



[Click Image to Watch Video](#)





Add a Bridge to Option A  
Proposal



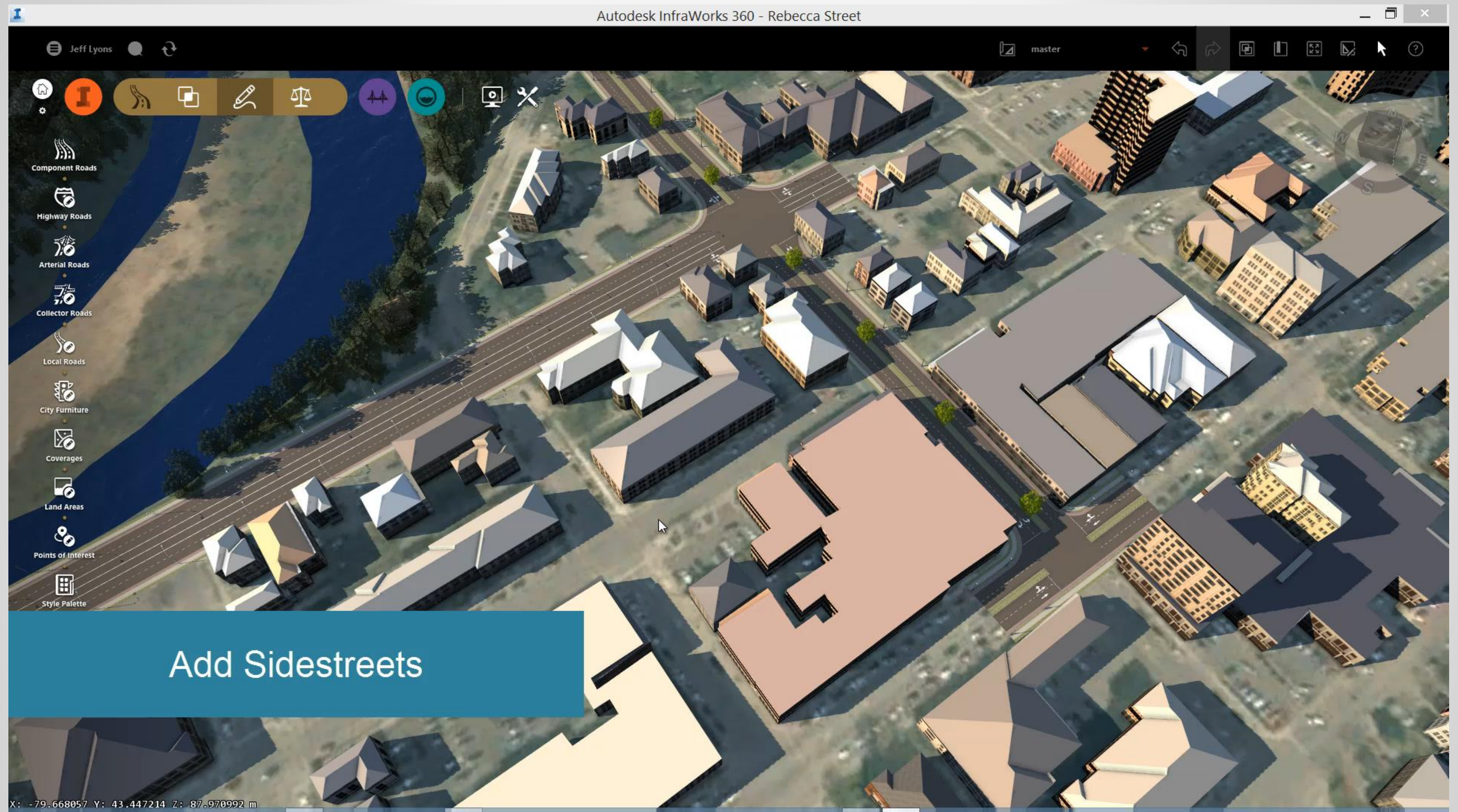
# Adding Intersections, Landscape, Street and Station Features

- Intersections with Paint
- Signalization
- Signage
- Landscape Design
- Station Platforms and Shelters



[Click Image to Watch Video](#)







# PART B: Brief Introduction to AEC Tender

AEC Tender is THE Best Solution on the market today to:

- Manage, Create and Analyze Contractor Bids for Project Construction
- Perform Real-time Cost Estimating on any project using YOUR data

The screenshot displays the AEC Solutions web application interface. The browser address bar shows the URL `aecolutions.ca/Tenders/EditSection?TenderID=193`. The page title is "Edit Tender Pay Item". The interface includes a navigation menu on the left with a tree structure for project sections: A - Site Preparation, B - Earthworks, C - Removals, D - Sanitary, E - Storm, F - Watermain, G - Primary Roadworks, and H - Sitework Materials. The main content area shows a table of pay items with columns for Index, Description, Quantity, Unit, Unit Cost, and Extended Price. The table lists 9 items, all related to 250mm PVC Pipe SI at various depths. A "Total" row at the bottom shows a total extended price of \$65,146.47. Below the table, there is a section for "Section: 300.8: Circular PVC Sanita" with a sub-table listing codes and descriptions for different pipe sizes (150 PVC, 200 PVC, 250 PVC, 300 PVC).

Index	Description	Quantity	Unit	Unit Cost	Extended Price
1	MH12A to MH13A - 250mm PVC Pipe SI at Avg. Depth 2.50vm	35.45	m	\$126.17	\$4,472.61
2	MH17A to MH18A - 250mm PVC Pipe SI at Avg. Depth 2.70vm	56.25	m	\$126.17	\$7,096.88
3	MH16A to MH110A - 250mm PVC Pipe SI at Avg. Depth 3.50vm	78.25	m	\$134.75	\$10,544.19
4	MH18A to MH16A - 250mm PVC Pipe SI at Avg. Depth 3.30vm	65.25	m	\$132.44	\$8,642.00
5	MH19A to MH18A - 250mm PVC Pipe SI at Avg. Depth 4.20vm	45.26	m	\$142.78	\$6,462.12
6	MH15A to MH16A - 250mm PVC Pipe SI at Avg. Depth 3.90vm	89.26	m	\$138.33	\$12,347.63
7	MH14A to MH15A - 250mm PVC Pipe SI at Avg. Depth 4.00vm	22.35	m	\$141.67	\$3,166.25
8	MH13A to MH14A - 250mm PVC Pipe SI at Avg. Depth 5.20vm	45.25	m	\$174.17	\$7,881.04
9	MH11A to MH12A - 250mm PVC Pipe SI at Avg. Depth 5.60vm	23.25	m	\$195.00	\$4,533.75
Total:					\$65,146.47

Code	Description
300.6.1	150 PVC
300.6.2	200 PVC
300.6.3	250 PVC
300.6.4	300 PVC



# Top 5 Productivity Features of AEC Tender

1. Standardization of Catalogs for any Project Type
2. Fast and Easy Cost Sheet Creation for Bidders using Drag n Drop from Catalog
3. Instantly Import Items direct from CAD or Civil 3D
4. Analyze Bids submitted from Contractors
5. Real-time Cost Estimates from past project pricing

The screenshot shows the 'Cost Estimates - AEC' web application. The browser address bar displays 'aecsolutions.ca/Estimate'. The page header includes the 'AEC Solutions' logo and navigation links for 'Profile', 'Portal', 'Account', and 'Log off'. The main content area is titled 'Cost Estimates' and features a tree view on the left for 'Northwinds Engineering Ltd' with categories like 'Getting Started Tender', 'A - Site Preparation', 'B - Earthworks', 'C - Removals', 'D - Sanitary', 'E - Storm', 'F - Watermain', 'G - Primary Roadworks', 'H - Sitework Materials', 'IWConnect', 'Municipal Standard', 'Site Plans', and 'Subdivisions'. The 'E - Storm' category is expanded, showing sub-items like 'E.1 - Storm Sewers', 'E.2 - Storm Manhole Structures', 'E.3 - Catchbasin Structures', 'E.4 - Sewer Installation', and 'E.5 - Structure Installation'. The 'H - Sitework Materials' category is also expanded. The right side of the interface is titled 'Create Cost Estimate' and includes a 'General Parameters' section with fields for 'Start Year' (2000), 'End Year' (2015), 'Inflation [%]' (1.5), 'Municipality', 'Project Type', 'Percentile', 'Awarded Only' (checkbox), and 'Trim Amount' (0). Below this is a 'Section Parameters' section with fields for 'StartMH', 'EndMH', 'Diameter' (From: 450, To: ), 'Material' (Concrete Pipe SI), 'Length' (From: , To: ), 'Street', 'Class', and 'AvgDepth' (From: 2, To: 4). A 'Generate Estimate' button is located below the 'Section Parameters' section. The bottom right corner displays a 'Results' section with a table showing statistical data:

Results		
Summary	Table	Chart
Average : \$319.00	Minimum : \$245.00	Maximum : \$457.00
25th Percentile : \$238.32	75th Percentile : \$399.68	User Percentile : \$0.00
Median : \$255.00	Standard Deviation : \$119.62	Count : 3
Skewness : 1.72	Kurtosis : NaN	



# Create Cost Estimate from Items...

1 - Site Preparation

1.1 - Bonding

1.2 - Insurance

1.3 - Site Preparation

1.4 - Dust Suppression

1.5 - Survey

1.6 - Earthworks

1.7 - Survey

1.8 - Earthworks

1.9 - Removals

1.10 - Sanitary

1.11 - Sanitary Sewers

1.12 - Sanitary Structures

1.13 - Sewer Installation

1.14 - Structure Installation

1.15 - Storm

1.16 - Watermain

1.17 - Primary Roadworks

Section: 300 B - Circular PVC Sanitar

Code	Description
300.6.1	150 PVC
300.6.2	200 PVC
300.6.3	250 PVC
300.6.4	300 PVC

Pay Items

Index	ItemCode	Description	StartMH	EndMH	Diameter (mm)	Material	Length (m)
1	300.6.3	250 PVC	1	2	250	PVC	25.36
2	300.6.3	250 PVC	2	3	250	PVC	38.62
3	300.6.3	250 PVC	3	4	250	PVC	54.26
4	300.6.3	250 PVC	4	5	250	PVC	67.52
5	300.6.3	250 PVC	5	6	250	PVC	80.77
6	300.6.3	250 PVC	6	7	250	PVC	94.03
7	300.6.3	250 PVC	7	8	250	PVC	77.00
8	300.6.3	250 PVC	8	9	250	PVC	66.03
9	300.6.3	250 PVC	9	10	250	PVC	79.29
10	300.6.3	250 PVC	10	11	250	PVC	48.22
11	300.6.3	250 PVC	11	12	250	PVC	61.47
12	300.6.3	250 PVC	12	13	250	PVC	74.73
13	300.6.3	250 PVC	13	14	250	PVC	45.26

