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Pennsylvania Department of Transportation
Highway Administration

Bentley SYNCHRO User Guide

Version 2
July 27, 2024

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Revision History

Revision	Revised by	Revision Date
Update language and graphics for new SYNCHRO application	HDR	July 12, 2024

CHAPTER 1. Introduction

Overview of the Digital Delivery Directive 2025

In 2019, PennDOT issued a directive stating that by 2025, projects will have the ability to be designed, constructed, bid, and archived digitally, instead of relying on 2D, static plan sheets and other disconnected documentation. Recent advances in technology provide the opportunities to use 2D and 3D models to advance the Department's e-Construction efforts and start the migration to a digital construction business model. As part of the directive, PennDOT is conducting a series of pilot projects to test and develop the new technology and methods in using digital delivery for every aspect of the project lifecycle. Construction field teams will use the pilot projects to perform field inspection utilizing 3D model-viewing software instead of using traditional 2D plans and cross sections, with the intent to fully integrate these types of technologies.

Purpose for SYNCHRO™ Training

It is important for construction project teams to have the proper tools and guidance to perform their duties in a model-based environment. This Guide provides instructions to assist construction teams in modifying current workflows to be able to realize the potential of digital delivery on PennDOT projects. This document will answer questions such as:

- What tools and technologies are available to access model-based deliverables?
- If I am not getting traditional plan sets and cross sections, what exactly am I getting and how do I interact with it for inspection and management of the project?
- What are the roles & responsibilities for digital construction and inspection?

The focus of this document is to provide "how-to" instructions on accessing SYNCHRO Control and downloading the mobile application SYNCHRO Field from the PennDOT Apple Store, accessing project data from plan sheets to the model, interrogating the model, plan markups, and documenting progress and issues within a digital environment.

Organization of This Document

The PennDOT SYNCHRO Training Manual is organized in a manner that introduces the user to the basic functions of SYNCHRO Field, then covers various markup tools, followed by more detailed investigation of the project model. After the user has completed the course, they should be able to:

- Install and log into SYNCHRO Field and open a SYNCHRO Project.
- Navigate to, open, review, and markup various project documents.
- Access the project model(s) and perform various types of measurements.
- Create profiles and cross sections as needed and perform measurements.
- Create, review, and assign various forms such as a PSA or RFI to others.
- Access SYNCHRO Control for additional functionality.
- Inspect a bridge model based on upcoming PennDOT pilot project expectations.

SYNCHRO Field™ – Mobile Application

SYNCHRO Field™[1] is a solution, provided by Bentley Systems, for performing project inspection using digital information. This solution enables the construction inspector and contractor to access and view project 3D models and PDFs either online or offline via an Apple iPad Pro. It also provides forms for Daily Logs (a.k.a. Project Site Activity [PSA] reports in PennDOT terminology), Requests for Information (RFIs), observations, and issue tracking. SYNCHRO Field also allows you to perform measurements such as:

- distance
- areas
- angles
- point location (northing, easting and elevation)
- station-offset and,
- slope between points or objects.

Perpendicular cross-sections can be viewed at any specified interval along any linear feature of the project. This feature provides access to more information than traditional, sheet based, cross section at a set interval. Two point cross sections or, linear sections, can be viewed along pipes, culvers and wall alignments.

SYNCHRO provides geospatial positioning of the project based on the 3D design model. The inspector can view their current position relative to each element of the project model. Much of SYNCHRO Field can be preset for ease of access by field staff. Saved Views and preset visualization options assist in displaying pertinent information in a manner that is intuitive for inspection tasks. This workshop will focus on navigating within the application while performing these activities.

SYNCHRO Control™ – Web Browser Application

SYNCHRO Control is a web-based software that provides more robust functionality than its SYNCHRO Field companion application. SYNCHRO Control is intended for office use by Contractors and DOT Construction managers, such as the Resident Engineer (RE) and ACE. It is through this interface, the RE and ACE will create, review, and approve PSAs, RFIs, issues, etc. that are submitted by the inspection staff or Contractor. The user can also access the model and view various 3D aspects, along with profiles and cross sections. The user can also access project PDFs and other documents. The main difference as it relates to this training manual is that Control is web-based instead of a mobile application and provides more functionality at this time for reviewing cross sections, which we will cover in this training course.

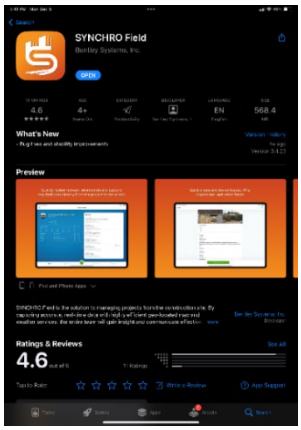
[1] SYNCHRO Field™ and all subsequent SYNCHRO products and the screenshots used within this document are the registered trademark of Bentley Systems, Inc. and are used with permission.

CHAPTER 2. Initial Setup

Accessing the SYNCHRO Field Application

SYNCHRO Field can be downloaded from the PennDOT App Store. This section provides step-by-step instructions for setting up SYNCHRO Field on a PennDOT issued iPad.

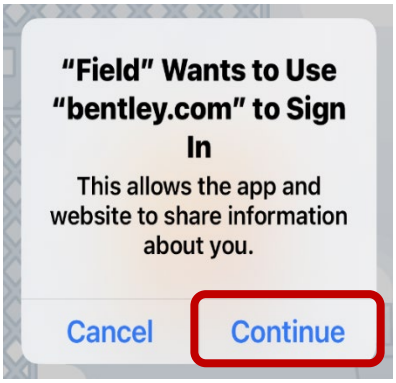
1. Obtain your Bentley credentials from the PennDOT 3D2025 Digital Delivery Section: RA-PDDigitalDelivery@pa.gov
2. Download and install the SYNCHRO Field app from the PennDOT App Store.



Once you have installed the SYNCHRO Field Application, tap on the icon to open the app. You will see a log-in screen as shown below.

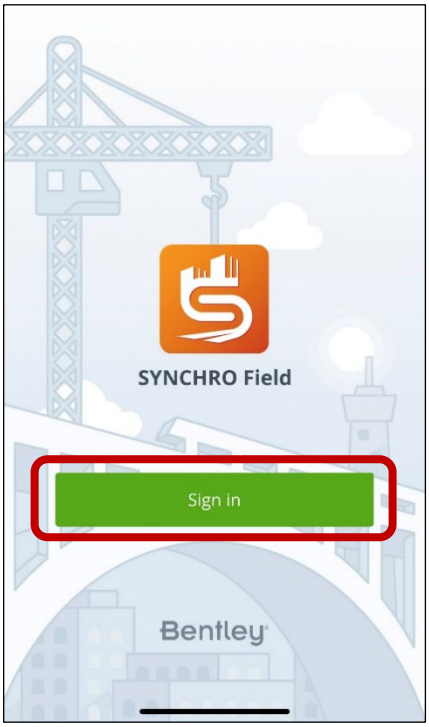
Logging Into SYNCHRO Field

3. Select the Sign In button. The app may ask you "Field" Wants to Use "Bentley.com" to Sign In, select "Continue".
4. Log in using your previously created Bentley account credentials you received from the PDDigitalDelivery, typically your work email for username.



5. After the initial login, you most likely will stay logged in, even if you close the application.

6. For assistance with Bentley SYNCHRO login issues, contact the Digital Delivery Section.

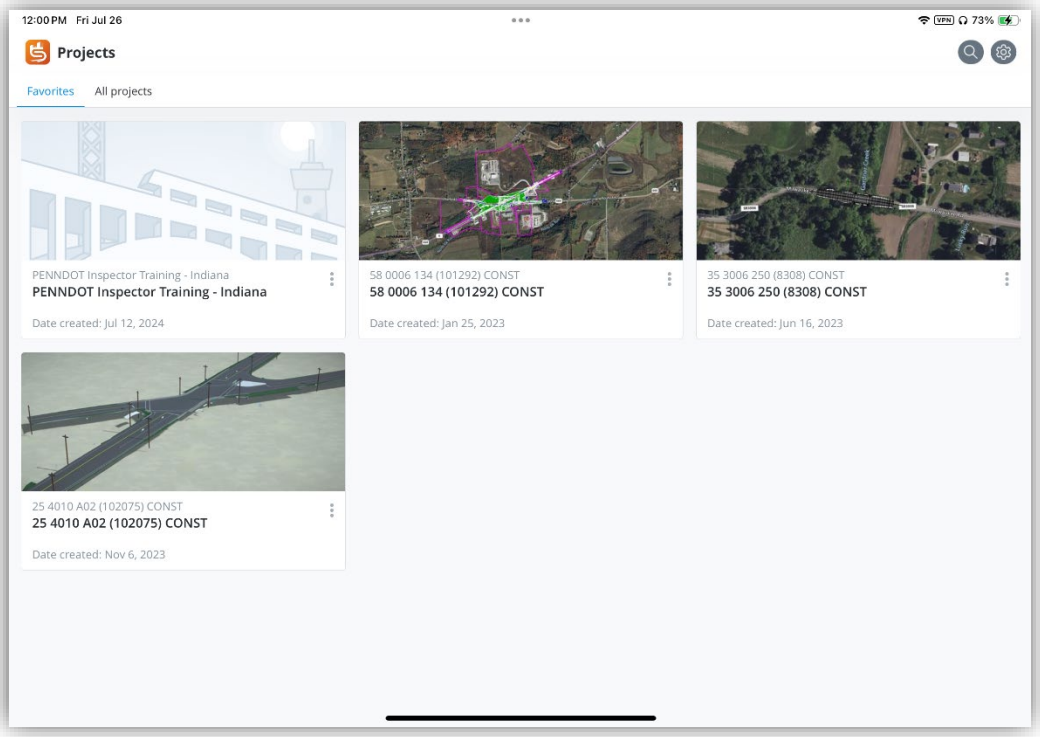


CHAPTER 3. Overview of SYNCHRO Field

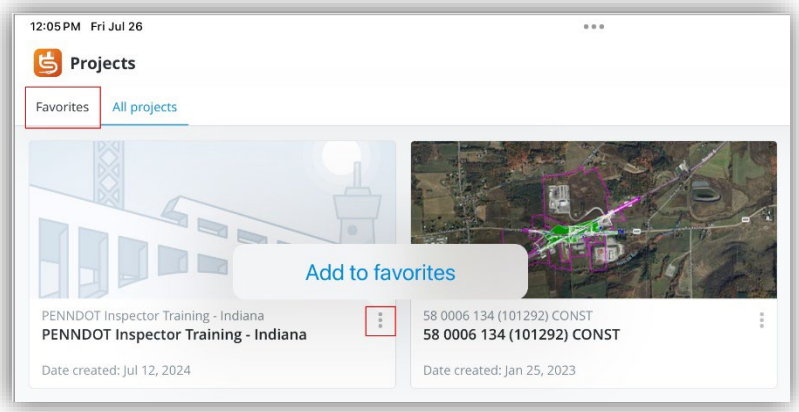
This chapter will cover the interface of SYNCHRO Field to prepare you for using the application in later chapters.

SYNCHRO Field Interface

After logging in, you will see the home screen showing projects that you have been added to. This Guide will focus on the PennDOT Inspector Training - Indiana exclusively. The workflows and techniques in the Guide apply to any SYNCHRO project you are assigned to.

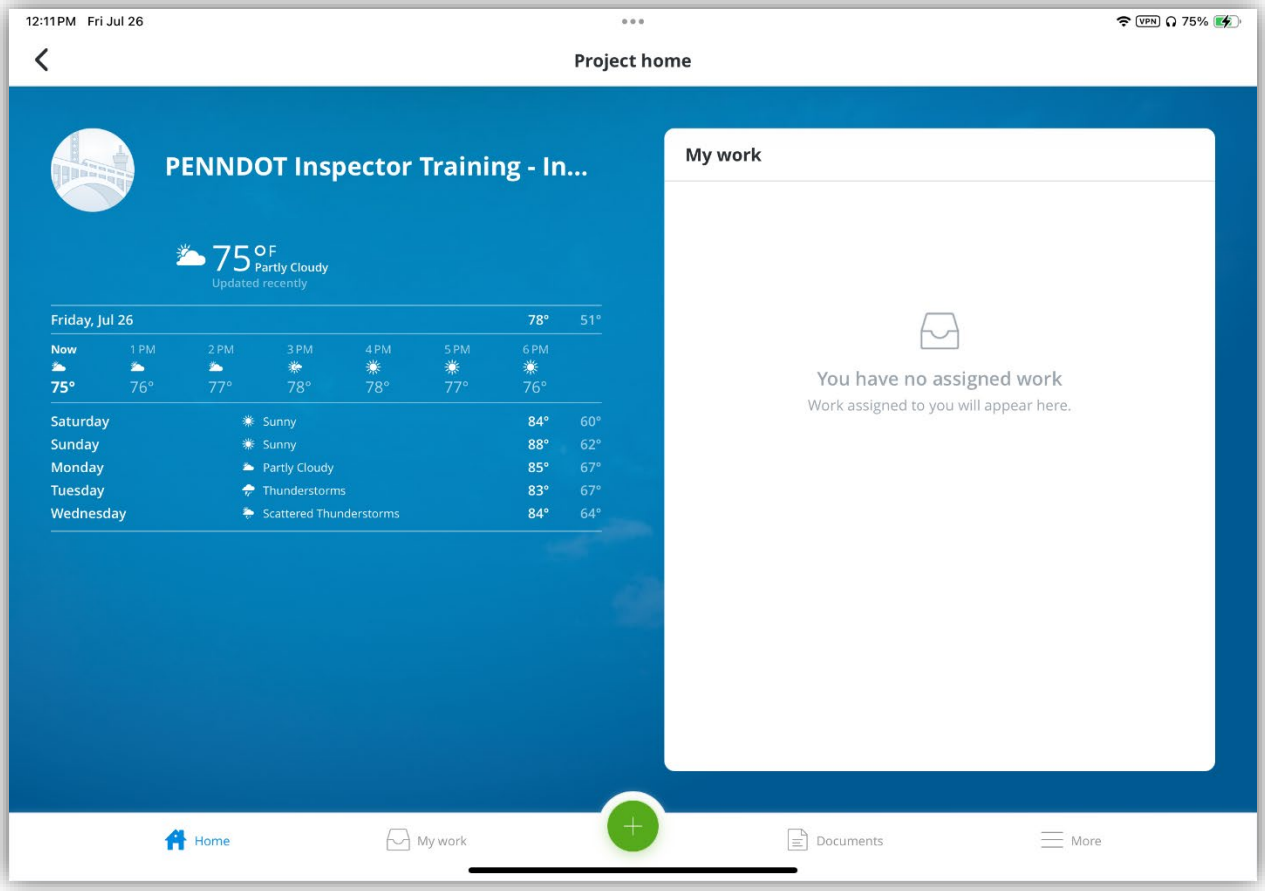


Tapping on a project will open your project's Home screen. You can add a project to your Favorites by tapping the vertical ellipsis/ellipsis menu (3 dots) in the lower right of the project icon.



The default SYNCHRO Field view should have a weather report in the left pane and My Work on the right. The My Work section is a list of tasks showing status of work that has been assigned to you.

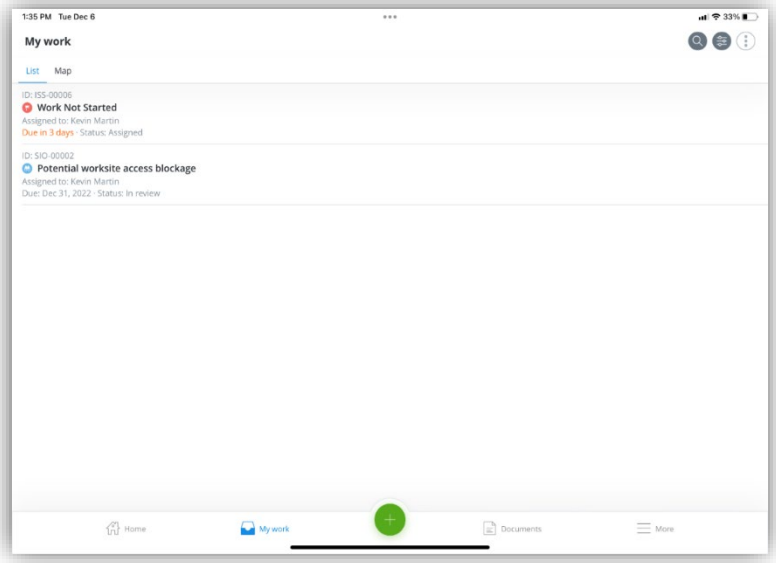
The weather forecast is tied to the project's location, by latitude and longitude, and is retrieving real time local weather data. The menu along the top of the application allows you to return to the previous window by tapping the < symbol in the upper left of the screen.



The bottom menu bar gives access to the SYNCHRO Field screens of Home, My Work, Documents, and More. The green button in the middle of the bar provides access to creating project specific forms that we will be discuss later in the Guide.

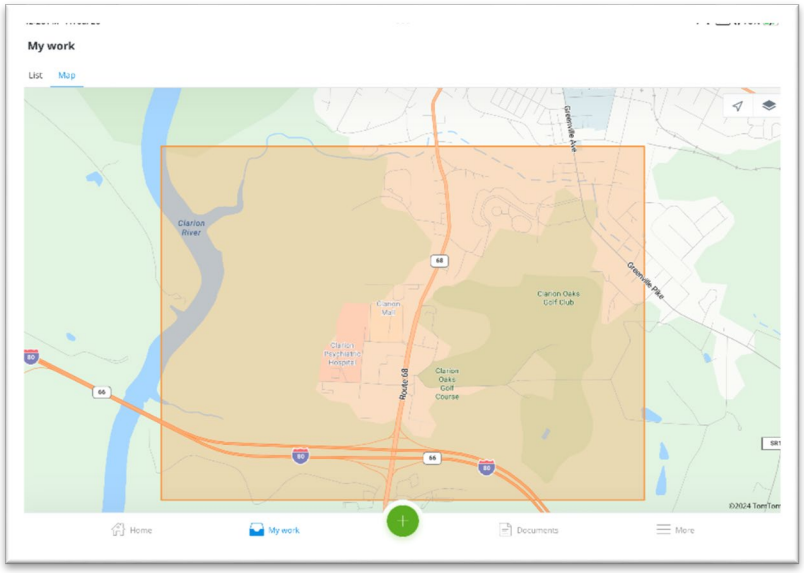
My Work

In the My Work panel, all tasks currently assigned to you are displayed. You should see tasks that have been created for the sandbox project. Once you engage in your active project, you will not see anything until an actual task has been created for you.



NOTE: The use of these work tasks and logs are not required for the initial pilot projects. However, we strongly encourage you to try different workflows and provide feedback to the 3D2025 team on the ease of use and how intuitive and valuable this can be within the SYNCHRO environment.

The user will have two means of accessing the My Work list: Map and List View. The previous screenshots depict the List view. Below is the Map view showing the same tasks from the List view. Note that in the screenshot below, the Issue has been selected, bringing up the floating information bubble. This is displayed only for the task selected at the time when using the Map view. The user can tap on the icons to bring up their respective information bubble.

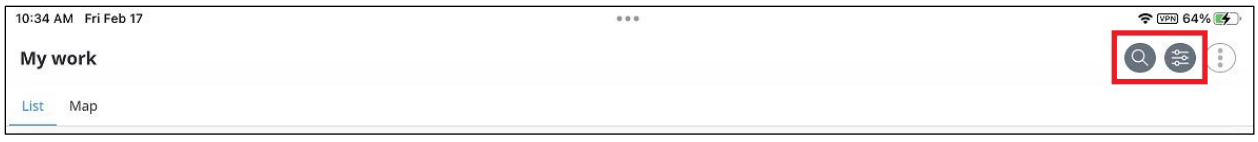


The shaded rectangle shown in the screenshot above is set up by the project administrator to delineate the general footprint of the project with a geofence. Note that it does incorporate more area than the actual project, but that does not matter for any of the work that you will be doing in the SYNCHRO Field application.

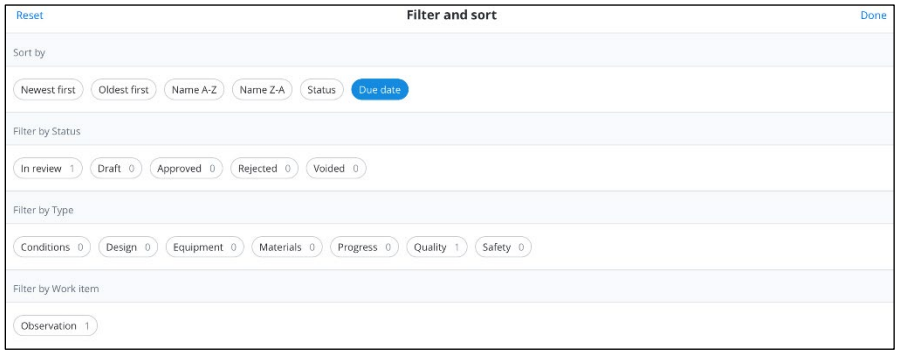
Tasks are listed and individually tagged with the due date. Tasks fall into the following six categories:

 Observation	**Observations**	Record of specific observations, i.e., documenting contractor surveyor's elevations on a bridge component.
 Issue	**Issues**	Logged site related issues, assign responsible party for prioritization of resolution.
 Photograph	**Photograph**	Record and locate site photos on the map and model
 PSA	**PSA**	Record Project Site Activity per PennDOT requirements.
 RFI	**RFI**	Record contractor Requests for Information and assign reviewers and approvers.
 Daily Log	**Daily Log**	Record you daily activities

Filters and sorting can be accessed via the two icons in the upper right of the screen.



There are several ways to filter work tasks. You can explore various ways of filtering now before moving to the next page.