# Perform ad Hoc Cost Estimates for any Template Items using Past Bids and Awarded Projects...

Northwinds Engineering Ltd

Getting Started Tender

Municipal Standard

I - Roadway

II - Storm Drainage Sewer

II.A - Pipes

II.A.1 - Storm Sewers

II.A.2 - Culverts

II.B - Structures

III - Sanitary Sewer

IV - Watermain

V - Utility

VI - Bridge

VII - Landscape

VIII - Buildings

Site Plans

Subdivisions

Create Cost Estimate

General Parameters

Start Year: 2000, End Year: 2015, Inflation [%]: 1.5, Awarded Only: ☒

Municipality: , Project Type: , Percentile: , Trim Amount: 0

Project Attribute 1: Client Type: , Public: , Project Attribute 2: Contract Category: , Municipal:

Section Parameters

ItemCode: , Description: , StartMH: , EndMH: , Diameter: From: 525 To: , Material: Concrete Pipe SI, Length: From: To: , Street: , Class: , AvgDepth: From: 3 To: 4

Generate Estimate

Results

Summary: Average: \$269.80, Minimum: \$165.00, Maximum: \$457.00, 25th Percentile: \$226.93, 75th Percentile: \$312.67, User Percentile: \$0.00, Median: \$275.00, Standard Deviation: \$63.57, Count: 15, Skewness: \$1.46, Kurtosis: 5.856

# Analyze Bid Pricing from Contractors...

Bid Comparison - Site Servicing and Roadworks

Download All Bids Show Relative Prices

Section Name	Cost Estimate	intend_BidderA @outlook.com	intend_BidderB @outlook.com	intend_BidderC @outlook.com
Site Preparation	\$64,222.50	\$53,915.00	\$57,820.00	\$58,121.00
Earthworks	\$340,745.50	\$685,680.00	\$757,782.00	\$675,040.00
Removals	\$28,232.00	\$30,290.00	\$27,365.00	\$33,000.00
Sanitary	\$577,577.18	\$645,696.70	\$590,812.48	\$690,895.47
Storm	\$1,149,676.68	\$1,274,778.85	\$1,179,170.44	\$1,402,256.74
Watermain	\$732,622.26	\$714,133.50	\$671,159.25	\$764,122.85
Primary Roadworks	\$0.00	\$1,674,073.35	\$1,485,640.00	\$1,757,777.02
Contingency	\$0.00	\$0.00	\$0.00	\$0.00
Total	\$2,893,076.06	\$5,078,567.40	\$4,769,749.17	\$5,381,213.07

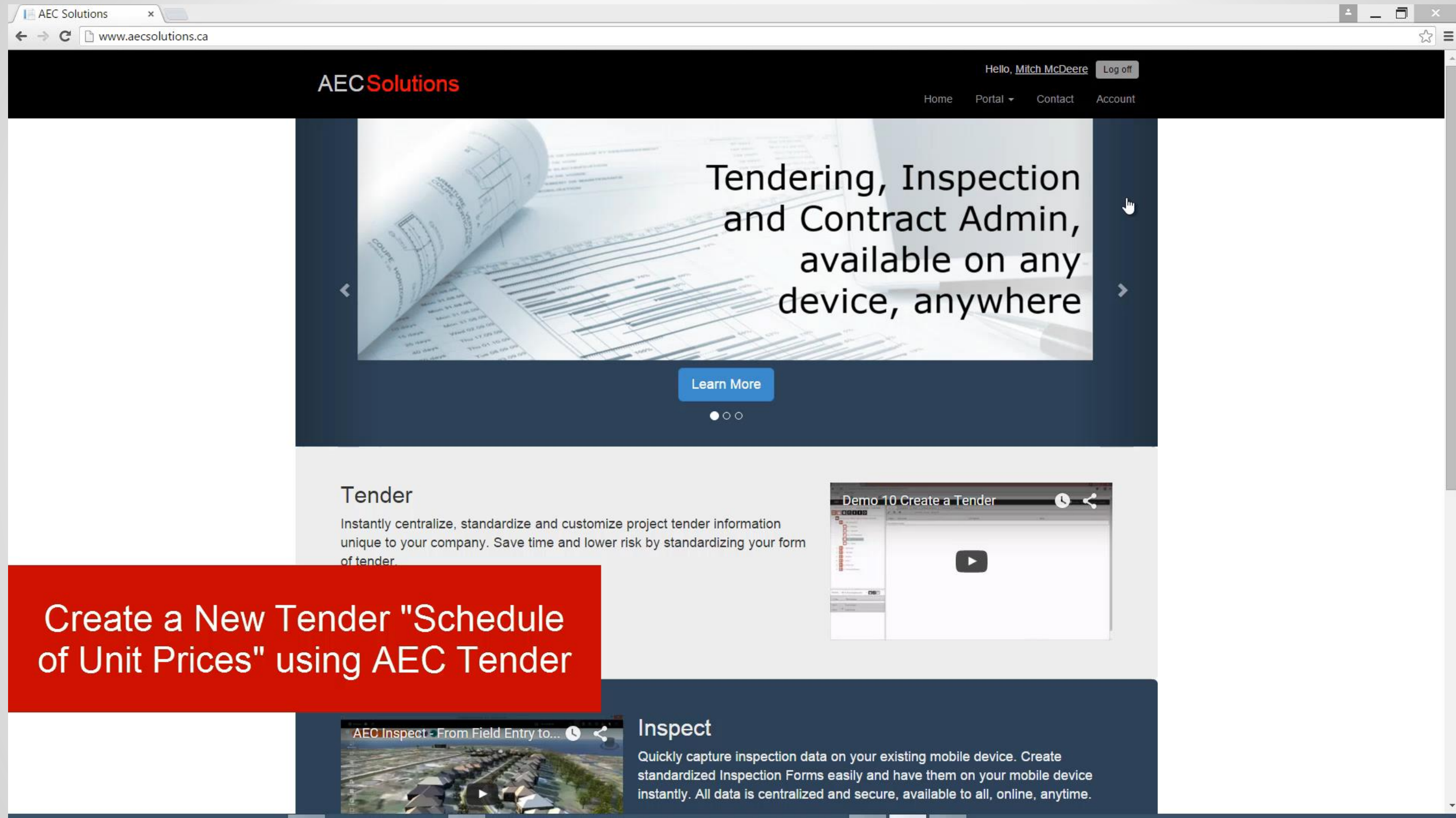
Bid Comparison

Price vs Section bar chart showing Cost Estimate, intend\_BidderA, intend\_BidderB, and intend\_BidderC across various sections.





# AEC Tender Introduction to Cost Estimating and Bid Preparation



The screenshot shows the AEC Solutions website. The browser address bar displays 'www.aecolutions.ca'. The website header includes the 'AEC Solutions' logo, a user greeting 'Hello, Mitch McDeere' with a 'Log off' button, and navigation links for 'Home', 'Portal', 'Contact', and 'Account'. The main banner features an image of architectural blueprints with the text 'Tendering, Inspection and Contract Admin, available on any device, anywhere' and a 'Learn More' button. Below this, the 'Tender' section is highlighted with a red background and white text: 'Create a New Tender "Schedule of Unit Prices" using AEC Tender'. To the right of this text is a video player titled 'Demo 10 Create a Tender'. At the bottom, the 'Inspect' section is visible, featuring a video player titled 'AEC Inspect - From Field Entry to...' and a description: 'Quickly capture inspection data on your existing mobile device. Create standardized Inspection Forms easily and have them on your mobile device instantly. All data is centralized and secure, available to all, online, anytime.'

AEC Solutions

Hello, [Mitch McDeere](#) [Log off](#)

[Home](#) [Portal](#) [Contact](#) [Account](#)

Tendering, Inspection and Contract Admin, available on any device, anywhere

[Learn More](#)

**Create a New Tender "Schedule of Unit Prices" using AEC Tender**

**Tender**  
Instantly centralize, standardize and customize project tender information unique to your company. Save time and lower risk by standardizing your form of tender.

**Demo 10 Create a Tender**

**Inspect**  
Quickly capture inspection data on your existing mobile device. Create standardized Inspection Forms easily and have them on your mobile device instantly. All data is centralized and secure, available to all, online, anytime.



# Ad-Hoc Cost Estimate using Past Project Bids

The screenshot shows the AEC Solutions website interface. At the top, the browser address bar displays 'www.aecsolutions.ca'. The website header includes the 'AEC Solutions' logo and a user greeting 'Hello, Mitch McDeere' with a 'Log off' button. Navigation links for 'Home', 'Portal', 'Contact', and 'Account' are present. The main content area features a large banner with a yellow excavator and the text 'Access tendered items from mobile devices to take field notes and photos on site', accompanied by a 'Learn More' button. Below this, the 'Tender' section describes centralizing tender information with a 'Learn More' button and a video player titled 'Demo 10 Create a Tender'. The 'Inspect' section describes capturing inspection data on mobile devices. A red overlay box in the bottom left corner contains the text 'Ad Hoc Cost Estimate System using Past Project Bid Unit Cost Data'.

AEC Solutions

Hello, Mitch McDeere Log off

Home Portal Contact Account

Access tendered items from mobile devices to take field notes and photos on site

Learn More

Tender

Instantly centralize, standardize and customize project tender information unique to your company. Save time and lower risk by standardizing your form of tender.

Learn More

Demo 10 Create a Tender

Inspect

Quickly capture inspection data on your existing mobile device. Create standardized Inspection Forms easily and have them on your mobile device instantly. All data is centralized and secure, available to all, online, anytime.

Ad Hoc Cost Estimate System using Past Project Bid Unit Cost Data



# Now Back to our Project!

## Connecting Infraworks 360 Online Model with AEC Tender for Cost Estimating

- Using Infraworks 360, you can post the Model to the Online Collaboration Site
- Using AEC Tender, we can “Connect” to the Online Model to Auto-Populate the Tender Section Table(s) with Content found in the Model

The screenshot displays the Autodesk InfraWorks 360 web application. A browser window is open to the URL `aecolutions.ca/Tenders/CreateTender`. The page title is "Create Tender". The form includes the following fields:

- Project:** A dropdown menu with "Oakville RapidLink" selected.
- Tender Type:** A dropdown menu with "InfraWorks 360" selected.
- Tender Number:** A text input field containing the number "1".
- Name:** A text input field containing "Option A Road and Bridge".
- Description:** A text area containing "Tender built from Content Imported from Online Infraworks 360 Model".
- Create Master:** A checkbox that is checked.
- Closing:** A date and time picker set to "12/15/2015 4:00 PM".
- Template:** A dropdown menu with "Municipal Standard" selected.

At the bottom of the form is a "Create" button and a "Back to Tenders" link. To the right of the form, there is a section titled "Connect to InfraWorks 360" with the text: "To connect to an InfraWorks 360 model, please login into your account using the button below and return to this page." Below this text is a "Login to AutoDesk" button. The background of the web application shows a sidebar with "My Models" and a list of models including "Rebecca" and "Ottawa".