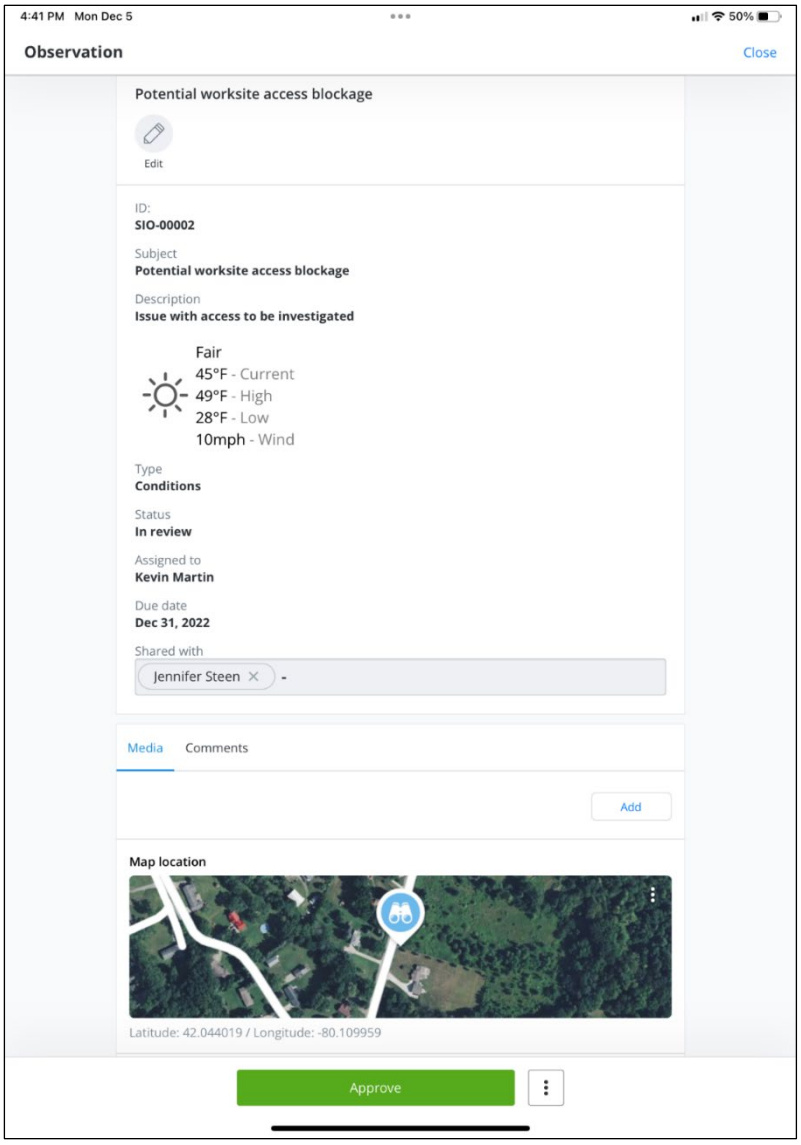


NOTE: The only way to differentiate each task in My Work without a filter is by the very tiny icon in front of the work title.

Assigned Tasks

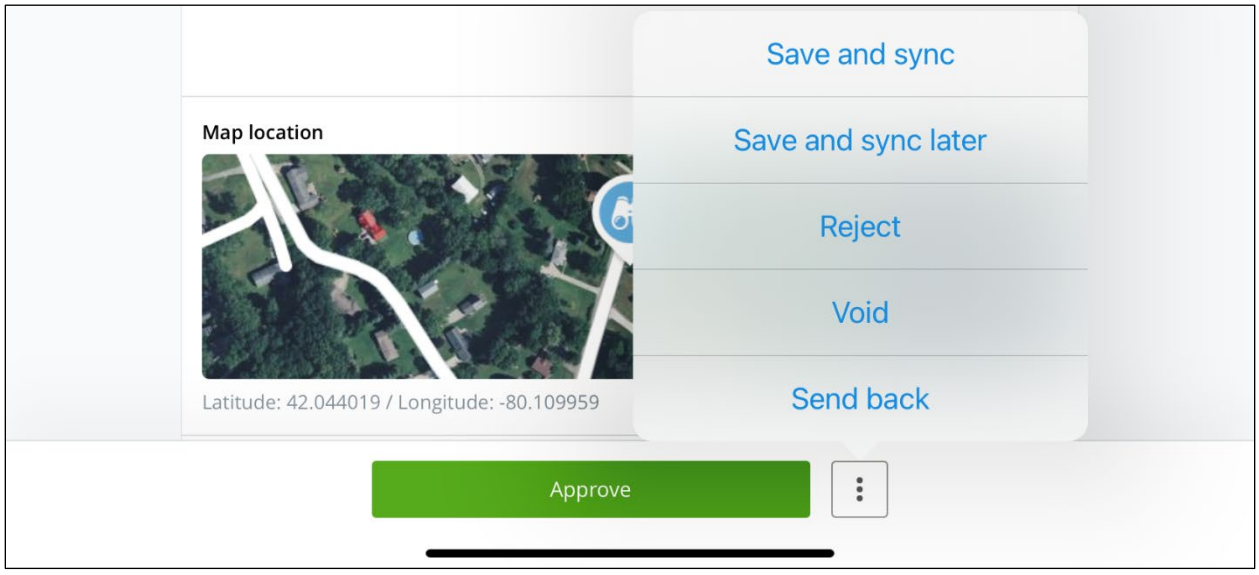
From the My Work list, you can select any assigned work items to review, edit, and/or approve. Let us look at an example of an Observation form that was created previously.

- **ID:** unique identifier auto generated by SYNCHRO.
- **Subject and Description**: user-created inputs to organize and inform about the issue.
- **Weather:** snapshot of the site weather from the time of the form's creation.
- **Type**: a user-selected pulldown that we will explore in more detail later.
- **Status**: current status of the form, if assigned to someone for review, approval, etc.
- **Assigned To**: selected from a pre-set list based on the configuration of the project and allows you to tag someone to respond to the issue.
- **Due Date**: selected by the record creator as needed.
- **Shared With**: optional field for tagging users assigned to the project, much like CC on email.
- **Media Tab:** tag an image or video file and add comments to better explain any action taken as the task is reviewed and resolved.



The green button along the bottom of the screen will allow you to apply an action to the task. Tapping on the vertical ellipsis menu will provide additional options. The options that you sees will depend on their assigned role and what type of form they are working on.

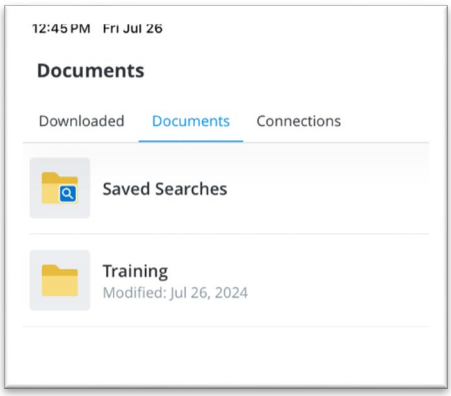
- **Approve:** approves the task.
- **Submit for review:** submits the task for review to the designated reviewer/approver.
- **Save and sync:** saves your progress and syncs the work to the cloud.
- **Save and sync later:** saves without syncing to the cloud.
- **Send Back:** sends the task back to the original submitter without rejecting it.
- **Reject:** rejects the task.
- **Void:** cancels your current actions and resets the form. Officially tracks the action as opposed to canceling or deleting the form.

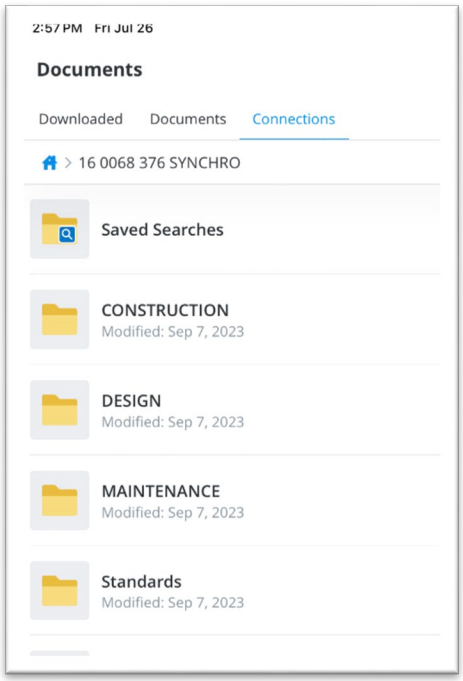


Documents

The Documents section provides access to project documents that can be downloaded to the tablet or accessed “live” via a cellular or WiFi data connection. The Document folder, located in connect.bentley.com, houses the Training folder which has files and videos that can be used during training sessions. The Connections tab shows the link to PennDOT’s on premis ProjectWise where access to the design Common Data Environment (CDE) is achieved. This connection will give you access to project documents, and files.

From the Home or My Work screen, you can tap the Documents button at the bottom of the screen to access a list of folders. Clicking through the folders, you can see documents of various types.

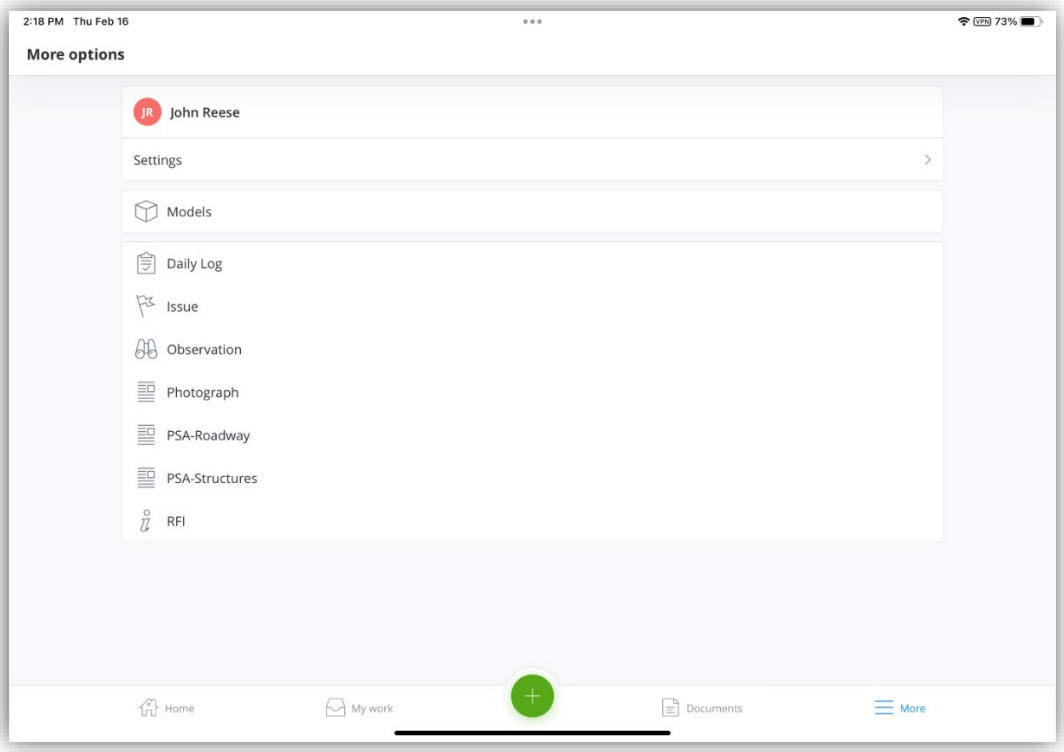




NOTE: PennDOT is discussing a standardized folder structure for Construction. This example list from the sandbox may change as the pilot projects evolve.

More Options

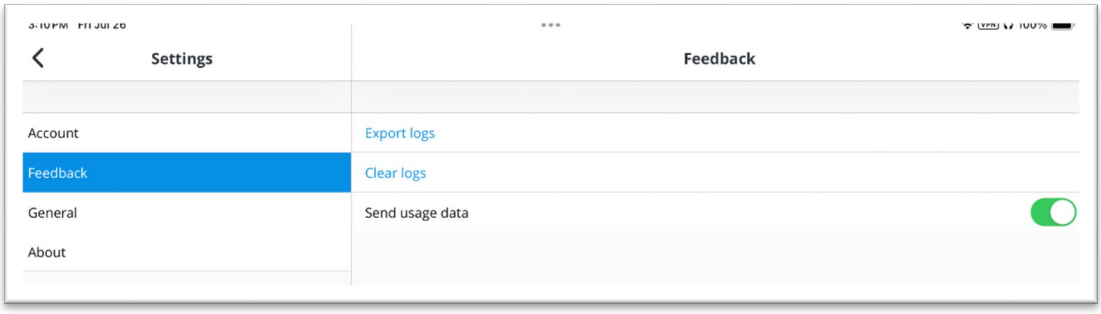
The More Options panel provides access to Settings, Models, and detailed list, by title, of forms that have been created for the project.



Settings

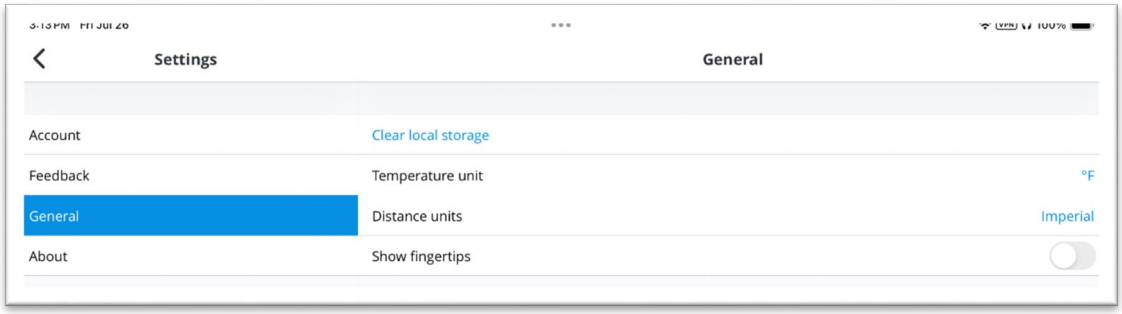
Selecting settings gives you access to:

- Account
  - This allows you to log out of the application
- Feedback
  - Allows you to export logs (de-bug)
  - Clear logs
  - Toggle sending usage data

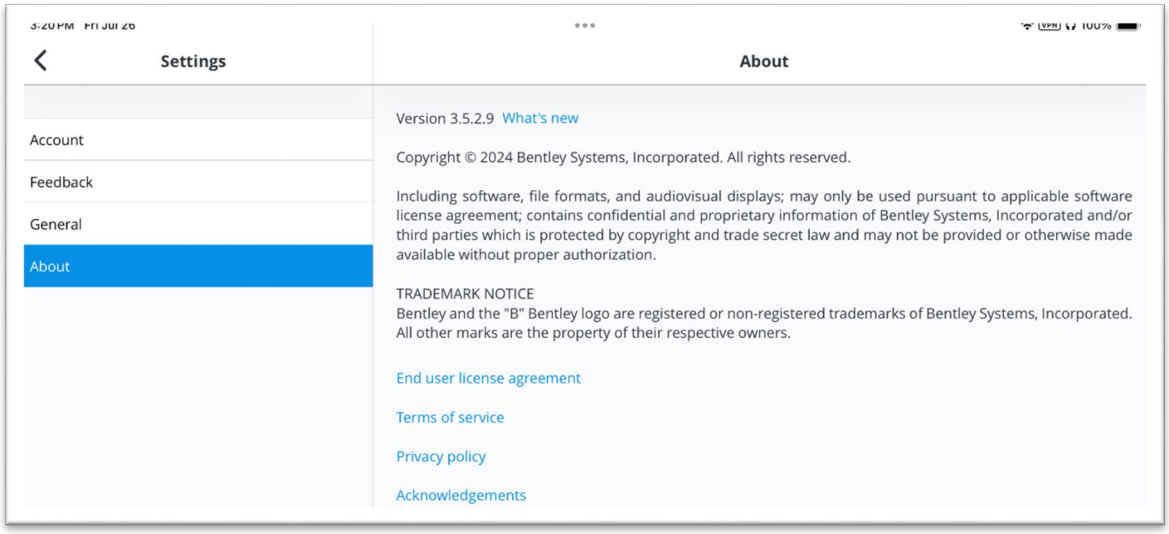


- General, and

- Clear local Storage. (clearing local storage will eliminate and markup you may have completed offline. Make sure to synchronize through the WiFi or cellular prior to clearing.)
- Changing your units, and
- Toggling fingerprints. (fingerprints allows you to see your finger location when sharing your screen in through a projection or online meeting.)

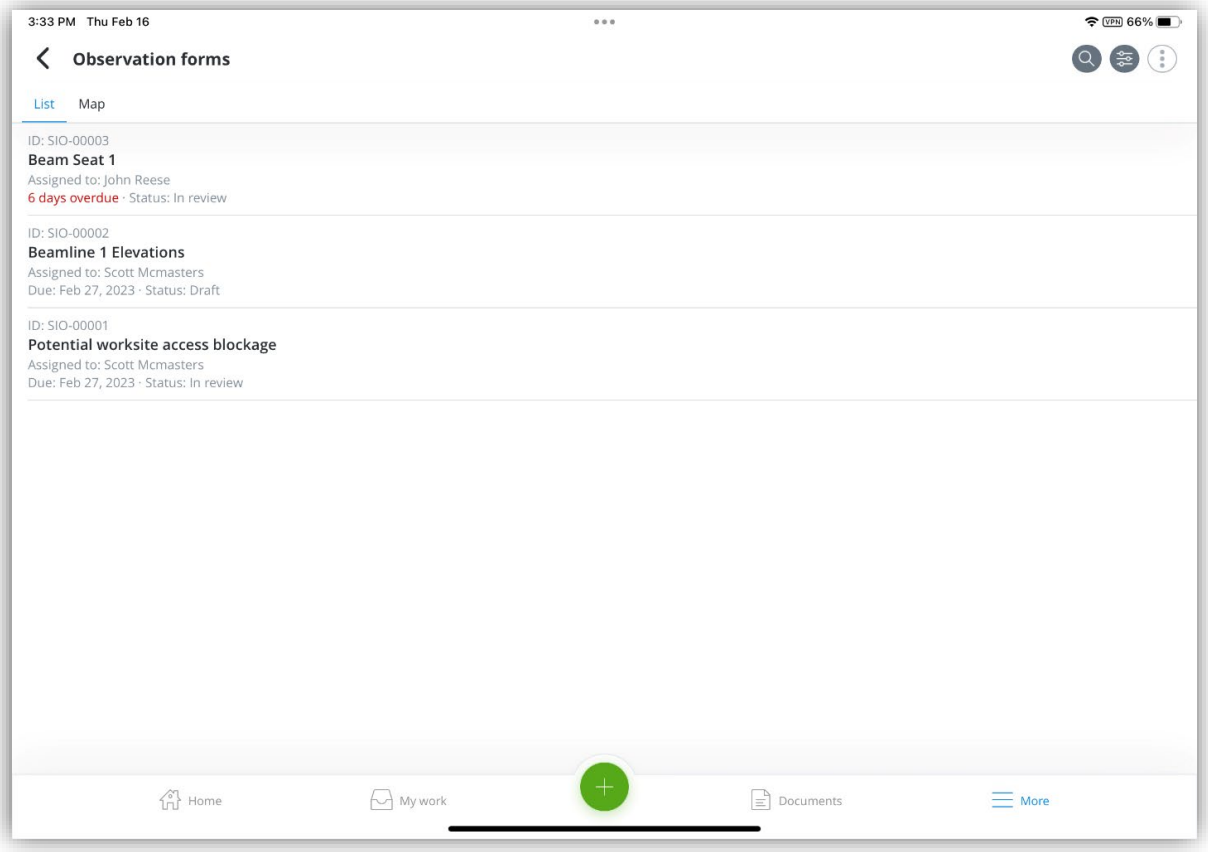


- About



Forms Review by Type

The listing on this screen provides you access to a listing of all forms that have been created for the project by type. You are able to review, edit and comment based on your current credentials. This figure shows the list of Observation forms. All lists are similar to this.

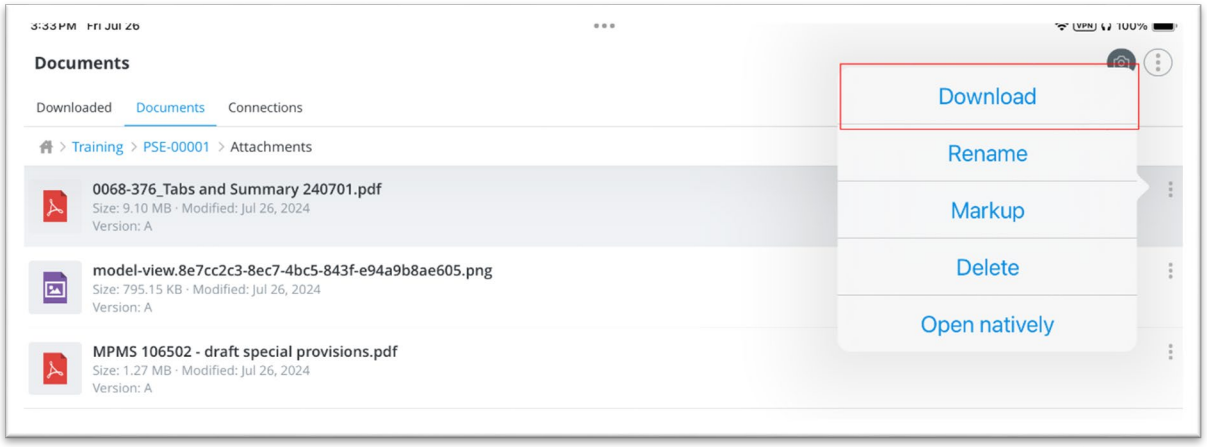


CHAPTER 4. Working with Project Documents

Accessing Project Documents

As discussed in Chapter 3 Documents, you can access project documents via the Documents tab at the bottom of the screen. In this chapter, we will explore the various documents contained within the Inspector Training project and try out its review and markup functionality for PDFs.

Keep in mind that these files are available online and offline. If you will be working in an area without Wi-Fi or reliable cellular service, download all files you plan to access offline to your device prior to going into the field.

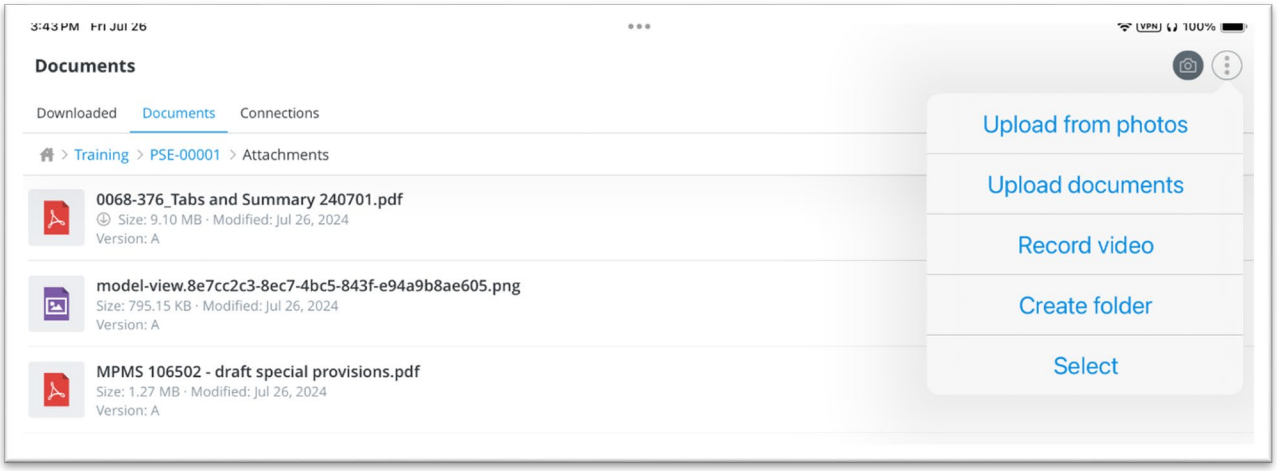


Local files can be accessed through the Downloads tab.

It is important to remember that the files are local to your device and will update the online files when you are able to re-establish an internet connection and re-connected to the Bentley cloud server over cellular or Wi-Fi.

Do not remove or delete local downloaded files from your device until you have re-connected to the SYNCHRO service online and verify that the changes you made in the field have been uploaded.

The user also has various document and folder management abilities from the vertical ellipsis menu in the upper right corner.