# A Quick Look under the Hood...

## Review 3 Key Concepts

- Infraworks Objects ARE ready for Cost Estimating
- We ARE Linking Infraworks Objects to AEC Tender Pay Items
- Mapping Object Properties with Pay Item Entry uses Expressions (Just like Civil 3D)

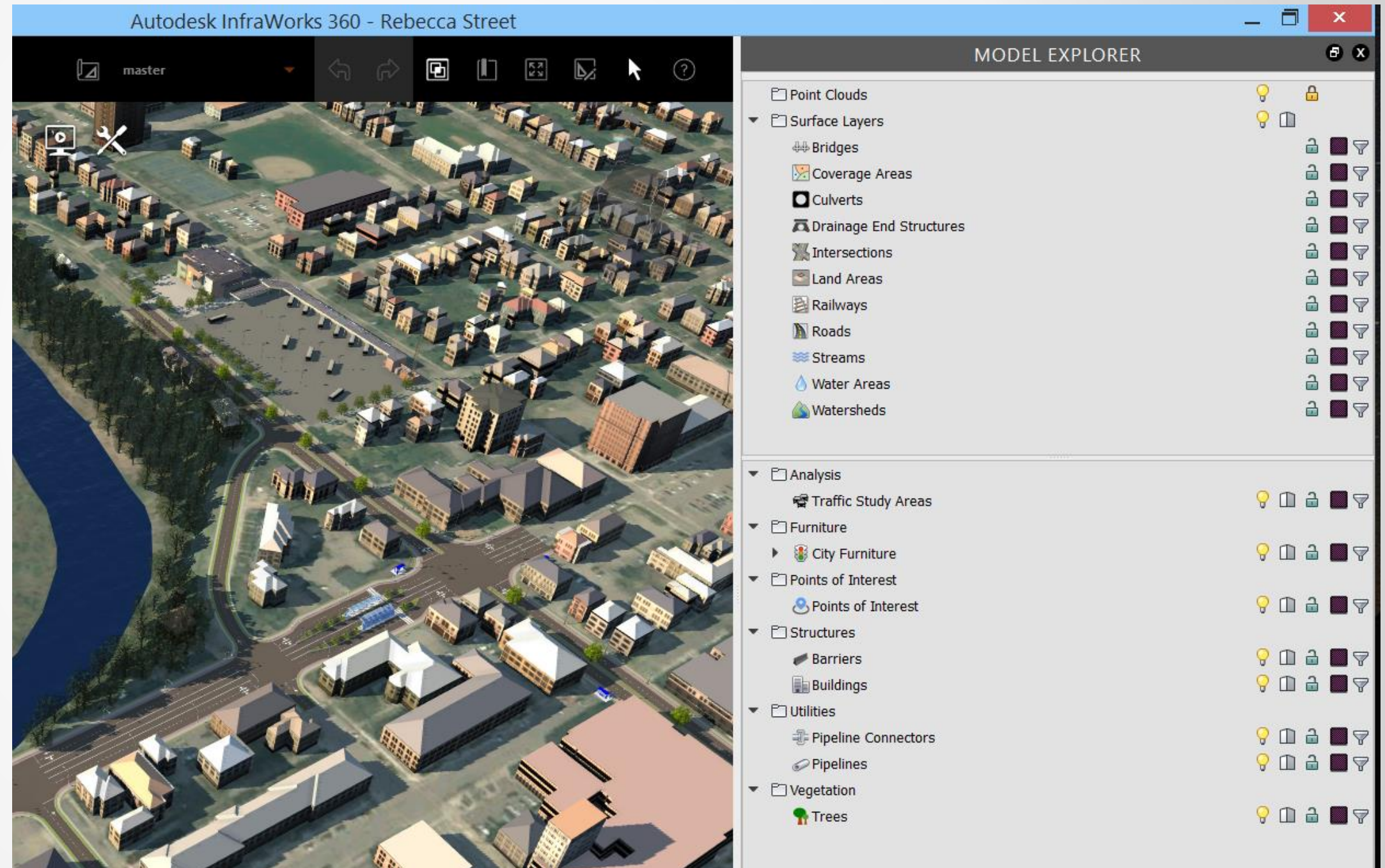




# Infraworks Objects subject to Cost Estimating

List of Objects and their “Default” Quantity Measurement Types:

- Coverages = Area
- Culverts = Length
- Drainage End Structures = Each
- Land Areas = Area
- Railways = Length
- Roads = Length
- City Furniture = Each
- Points of Interest = Each
- Barriers = Length
- Buildings = Each
- Pipeline Connectors = Each
- Pipelines = Length
- Trees = Each





# Linking Infraworks Objects with AEC Tender Template Groups and Items

- The Infraworks object “Tag” and “User Data” properties are used to “Link” Infraworks Object(s) to an AEC Tender Cost Estimating Section Table Item
- Back in AEC Tender, the Tender Section Table Name and Pay Item Configuration determines Auto-Population of the Tender Items

AEC Solutions

Northwinds Engineering Ltd Profile Portal Account

## Manage Tender Sections Templates

-- Select Node to Start --

Northwinds Engineering Ltd

- Getting Started Tender
- IWConnect
- Municipal Standard
  - A - Roadway
  - B - Storm Drainage Sewer
  - C - Sanitary Trunk Sewer
  - D - Watermain
  - E - Utility
  - F - Bridge
  - G - Landscape
    - G.1 - Structures
      - G.1.a - Curb
    - G.2 - Coverages
    - G.3 - Vegetation
  - H - Buildings
- Site Plans
- Subdivisions

Name: Curb

Description:

Grouping Field 1: Grouping Field 2: Grouping Field 3: Sorting Field: Manual

Grouping 1 Sort: Ascending Grouping 2 Sort: Ascending Grouping 3 Sort: Ascending Sort Direction: Ascending

Table Enum Override: Default Start New Worksheet: ☐

Catalog: Edit Catalog Municipal Standard Pay Item Grp.: Edit Pay Items Getting Started Cost Est. Query: Edit CEO Curb Length

100 Roadworks

801 Structures

Catalog Section: 801.1: Curb

Pay Item Table: Curb Length

Fields to be Shown in Tender Section Table

- ☒ Description
- ☒ ItemCode
- ☒ Note
- ☒ Length
- ☐ Street
- ☒ Type

Save Section Table Saved

[Return to Account](#)



# Mapping Infracore Object Properties to AEC Tender Pay Item Properties using Expressions

Using Infracore,

1. Select Design Road
2. Edit Tag: **Roadway**
3. Add User Data: **Width=12**

Using AEC Tender,

1. Create or Verify that “**Roadway**” is a Section Group Name in the Tender Section Template to be used
2. Review the Pay Items used to build the Roadway Tender Section
3. Configure the Pay Item “IW Object Mapping” to Automatically populate and calculate Tender Pay Item Fields from Object Property and User Data Fields

The screenshot displays the 'AEC Solutions' web application interface. The main title is 'Pay Items Table Manager'. Below the title, there is a search bar with the text '-- Select Node to Start --'. A navigation pane on the left lists various object categories: 'Each', 'Cost Estimates', 'Length', 'Hourly', 'Tonne', 'LumpSum', 'Manual', 'Linear Box', 'Box - Vertical', 'Pipe - Circular', 'Siteworks', 'Getting Started', 'Circular Pipe', 'Circular Structure', 'Lumpsum', 'Volume', 'Manual Entry', 'Watermain', 'Road Areas', 'Curb Length', 'CatchBasin', 'Landscape', 'Barrier Curb', 'Street Tree', and 'IW Object Mapping'. The 'IW Object Mapping' item is highlighted with a red box. On the right side, the 'Infracore 360 Object Property Mapping' section is visible. It contains a description: 'Map the Infracore Object Property to a Pay Item Property. Build an Expression to AutoCalculate Property Values or Quantity Values (Use "[ ]" Brackets to define a Pay Item or Object property)'. Below this, there is a 'Pay Item Quantity Field' dropdown menu set to 'Count'. A table with two columns, 'Name' and 'Expression', shows the mapping for various pay item fields: 'ItemCode' maps to '[NAME]', 'Description' maps to '[DESCRIPTION]', 'Spacing' maps to '[USERDATA:SPACING]', 'Count' maps to '[LENGTH]/[SPACING]', and 'Note' maps to '[TOOLTIP]'.