As you can see from the screenshot above, tapping on the vertical ellipsis menu allows the user to:

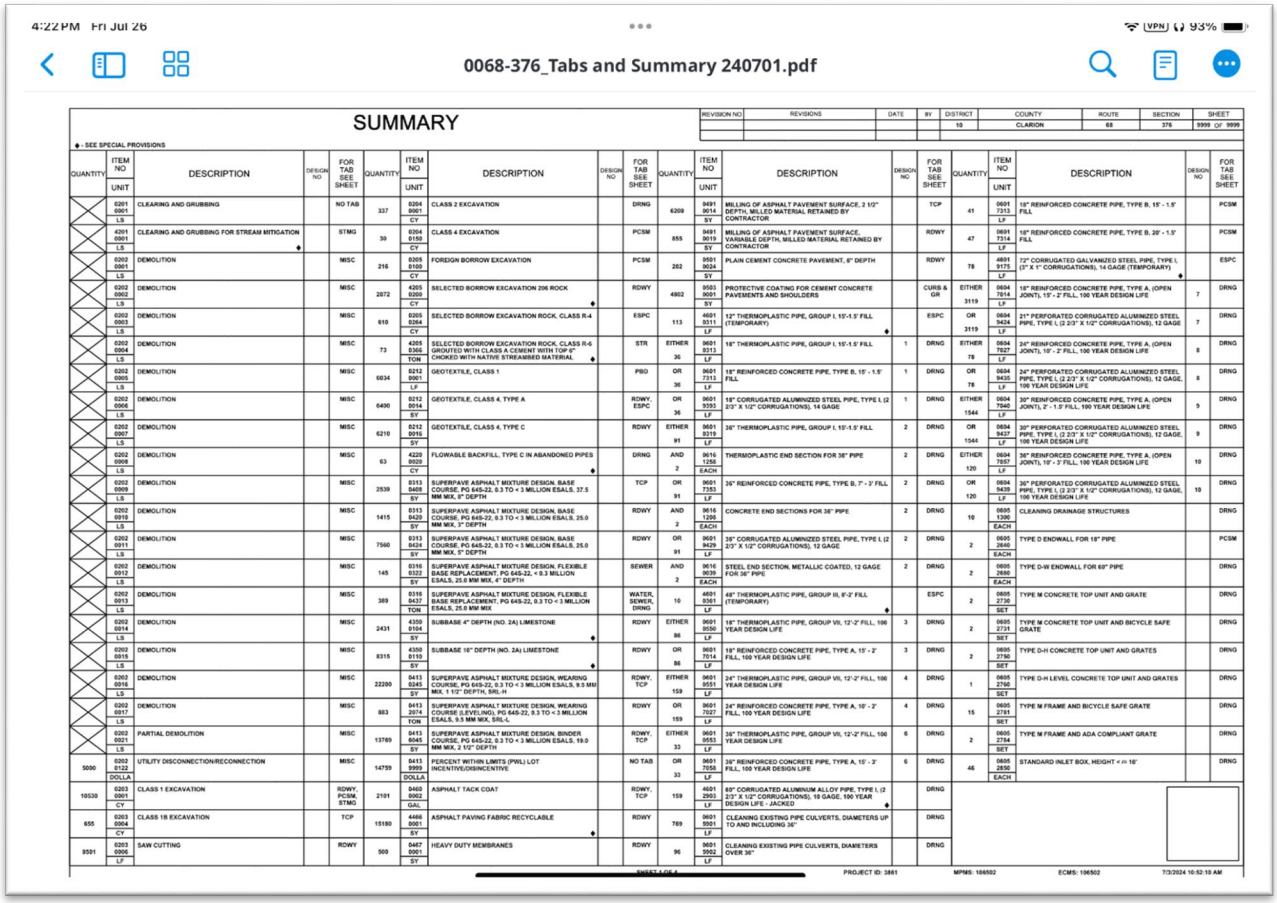
- **Upload from Photos:** upload previously captured photos on the iPad.
- **Upload Documents:** upload documents stored locally on the iPad.
- **Record Video:** activate the camera to record a video. The video will be added to your photos and give you the option to upload it to your devise.
- **Create Folder:** Create and name a custom folder.
- **Select:** allows the user to batch select multiple files and/or folders.

Along with the ability to capture video, the user can tap on the camera icon to the left of the vertical ellipsis menu to directly access the iPad's camera and capture a photo or video to a desired folder.

Opening a PDF

There are two ways to view a PDF in this application. The first is a reader version and the second is the markup version. We will explore both, starting with the reader. Navigate to a Project PDF by selecting Training\PSE-00001.\Attachments. From here you will see the file *0068-376_Tabs and Summary 240701.pdf*. Double tap on the document and it will open in a viewer

Document Viewer Options



The in the ribbon at the top of the view are used navigation.

Navigates you back to the Document page

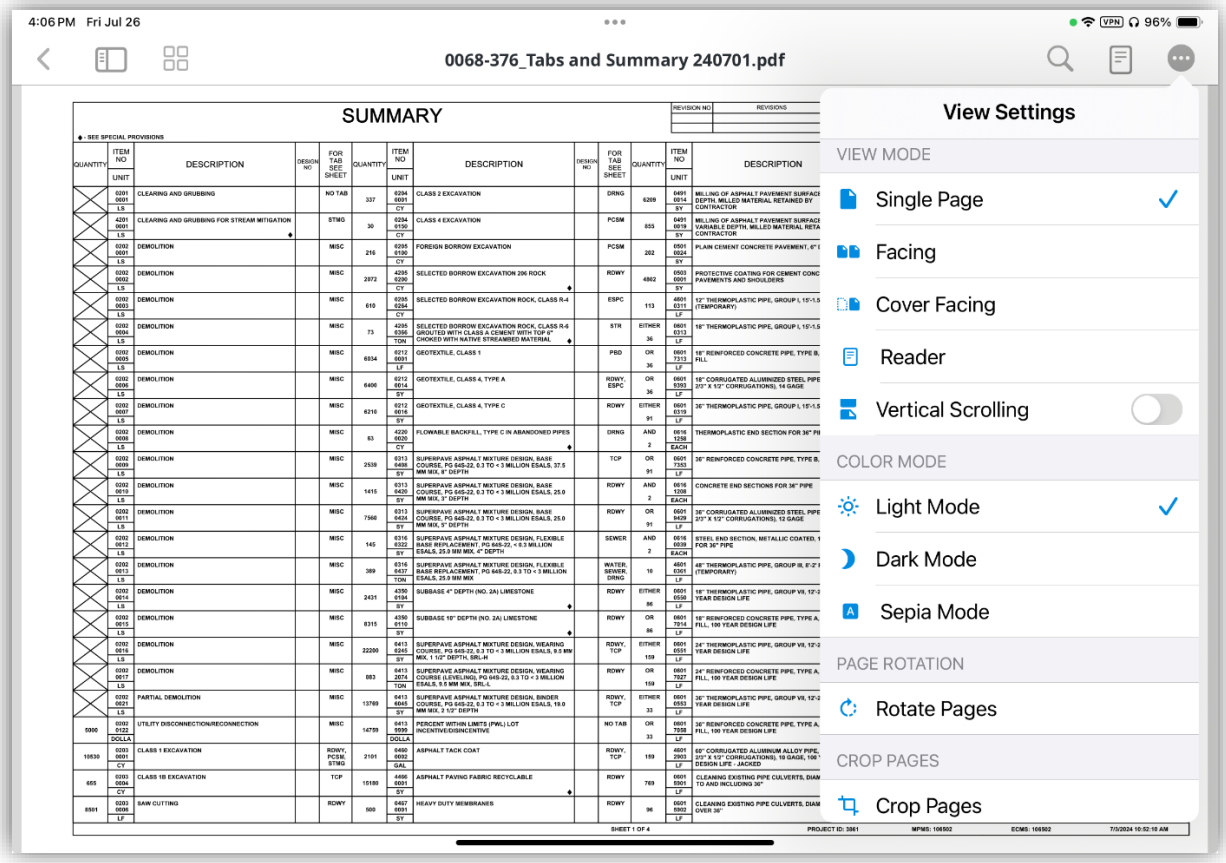
Used to open the side pane to access the Outline, Comments, etc.

Allows you to see individual pages.

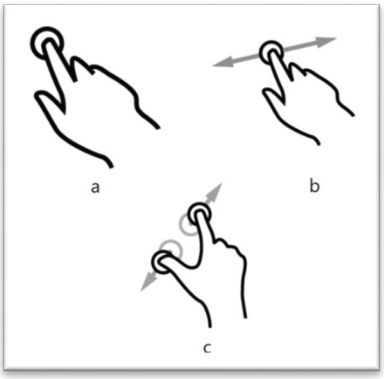
Allows you to search a document for full or partial text.

Reader is not used in this training.

View Settings.

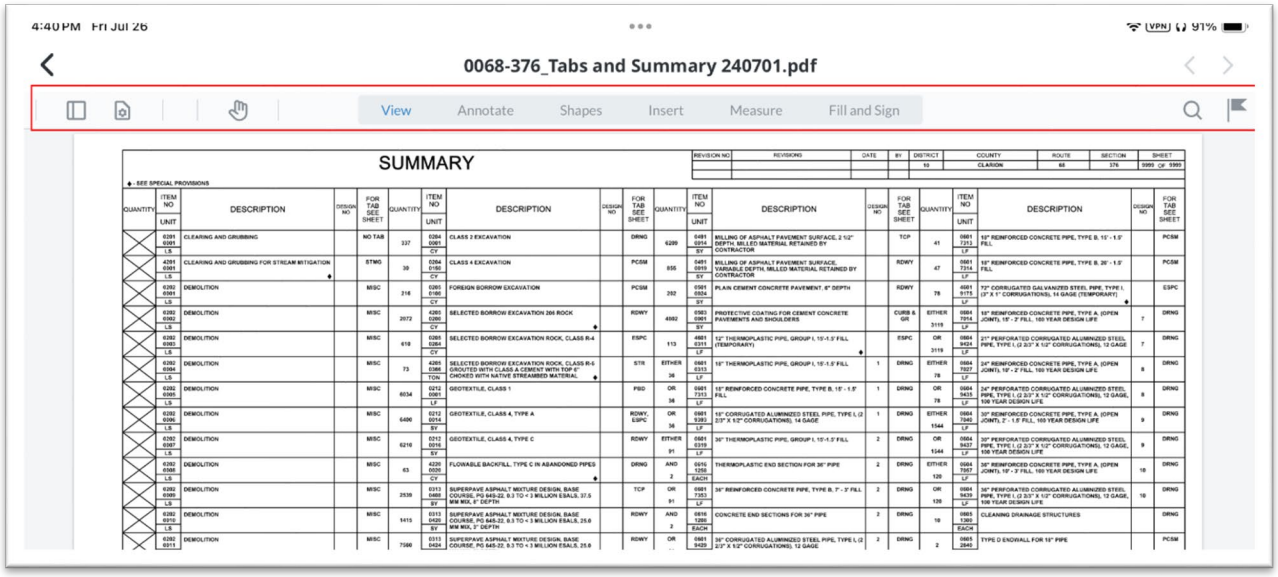


Panning in the PDF is achieved by one finger a. touch and b. drag. Zooming can be accomplished by c. two finger pinch, to zoom in and, spread to zoom out. The gestures are normal to Apple devices.