AEC Solutions

Pay Items Table Manager

-- Select Node to Start --

Each

Cost Estimates

Length

Hourly

Tonne

LumpSum

Manual

Linear Box

Box - Vertical

Pipe - Circular

Siteworks

Getting Started

Circular Pipe

Circular Structure

Lumpsum

Volume

Manual Entry

Watermain

Road Areas

Curb Length

CatchBasin

Landscape

Barrier Curb

Street Tree

IW Object Mapping

### Infracore 360 Object Property Mapping

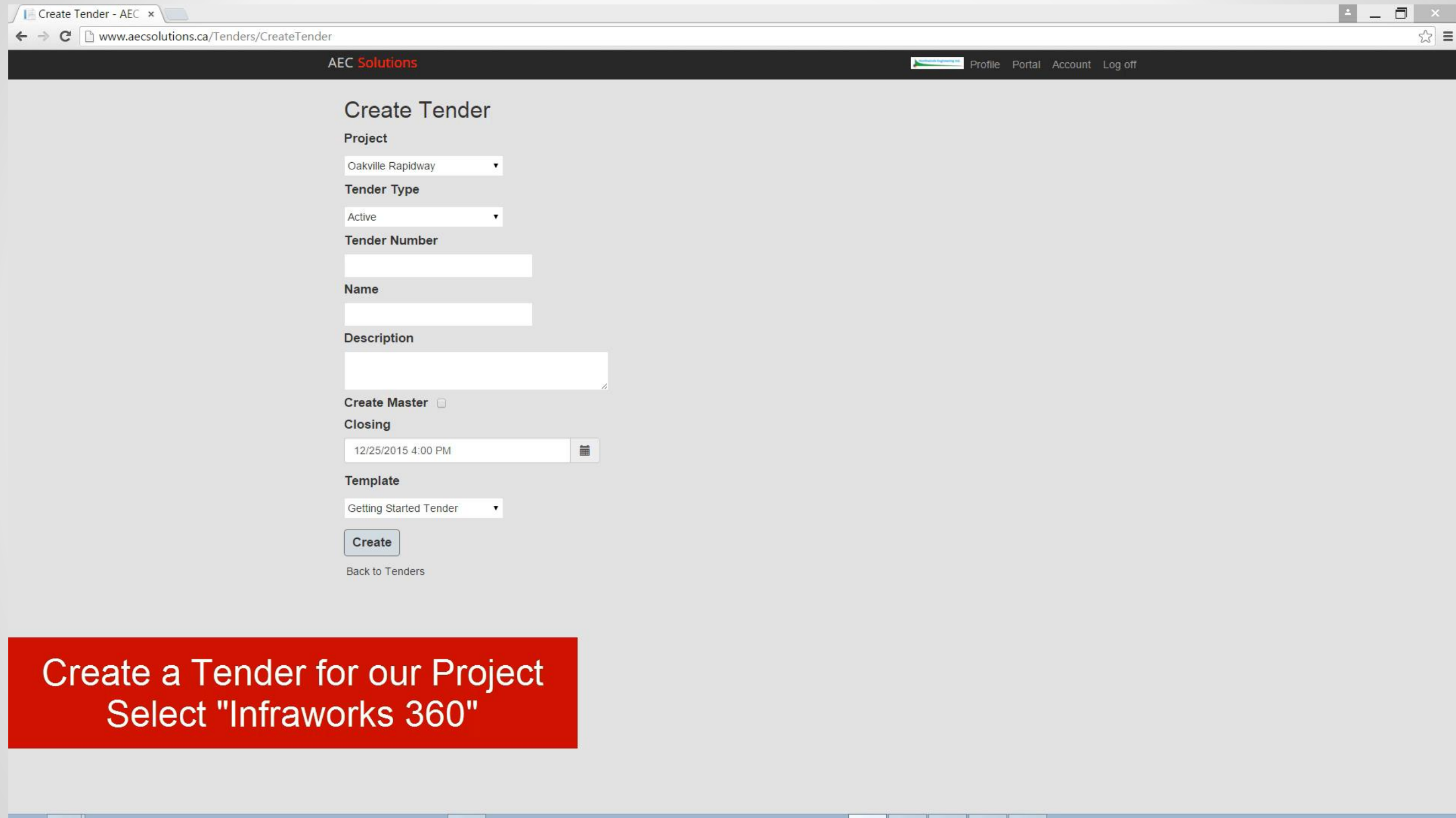
Map the Infracore Object Property to a Pay Item Property  
Build an Expression to AutoCalculate Property Values or Quantity Values  
(Use "[ ]" Brackets to define a Pay Item or Object property)

Pay Item Quantity Field: Count

Name	Expression
ItemCode	[NAME]
Description	[DESCRIPTION]
Spacing	[USERDATA:SPACING]
Count	[LENGTH]/[SPACING]
Note	[TOOLTIP]



# Building a Cost Estimate from Infraworks 360 Model



The screenshot shows a web browser window with the URL [www.aecsolutions.ca/Tenders/CreateTender](http://www.aecsolutions.ca/Tenders/CreateTender). The page title is "Create Tender - AEC". The header includes the "AEC Solutions" logo and navigation links: "Profile", "Portal", "Account", and "Log off".

The main content area is titled "Create Tender" and contains the following fields:

- Project:** A dropdown menu with "Oakville Rapidway" selected.
- Tender Type:** A dropdown menu with "Active" selected.
- Tender Number:** An empty text input field.
- Name:** An empty text input field.
- Description:** A large empty text area.
- Create Master:** A checkbox that is currently unchecked.
- Closing:** A date and time picker showing "12/25/2015 4:00 PM".
- Template:** A dropdown menu with "Getting Started Tender" selected.

Below the form fields is a "Create" button and a "Back to Tenders" link.

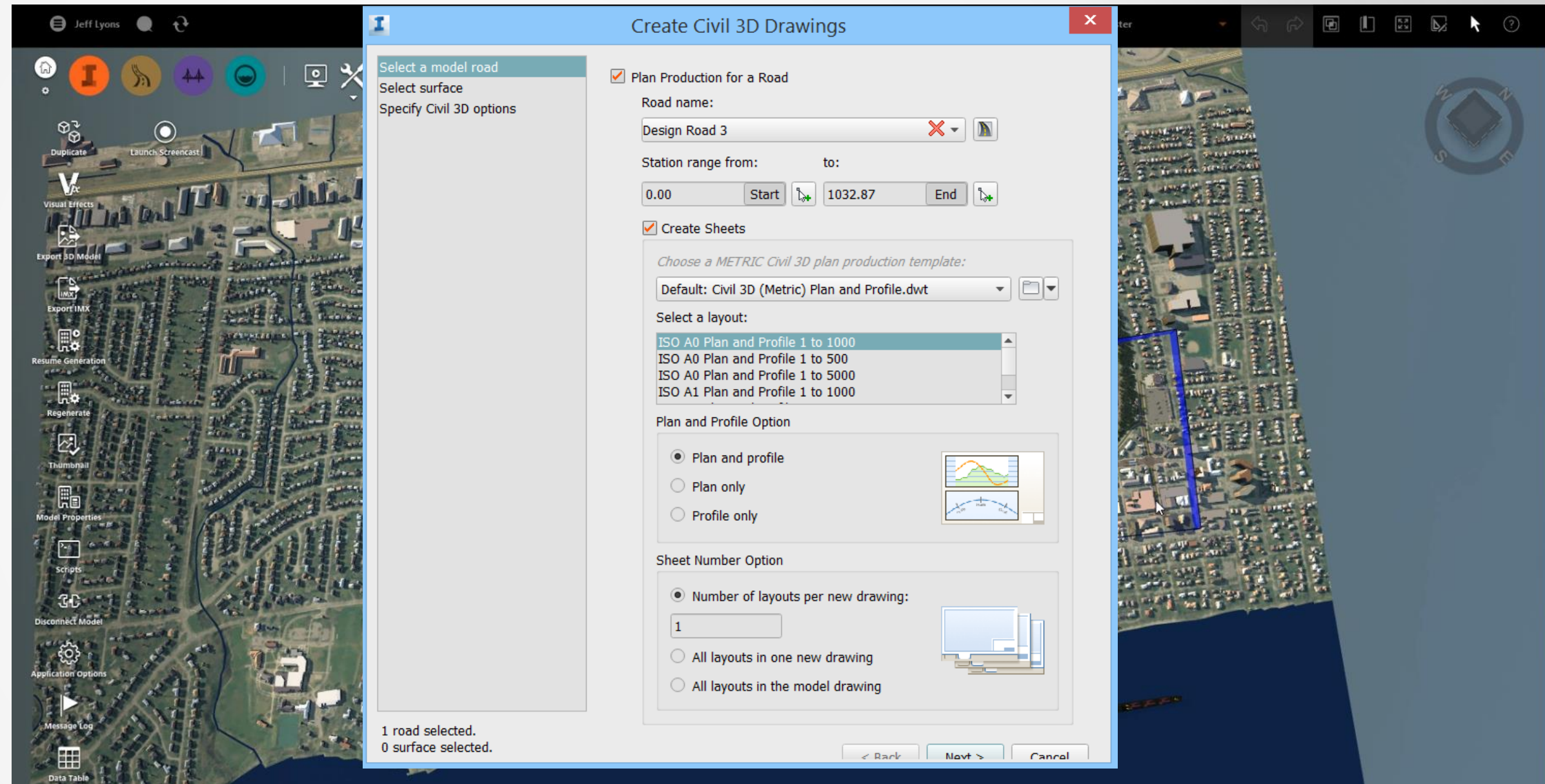
Create a Tender for our Project  
Select "Infraworks 360"



# PART C: From Concept to Detailed Design

Options to Export,

- Export Selected area or entire model to IMX
- Export Design Road to Civil 3D using Plan Production Tools (360 Version Only)