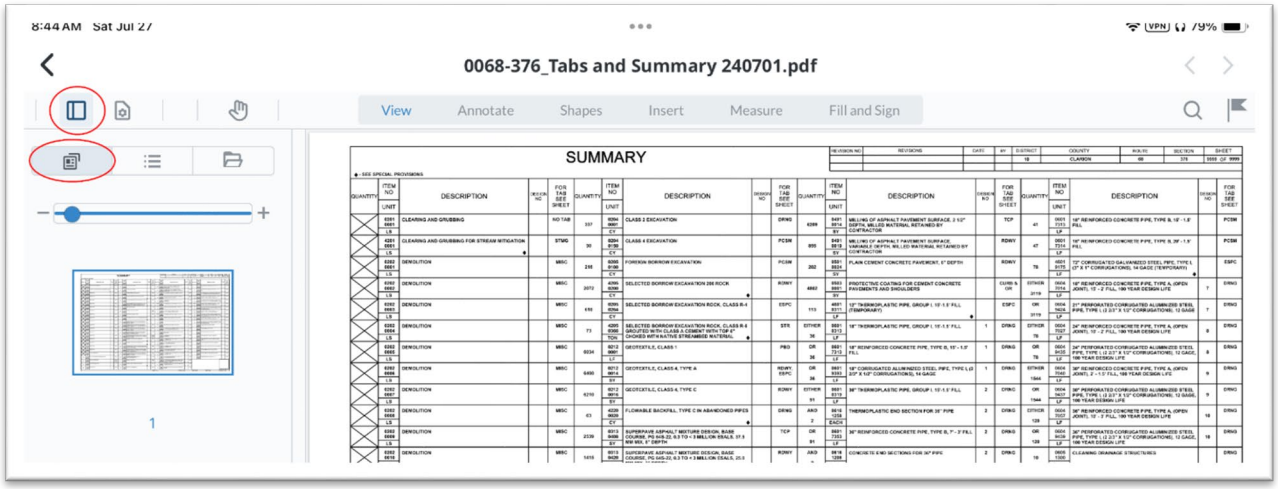


Document Markup Tools

Now we will open the same PDF in the markup viewer. Navigate to the same PDF (Training\PSE-00001.\Attachments. From here you will see the file *0068-376_Tabs and Summary 240701.pdf*).Select the vertical ellipsis menu in the upper right. Select Markup from the list. When the document appears you will see a new set of tools in the top ribbon.



Once the PDF has opened in the View workflow, tap on the icon in the upper left as shown in the screenshot below. This opens the left side pane, displaying the index of pages (similar to PDF bookmarks), as well as Layer/Level control.



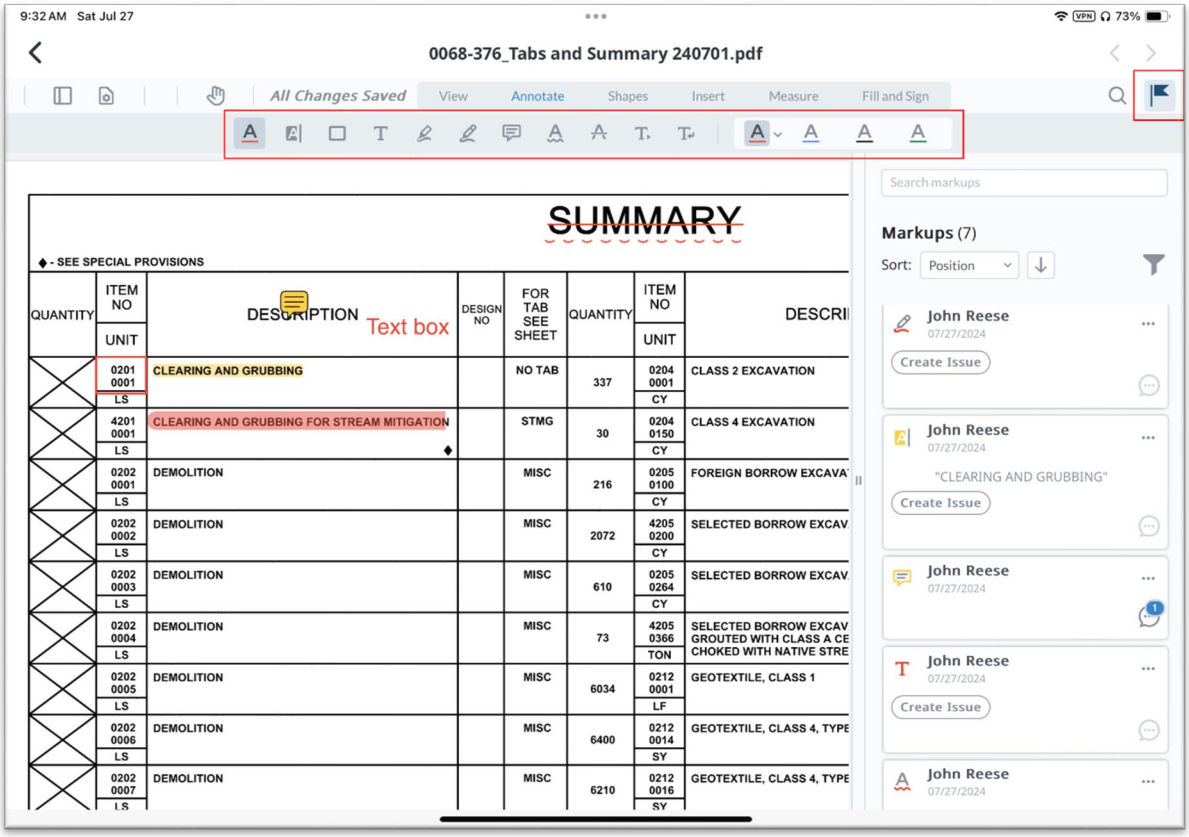
This view allows you to navigate the PDF in various ways, using the index of sheets on the left to select and, allowing you to pan and zoom using your fingers or Apple pencil.

The markup tools are outlined here.

- **View**: Cancels the active command. Use this to halt markup and pan/zoom
- **Annotate:** Provides common markup tools that allow comments/issues, text placement, etc.
- **Shapes:** Provides tools for drawing clouds and other shapes.
- **Insert:** Provides tools for directly adding an issue, photos, or links to documents
- **Measure:** Provides tools for measuring distance, area, etc.

ANNOTATE

The user can access annotation tools to create PDF markups. As shown in the screenshots below, text can be placed in various colors and sizes and flagged as an issue. Alternatively, a comment can be placed that also allows you to create an issue. Each markup and comment can be tracked by the Markup pane on the left that is turned on by selecting the flag icon in the upper right of the view.

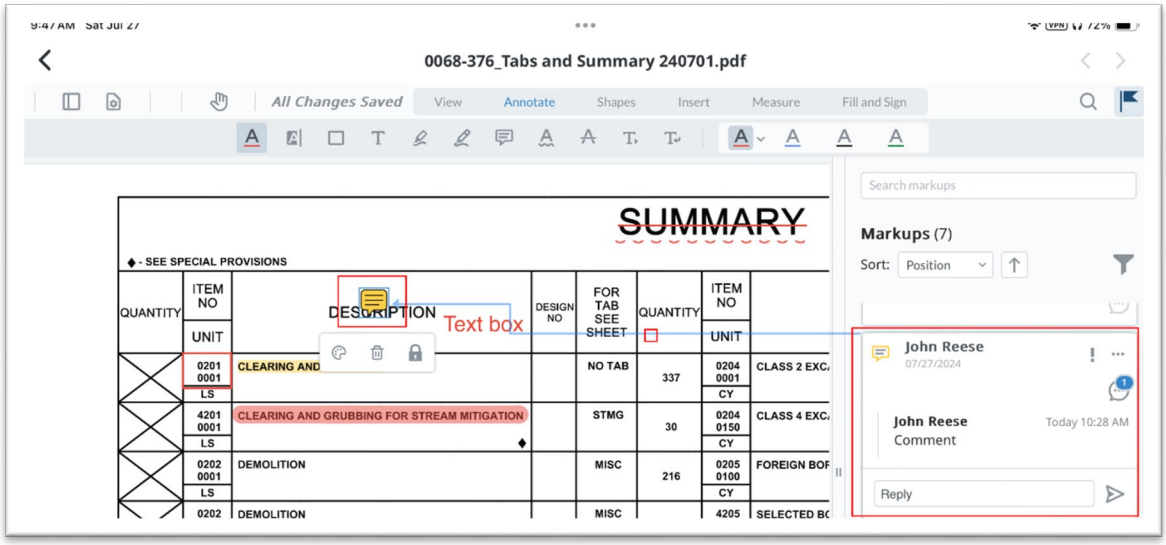


Each markup allows the creation of an issue. The issue form that is filled out in this workflow can be assigned to any role or individual who is participating in this SYNCHRO session.

See Create Issue in Chapter 7.

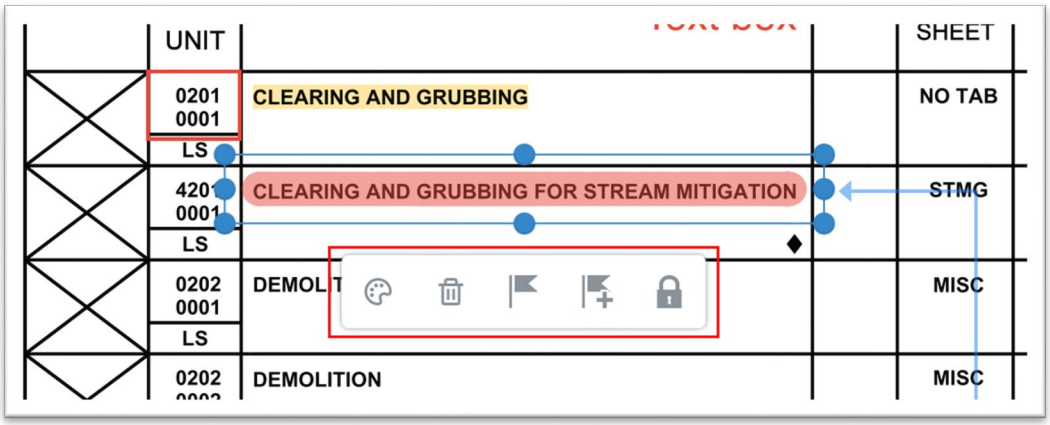
NOTE

The Note tool lets you place a note or comment bubble, as shown below, and add you text in the Markup window on the left. This markup allows individuals to have a conversation but does not provide the option of creating an issue.



Each tool has options that allow you to edit the existing markup, create issues or reference the issue created by another individual.

Tap on any markup and the selection of icons appears below the markup.



The pallet allows you to edit color, line width and, transparency

The trashcan deletes the markup **(Note: once an issue has been created you no longer have the ability to delete the markup.**

The flag provides the creation of an issue. (See Create Issue in CHAPTER 7)

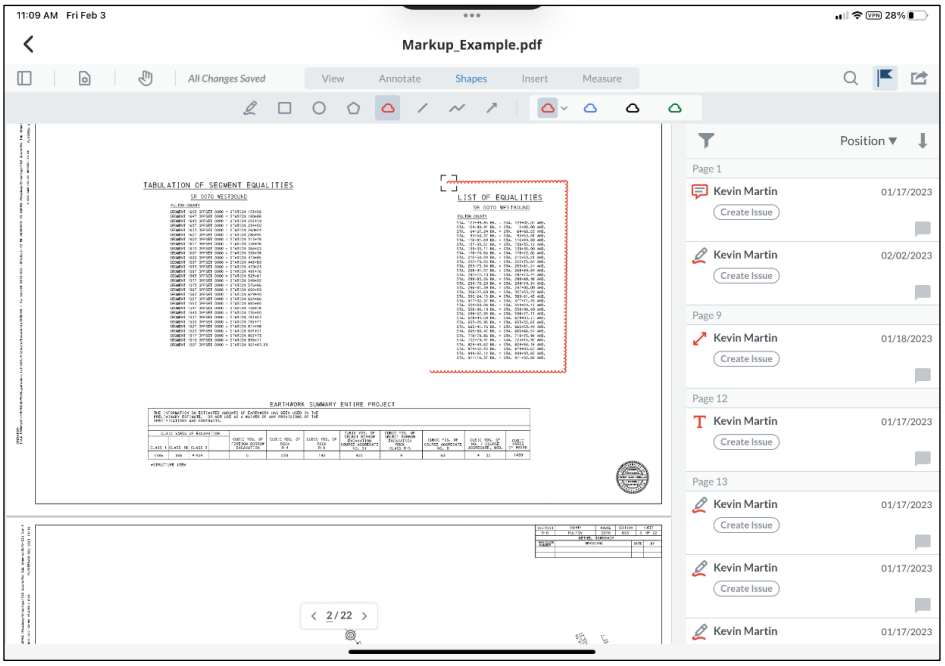
The flag with a plus mark allows you to attach someone's previous issue within your issue.