# Export Concept Model Content

Export our Selected Proposal  
to IMX for AutoCAD Civil 3D  
Detailed Design

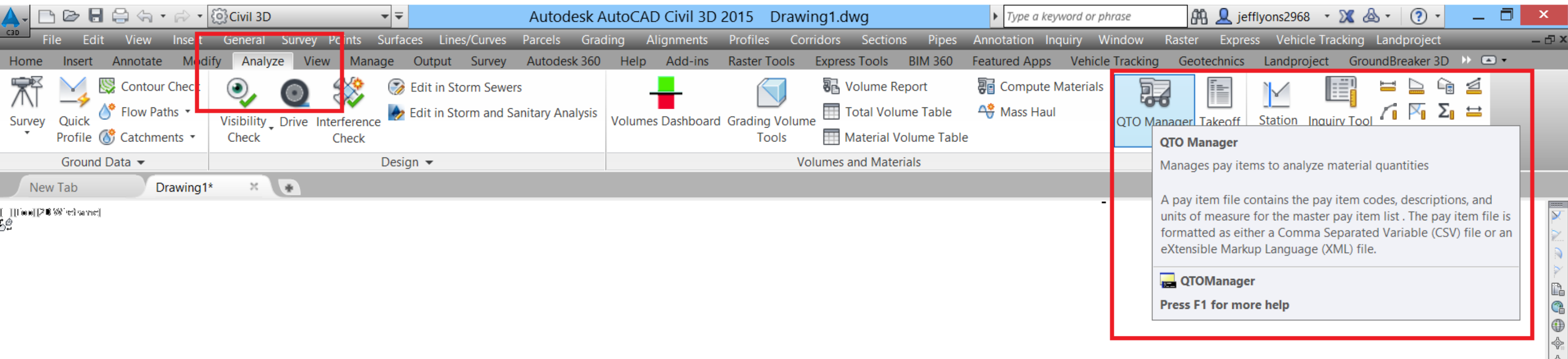


# Import Concept Model Content

Export our Selected Proposal  
to IMX for AutoCAD Civil 3D  
Detailed Design



# Detailed Design using AutoCAD Civil 3D



## ■ Civil Objects

- Road Corridor
- Pipe Network
- Pressure Pipe Network

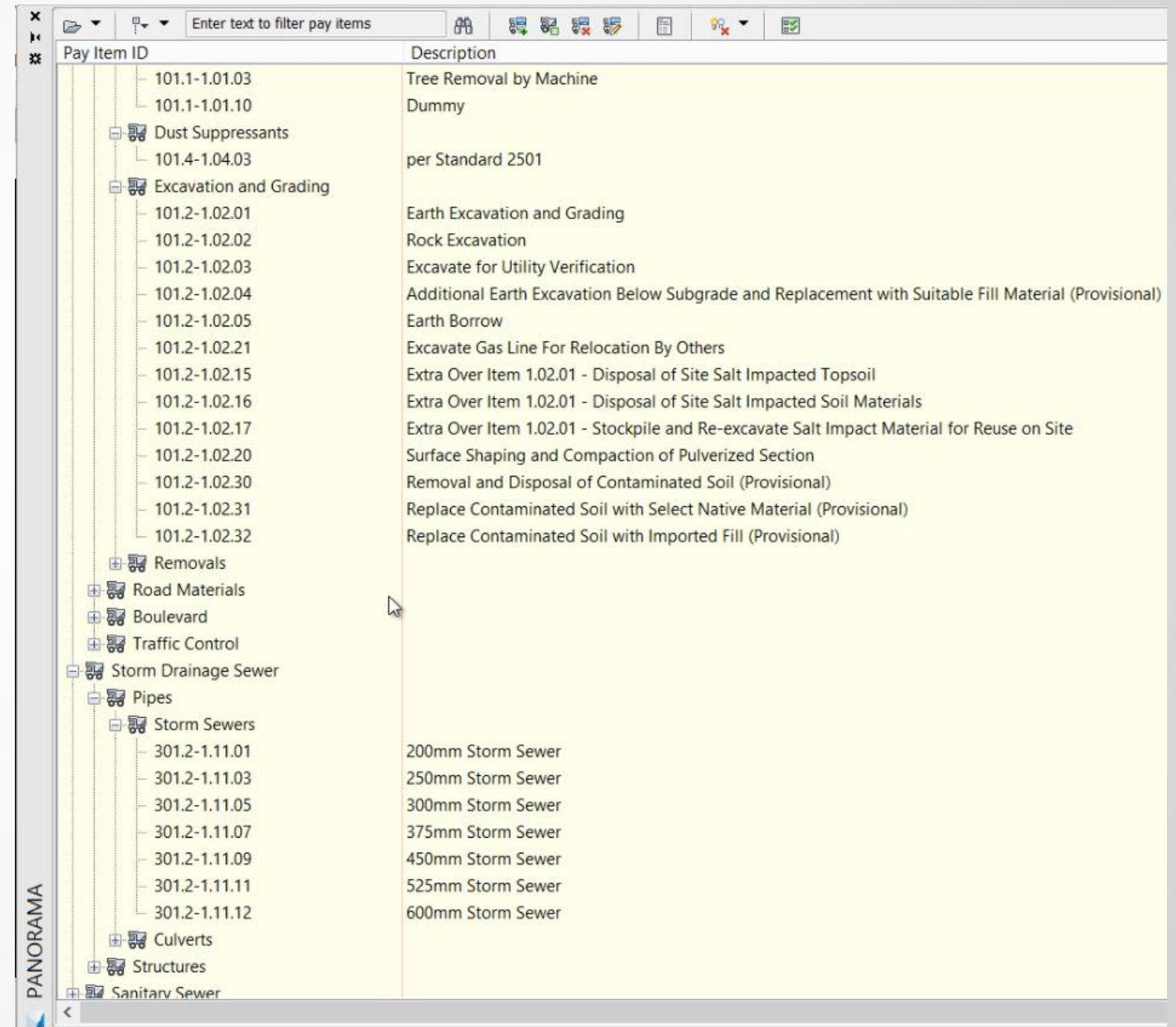
## ■ AutoCAD Objects

- Walls, Fences, Barriers
- Landscape Trees and Coverages
- Utility Equipment and Conduit



# Exporting the AEC Tender Template to AutoCAD Civil 3D QTO Pay Items Template

- Export Tender Section Groups, Tables and Items instantly to QTO Compatible Format
- Note: Import YOUR existing QTO Pay Items directly into AEC Tender Catalog



The screenshot displays the 'Pay Item ID' and 'Description' columns of the QTO Pay Items Template. The interface includes a search bar at the top and a tree view on the left for navigating through the catalog structure.

Pay Item ID	Description
101.1-1.01.03	Tree Removal by Machine
101.1-1.01.10	Dummy
101.4-1.04.03	per Standard 2501
101.2-1.02.01	Earth Excavation and Grading
101.2-1.02.02	Rock Excavation
101.2-1.02.03	Excavate for Utility Verification
101.2-1.02.04	Additional Earth Excavation Below Subgrade and Replacement with Suitable Fill Material (Provisional)
101.2-1.02.05	Earth Borrow
101.2-1.02.21	Excavate Gas Line For Relocation By Others
101.2-1.02.15	Extra Over Item 1.02.01 - Disposal of Site Salt Impacted Topsoil
101.2-1.02.16	Extra Over Item 1.02.01 - Disposal of Site Salt Impacted Soil Materials
101.2-1.02.17	Extra Over Item 1.02.01 - Stockpile and Re-excavate Salt Impact Material for Reuse on Site
101.2-1.02.20	Surface Shaping and Compaction of Pulverized Section
101.2-1.02.30	Removal and Disposal of Contaminated Soil (Provisional)
101.2-1.02.31	Replace Contaminated Soil with Select Native Material (Provisional)
101.2-1.02.32	Replace Contaminated Soil with Imported Fill (Provisional)
301.2-1.11.01	200mm Storm Sewer
301.2-1.11.03	250mm Storm Sewer
301.2-1.11.05	300mm Storm Sewer
301.2-1.11.07	375mm Storm Sewer
301.2-1.11.09	450mm Storm Sewer
301.2-1.11.11	525mm Storm Sewer
301.2-1.11.12	600mm Storm Sewer



AEC Solutions

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# AEC Tender Standardizes Construction Items and Tendering Sections

[Learn More](#)

**Tender**  
Instantly centralize, standardize and customize project tender information

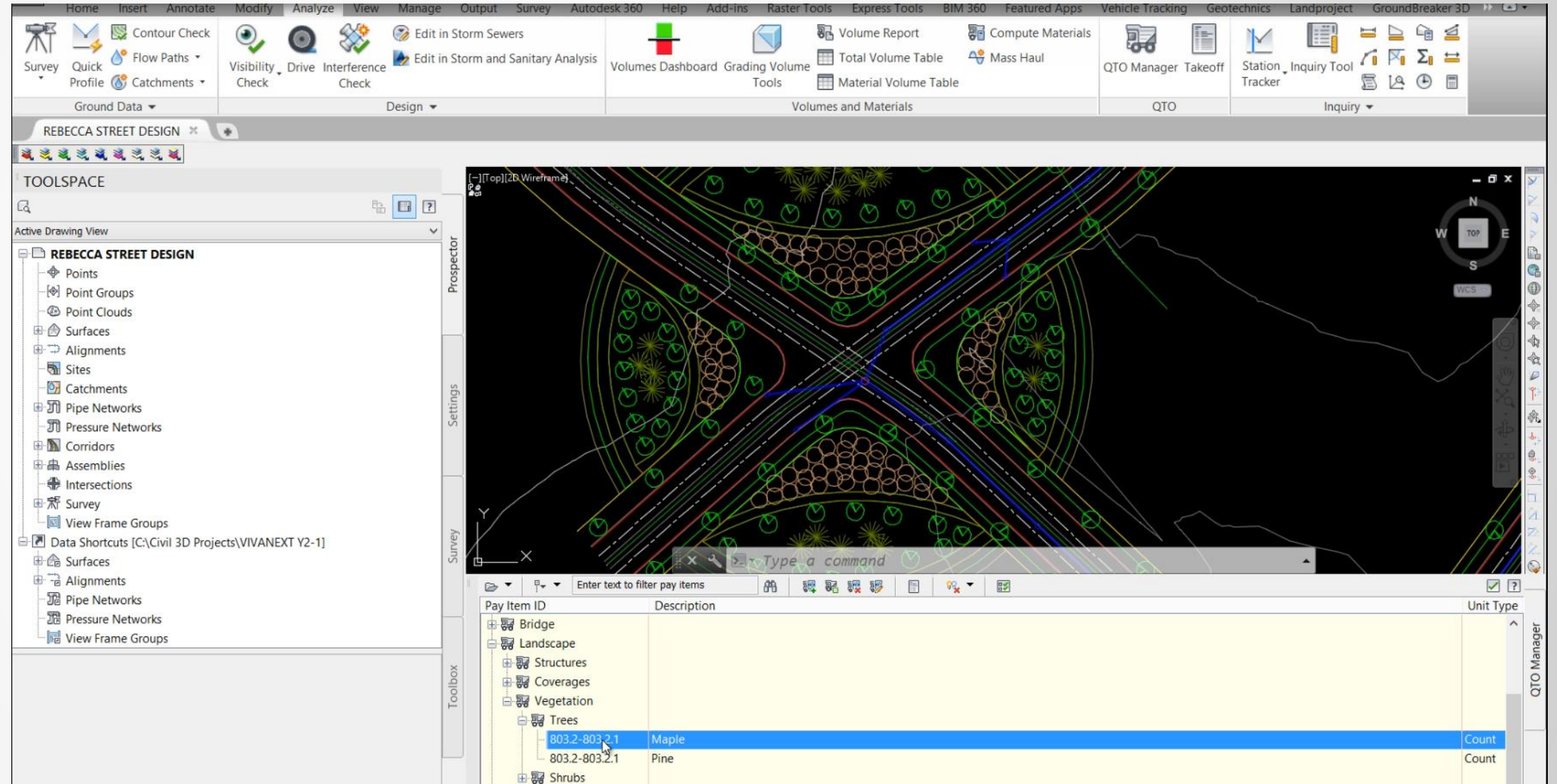
## Export AEC Tender Template to AutoCAD Civil 3D QTO Pay Items Catalog

**Inspect**  
Quickly capture inspection data on your existing mobile device. Create standardized Inspection Forms easily and have them on your mobile device instantly. All data is centralized and secure, available to all, online, anytime.

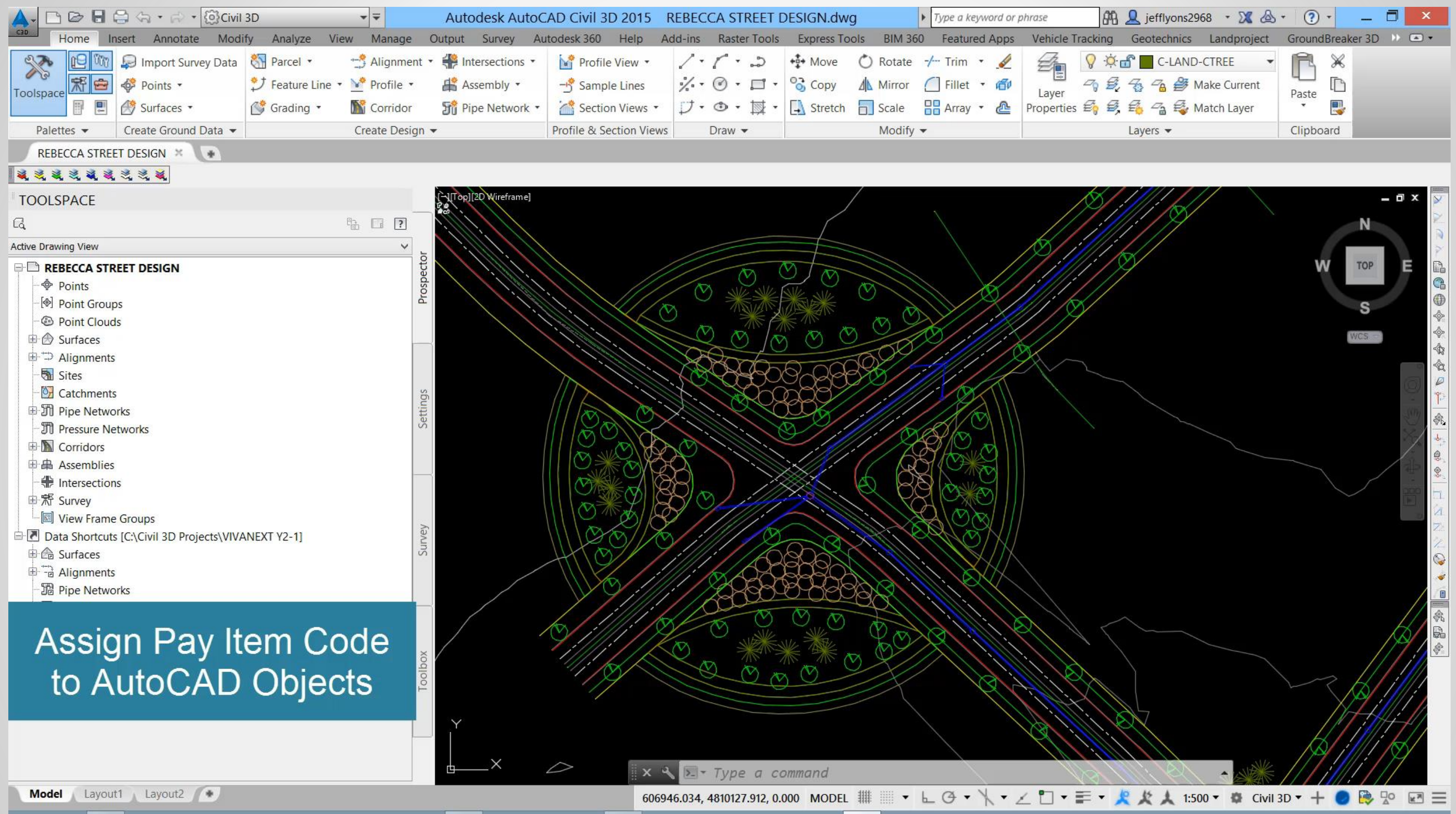


# Using AutoCAD Civil 3D Quantity Takeoff: The Basics of Counting Design Content

- Assigning Basic AutoCAD Objects
- Exporting to XML Ready for AEC Tender



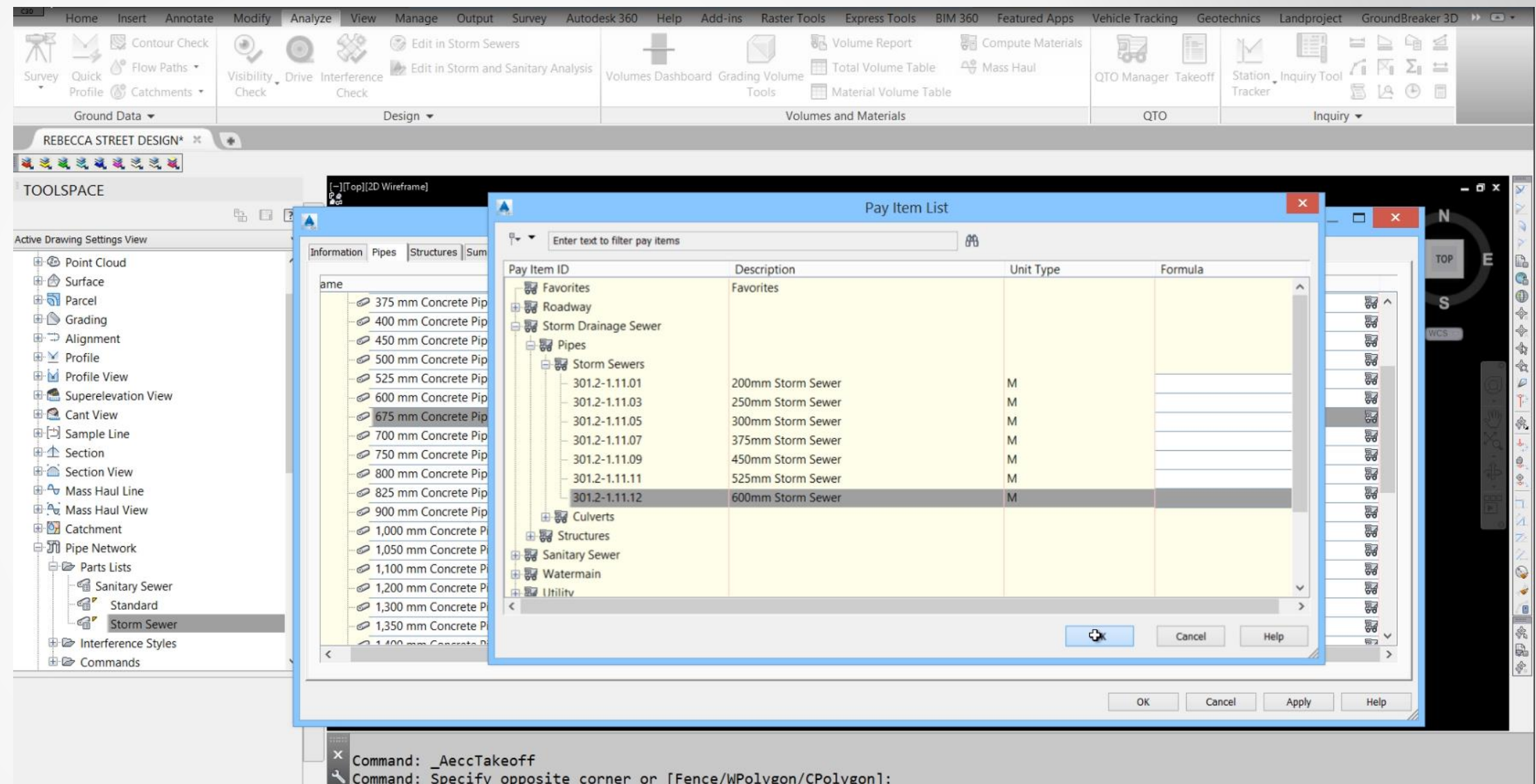






# Extracting Pipe Network Content

- Assign Parts List Items with Pay Item Codes
- HINT: Assigning Pay Item Codes to the Parts List AFTER you create the Pipe Network will not automatically attach the code. Use SWAP or assign manually using QTO Manager





Autodesk AutoCAD Civil 3D 2015 REBECCA STREET DESIGN.dwg

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Survey Quick Profile Flow Paths Catchments Contour Check Visibility Check Drive Interference Check Edit in Storm Sewers Edit in Storm and Sanitary Analysis Volumes Dashboard Grading Volume Tools Volume Report Total Volume Table Material Volume Table Compute Materials Mass Haul QTO Manager Takeoff Station Inquiry Tool Tracker

REBECCA STREET DESIGN\*

TOOLSPACE

Active Drawing View

REBECCA STREET DESIGN

- Points
- Point Groups
- Point Clouds
- Surfaces
- Alignments
- Sites
- Catchments
- Pipe Networks
- Pressure Networks
- Corridors
- Assemblies
- Intersections
- Survey
- View Frame Groups
- Data Shortcuts [C:\Civil 3D Projects\VIVAN...]
- Surfaces
- Alignments
- Pipe Networks
- Pressure Networks

Prospector Settings Survey

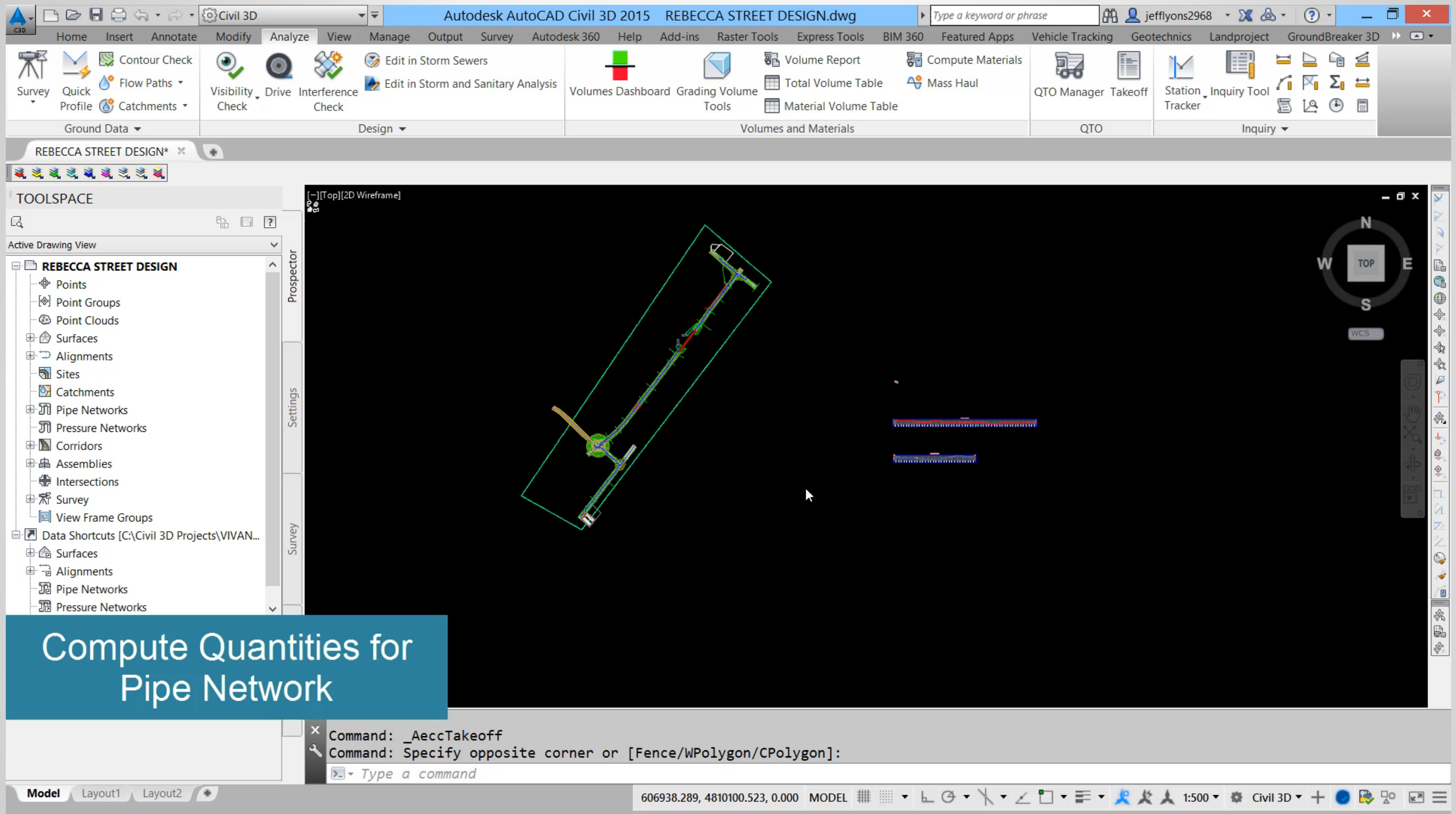
[Top][2D Wireframe]