The lock locks your markup. This is a toggle that allows you to unlock the markup.

SHAPES

The Shapes tool allows you to create various items such as rectangular or circular shapes, along with clouds, lines and leader arrows, as well as freehand drawing. These can also be tagged as an Issue or RFI.

1. Scroll to sheet 2 as shown in the screenshot below and tap on the Shapes button, then the Cloud command.
2. Tap on the screen to start drawing a cloud around the List of Equalities.
3. Drawing a cloud can be a little tricky on the iPad. You will want to tap and hold your finger down to start drawing the first side of the cloud shape. Then drag your finger to the first corner and let off. If you do not stop touching the screen, you will just drag the cloud line around the page. Once you have it located similar to the screenshot below, pull your finger off the screen, then tap the end of the cloud line to continue with the next side.
4. Continue in this manner until you have drawn the three sides as shown below. You will notice a target square appear on the origin point of the cloud. You can then tap the square to close the shape if you wish. If you need to continue to draw cloud sides, you may do so. Then tap the square target to close and accept the cloud shape.

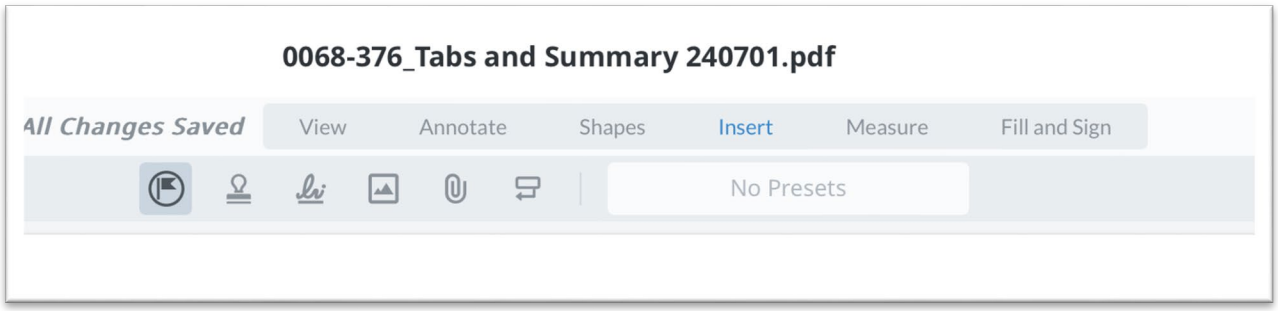


NOTE: you can create an issue from this cloud in the same manner used previously with Freehand Text

.

INSERT

This tools will be used to insert issue forms, stamps, photos and, text boxes. (links and signatures are not used)



Insert an issue form (See Create Issue CHAPTER 7)

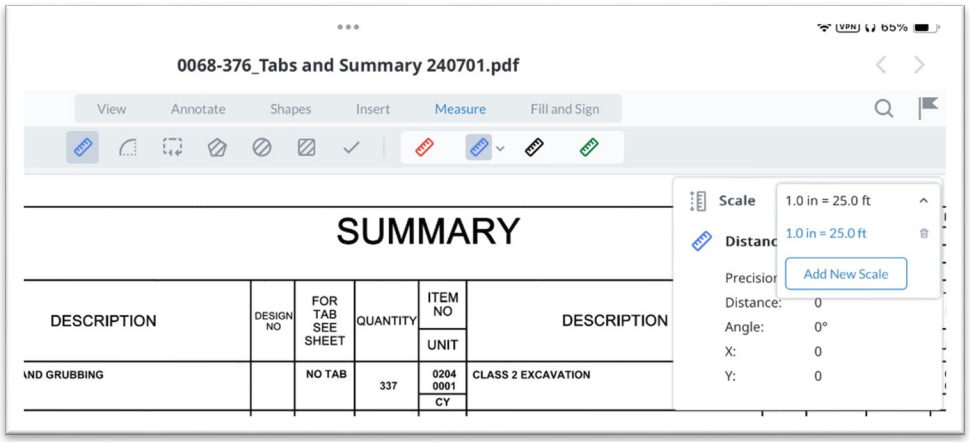
Insert a stamp

Insert a photo

Insert a text box

MEASURE

This tool allows you to set a scale for the measurements you are taking. PennDOT's sheets are normally 1"=25'. New scales can be added in the dialog box on the right.



Distance

Arc

Perimeter

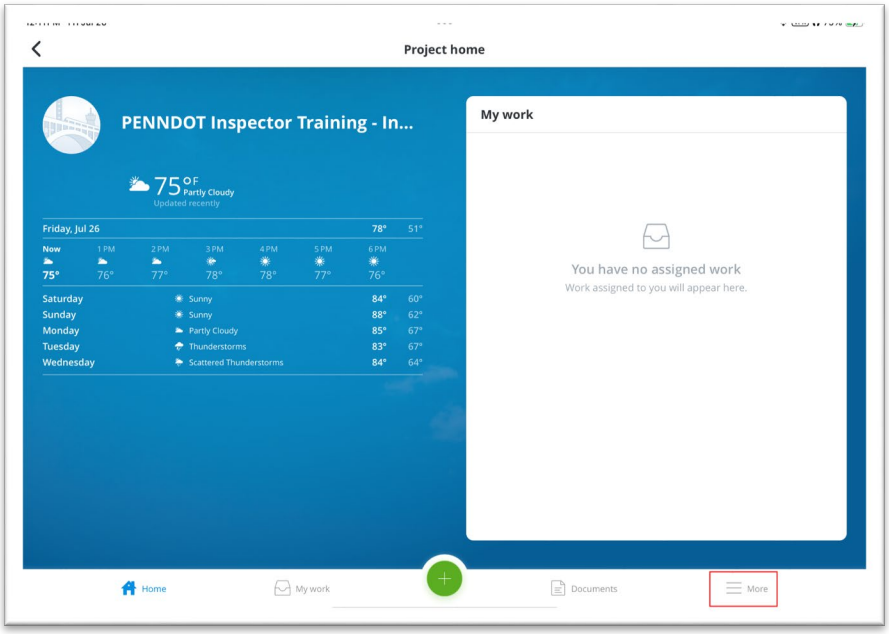
Shapes

Count

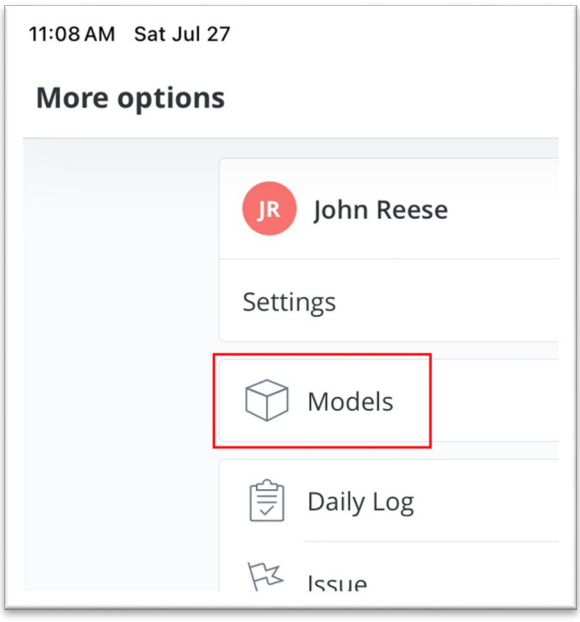
CHAPTER 5. Model Access and Navigation

Along with accessing project documents, SYNCHRO allows you to access the design model(s) to review 2D/3D information from their mobile device. This section of the Guide will walk through the basics of accessing and navigating the various model elements and views.

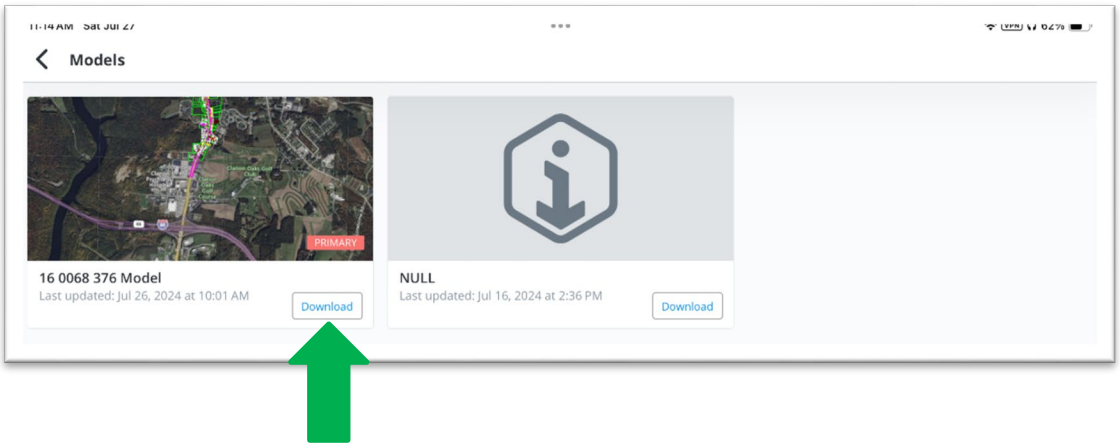
1. To open the model view, navigate back to the Home Screen and tap More on the project Home Screen