WCS

Command: `_AeccTakeoff`  
Command: `Specify opposite corner or [Fence/WPolygon/CPolygon]:`  
Type a command

Model Layout1 Layout2

606938.289, 4810100.523, 0.000 MODEL 1:500 Civil 3D





# Extracting Pipe Network Content using Automation...

- For better Cost Estimating Results, you may have to create a Custom Automation to Extract pipe and structure properties

Extract AutoCAD Quantities

CSV Filename:  
C:\Users\Jeff\Documents\Autodesk InfraWorks 360\Rebecca Street\Datasources\DWG\REBECCA STREET DESIGN--STORI

Extraction Parameters:

Extract Type: Pipes (m)

Layer Filter: C-STRM-PIPE

Block Filter: \_ClosedBlank

Pay Item Properties:

Group Name: PIPE

ItemCode: -

Description: STORM SEWER

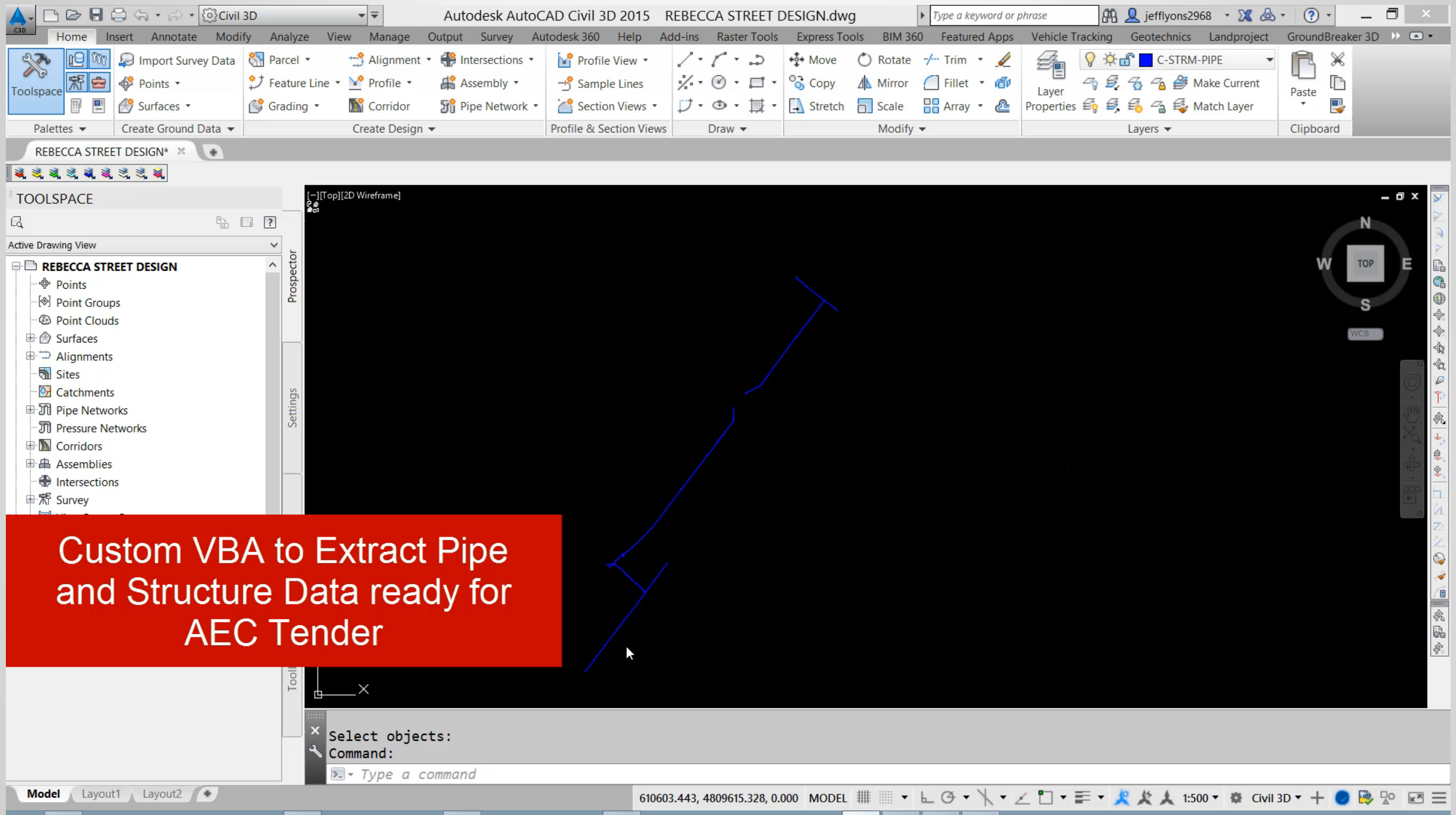
☐ Add Data for ALL Objects ☒ Add Data for Each Object

Data Preview:

Structure - (47),Structure - (28),250 mm Concrete Pipe,250,Concrete Pipe SI,REBECCA STREET WEST,3.71,12.509  
Structure - (46),Structure - (28),250 mm Concrete Pipe,250,Concrete Pipe SI,REBECCA STREET WEST,4.66,11.644  
Structure - (45),Structure - (26),250 mm Concrete Pipe,300,Concrete Pipe SI,TRAFALGAR,3.41,28.278  
Structure - (44),Structure - (26),250 mm Concrete Pipe,300,Concrete Pipe SI,REBECCA STREET WEST,3.40,33.253  
Structure - (43),Structure - (3),450 mm Concrete Pipe,525,Concrete Pipe SI,TRAFALGAR,4.19,82.242  
Structure - (41),Structure - (42),1,050 mm Concrete Pipe,1200,Concrete Pipe SI,REBECCA STREET WEST,14.24,62.127  
Structure - (40),Structure - (41),1,050 mm Concrete Pipe,1050,Concrete Pipe SI,REBECCA STREET WEST,20.15,40.449  
Structure - (39),Structure - (40),825 mm Concrete Pipe,1050,Concrete Pipe SI,REBECCA STREET WEST,19.42,53.140  
Structure - (38),Structure - (39),900 mm Concrete Pipe,900,Concrete Pipe SI,REBECCA STREET WEST,18.65,42.823  
Structure - (37),Structure - (38),825 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,17.78,73.156  
Structure - (36),Structure - (37),525 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,16.95,40.207  
Structure - (35),Structure - (36),525 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,16.12,79.857  
Structure - (34),Structure - (35),750 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,15.22,94.407  
Structure - (33),Structure - (34),525 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,14.85,45.692  
Structure - (32),Structure - (33),750 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,14.29,86.721  
Structure - (31),Structure - (32),750 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,13.16,94.349  
Structure - (30),Structure - (31),675 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,12.58,85.798  
Structure - (29),Structure - (30),675 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,11.85,87.292  
Structure - (28),Structure - (29),675 mm Concrete Pipe,525,Concrete Pipe SI,REBECCA STREET WEST,10.93,33.670

Select Data for Export Clear ALL Data Remove Data Entry Export to CSV Quit

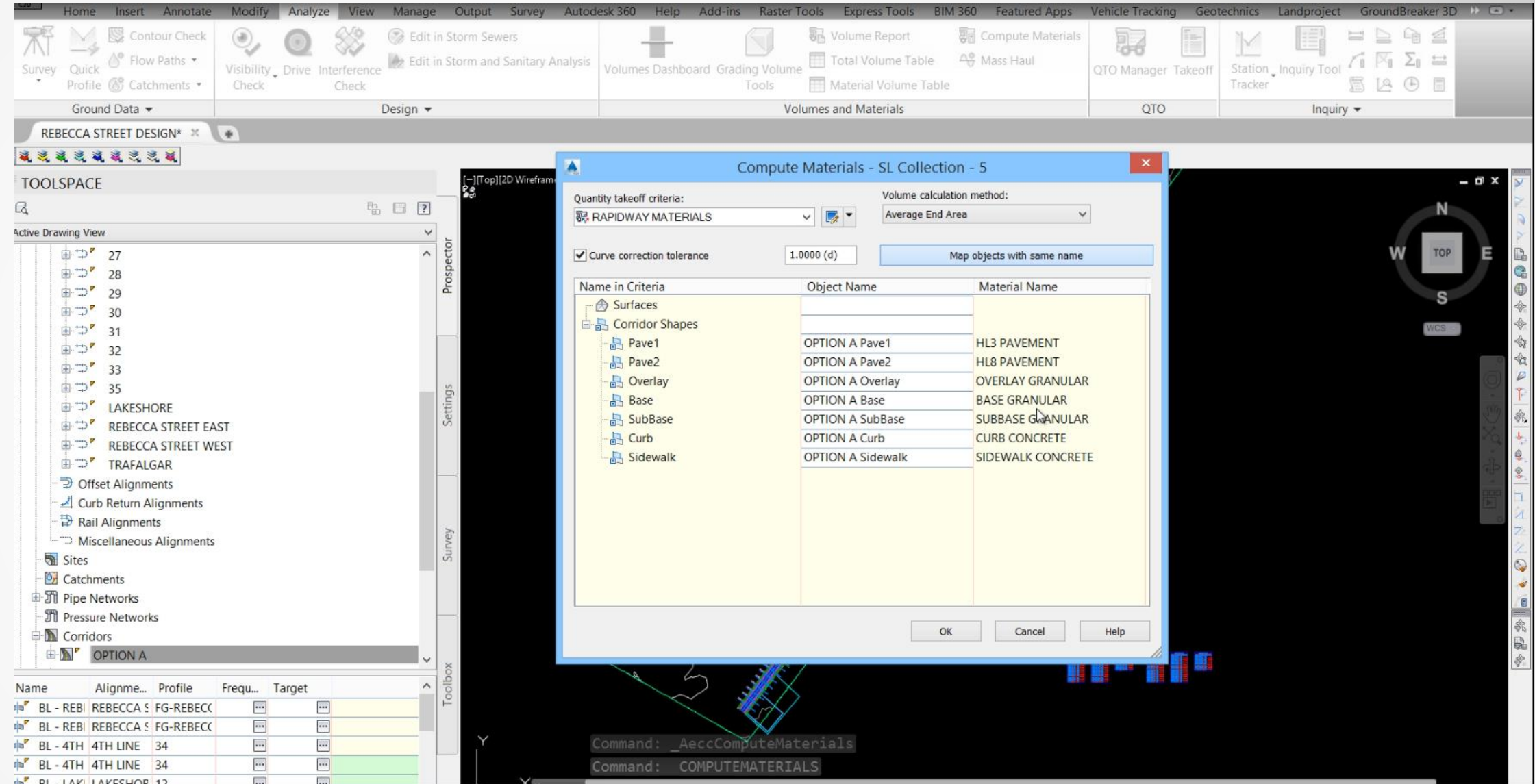






# Extracting Road Corridor Material Quantity

- Use standard Average End Area Volume method to Compute and Report Materials based on Corridor Assembly
- Export Material Report to XML





Autodesk AutoCAD Civil 3D 2015 REBECCA STREET DESIGN.dwg

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Survey Quick Profile Catchments Contour Check Flow Paths Visibility Check Drive Interference Check Edit in Storm Sewers Edit in Storm and Sanitary Analysis Volumes Dashboard Grading Volume Tools Volume Report Total Volume Table Material Volume Table Compute Materials Mass Haul QTO Manager Takeoff Station Inquiry Tool Tracker

REBECCA STREET DESIGN\*

TOOLSPACE

Active Drawing View

- 25
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- 29
- 30
- 31
- 32
- 33
- 35
- LAKESHORE
- REBECCA STREET EAST
- REBECCA STREET WEST
- TRAFALGAR
- Offset Alignments
- Curb Return Alignments
- Rail Alignments
- Miscellaneous Alignments
- Sites
- Catchments

Prospector Settings Survey

Compute Quantities for Road Corridor

BL - 4TH	4TH LINE	34			
BL - 4TH	4TH LINE	34			
BL - LAKI	LAKESHOR	12			

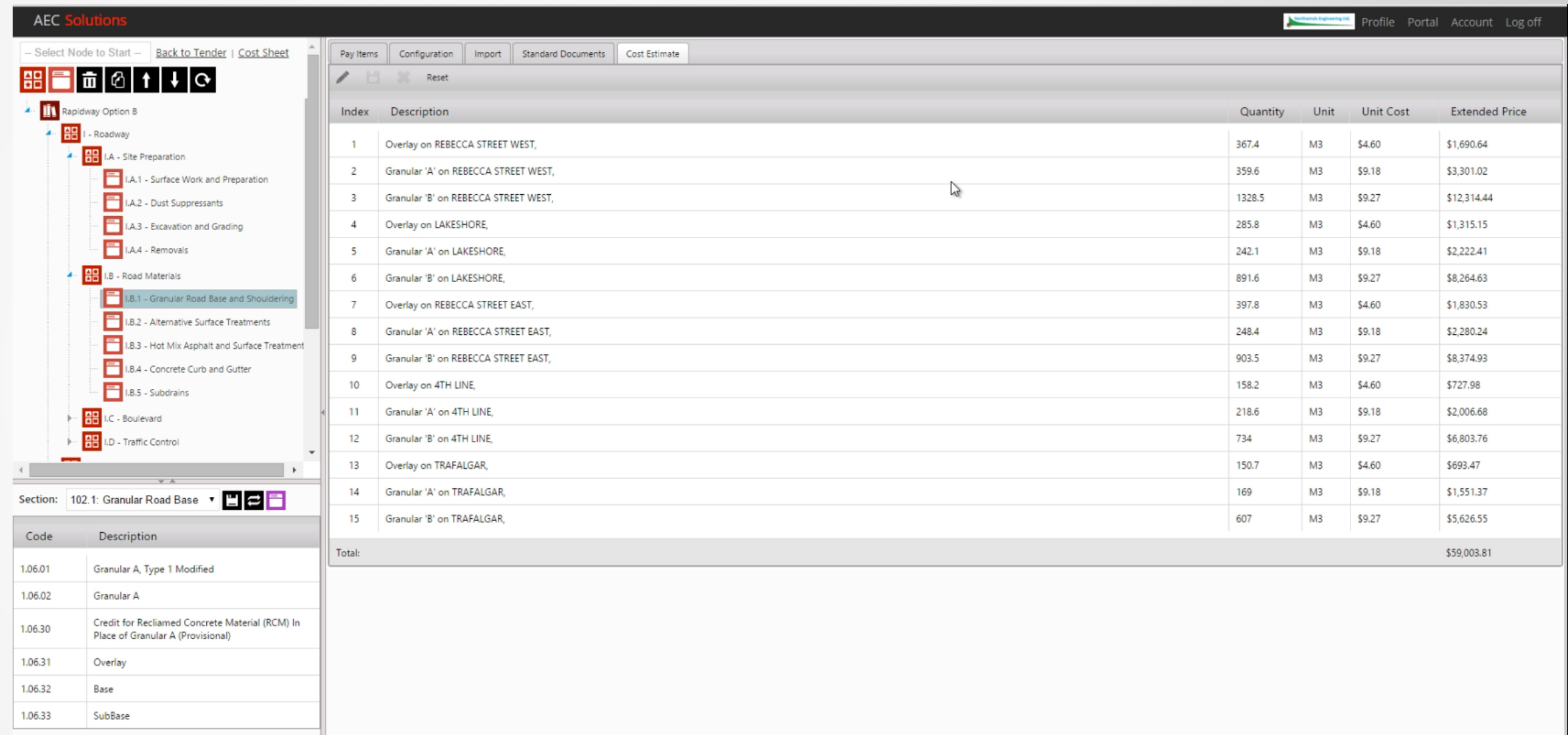
Model Layout1 Layout2

608352.205, 4811094.336, 0.000 MODEL 1:500 Civil 3D



# Detailed Cost Estimate using Detailed Design Takeoffs and AEC Tender Data Import from CSV

- Clear Concept Data from Tender Tables
- Import Actual Quantity Takeoff Data from Civil 3D
- Cost Estimates are performed in Real-time



The screenshot displays the AEC Solutions software interface. On the left, a tree view shows the project structure under 'Rapidway Option B', including sections for Roadway, Site Preparation, Road Materials, and Boulevard/Traffic Control. The 'Section: 102.1: Granular Road Base' is selected. The main area shows a table with 15 items, each with a description, quantity, unit, unit cost, and extended price. The total cost is \$59,003.81.

Index	Description	Quantity	Unit	Unit Cost	Extended Price
1	Overlay on REBECCA STREET WEST,	367.4	M3	\$4.60	\$1,690.64
2	Granular 'A' on REBECCA STREET WEST,	359.6	M3	\$9.18	\$3,301.02
3	Granular 'B' on REBECCA STREET WEST,	1328.5	M3	\$9.27	\$12,314.44
4	Overlay on LAKESHORE,	285.8	M3	\$4.60	\$1,315.15
5	Granular 'A' on LAKESHORE,	242.1	M3	\$9.18	\$2,222.41
6	Granular 'B' on LAKESHORE,	891.6	M3	\$9.27	\$8,264.63
7	Overlay on REBECCA STREET EAST,	397.8	M3	\$4.60	\$1,830.53
8	Granular 'A' on REBECCA STREET EAST,	248.4	M3	\$9.18	\$2,280.24
9	Granular 'B' on REBECCA STREET EAST,	903.5	M3	\$9.27	\$8,374.93
10	Overlay on 4TH LINE,	158.2	M3	\$4.60	\$727.98
11	Granular 'A' on 4TH LINE,	218.6	M3	\$9.18	\$2,006.68
12	Granular 'B' on 4TH LINE,	734	M3	\$9.27	\$6,803.76
13	Overlay on TRAFALGAR,	150.7	M3	\$4.60	\$693.47
14	Granular 'A' on TRAFALGAR,	169	M3	\$9.18	\$1,551.37
15	Granular 'B' on TRAFALGAR,	607	M3	\$9.27	\$5,626.55
Total:					\$59,003.81



Tender Portal - AEC x Standards Catalog M x Lookup Lists - AEC S x

aecolutions.ca/Tenders?TenderID=219

AEC Solutions

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Transportation

Oakville Rapidway

Rapidway Option A

Rapidway Option B

Water Resources

Proposals

Ungrouped Projects

Personal

Project: Oakville Rapidway

Tender: Rapidway Option A

Closing: 12/24/2015 2:25:03 AM

Addendum No.: No Addendums

Summary

Section Name	Pay Items	Cost Estimate
I - Roadway		
A - Site Preparation		
1 - Surface Work and Preparation	3	\$20,725.00
2 - Dust Suppressants	1	\$1,500.00
3 - Excavation and Grading	13	\$152,716.00
4 - Removals	13	\$324,581.00
B - Road Materials		
1 - Granular Road Base and Shouldering	15	\$62,126.44
2 - Alternative Surface Treatments	1	\$34,907.58
3 - Hot Mix Asphalt and Surface Treatments	10	\$0.00
4 - Concrete Curb and Gutter	5	\$504,816.17
5 - Subdrains	5	\$387,700.00
C - Boulevard		
1 - Sidewalks	3	\$155,100.00
2 - Fencing	9	\$28,260.00
3 - Miscellaneous Concrete	1	\$19,000.00
4 - Sodding and Seeding	4	\$67,975.00
D - Traffic Control		
1 - Pavement Marking and Water Borne Traffic Paint	3	\$93,787.50
2 - Pavement Marking Durable Field Reacted Polymeric	2	\$12,750.00

Title/Legal

Spec Docs

Drawings

Standard Docs

Appendices

Edit Title Page

Edit Legal Docs

Hot Mix Asphal....xlsx

Hot Mix Asphal....xlsx

Hot Mix Asphal....xlsx

Granular Road ....xlsx

Show all downloads...

Edit the Infraworks Cost Estimate with Actual Quantities from AutoCAD Civil 3D Detailed Design



# Export the AEC Tender “Schedule of Unit Pricing” Ready for Contractor Bidding

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Engineering

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Land Development

Municipal

Transportation

Oakville Rapidway

Rapidway Option A

Rapidway Option B

Water Resources

Proposals

Ungrouped Projects

Personal

Project: Oakville Rapidway

Tender: Rapidway Option A

Closing: 12/24/2015 2:25:03 AM

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5 - Subdrains	5	\$387,700.00
C - Boulevard		
1 - Sidewalks	3	\$155,100.00
2 - Fencing	2	\$27,620.55
3 - Miscellaneous Concrete	1	\$19,000.00
4 - Sodding and Seeding	1	\$37,680.86
D - Traffic Control		
1 - Pavement Marking and Water Borne Traffic Paint	1	\$31,186.84
2 - Pavement Marking Durable Field Reacted Polymeric	2	\$12,750.00
3 - Pickup and Install New Traffic Signs	8	\$27,930.00
4 - Guide Rail Systems and Barriers	4	\$69,295.89
5 - Miscellaneous Items	5	\$190,822.00
II - Storm Drainage Sewer		

Title/Legal

Spec Docs

Drawings

Standard Docs

Appendices

Edit Title Page

Edit Legal Docs

Select Completed Tender



# Contact Information

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AU2015: BOOTH #3

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Cell: 289-928-8676

YouTube: [www.youtube.com/user/aecsolutionsinc](http://www.youtube.com/user/aecsolutionsinc)

Videos for this Presentation:

[www.screencast.com/users/aecsolutions](http://www.screencast.com/users/aecsolutions)