2. Select Models



3. Select the .16 0068 376 Model

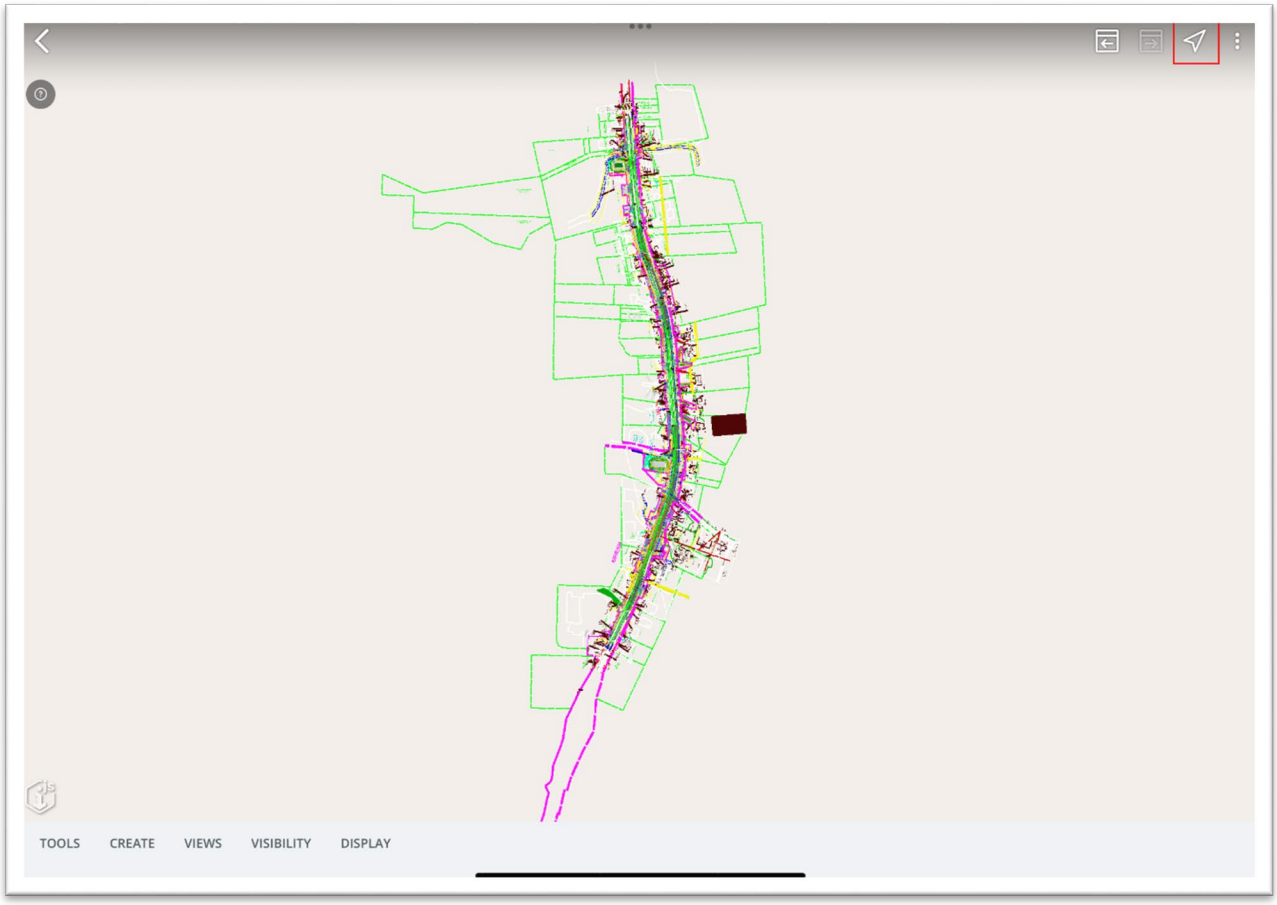


NOTE: Each time you open a model the software will determine if it needs to be Downloaded or updated before you begin. Your work will continue to synch as long as you are connected to the internet. You will be able to view and markup the model when you are disconnected from the internet. Your changes will be re-synched once you return to cellular or Wi-Fi coverage.

NOTE: should a model be edited and synchronized with the project, you will be alerted to update your model data.

Setting the Display

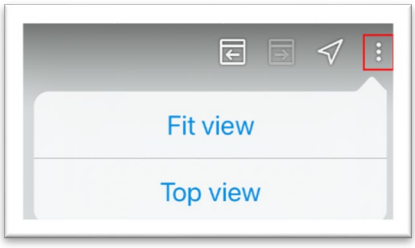
The model will open to the default view.



To navigating the model, use finger gesture of

- One finger to rotate
- Two fingers to pan
- Two finger pinch and spread to zoom in and out

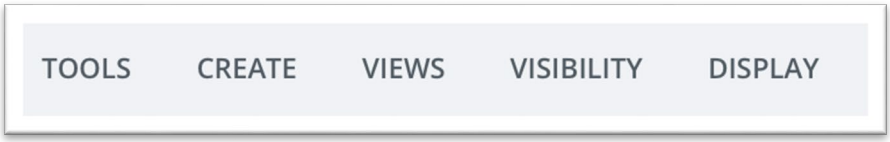
Select the ellipsis menu in the upper right corner to Fit view and got to Top View



The select the Arrow in the upper right corner to use the on-board GPS to show you current position on the project.

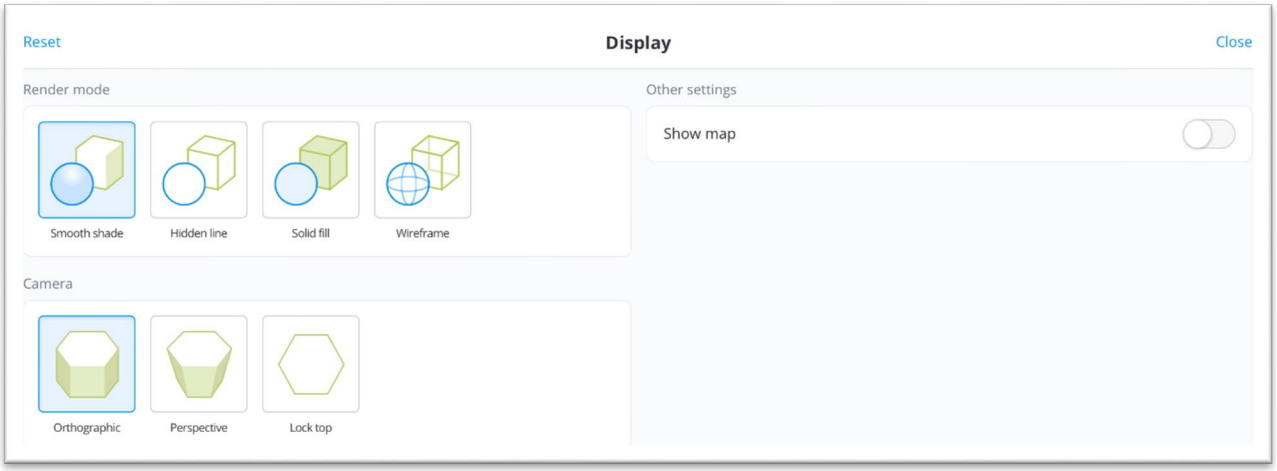
You will see both the 2D and 3D elements of the model when rotating.

The tools along the bottom of the view allow for more adjustments to the display.



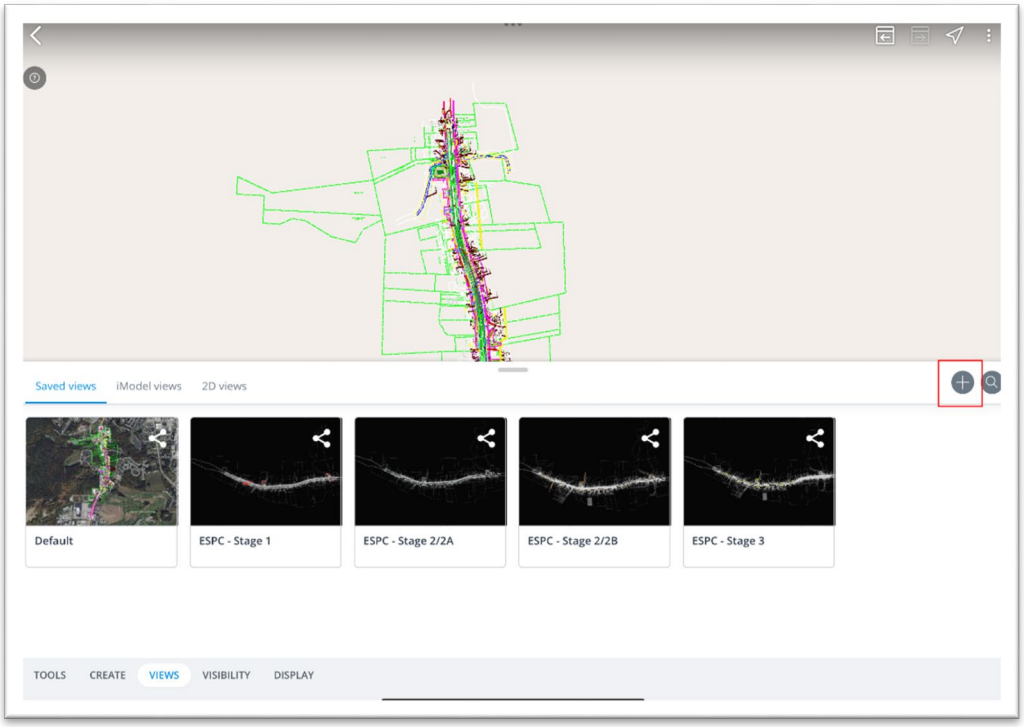
Visibility allows the manipulation of models and categories (levels). You will be able to toggle on and off whole model and individual levels to suite the needs of your task.

Display allows you to change the Render mode and Camera. The Lock top tool locks the model in top position so that you can rotate in a flat plain.



Saved Views

At the bottom of the screen tap on Views. This will open a window of Saved Views preset by the Administrator. For this sandbox, we have access to the following Saved Views:



Selecting a view will take you directly to that data set.

Creating Saved Views

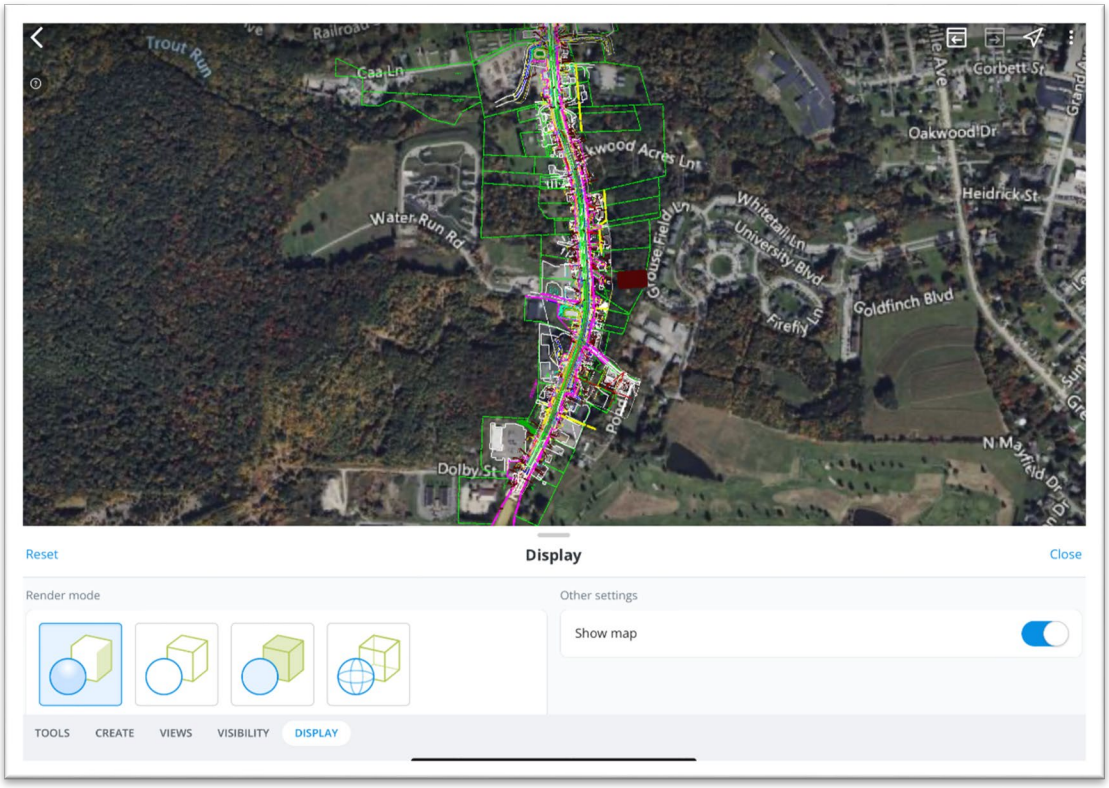
You can create your own saved view by navigating to a location in the model and selecting the plus symbol above the views. Name your view and it will be available to you the next time you want to visit that location. Once created you can perform the following:

Your view can only be seen by you unless you choose to share it with the team. You are the only person who can edit the views you create.

Background Map

For easier orientation to real-world conditions, you may require a background aerial map. SYNCHRO can display Bing Maps in the background for 2D orientation. This background can be switched on and off via a toggle on the Display button along the bottom of the screen.

Tap Display and then toggle on the Show Map setting. You should see the map stream into the project in the background, as shown in the image to the left.

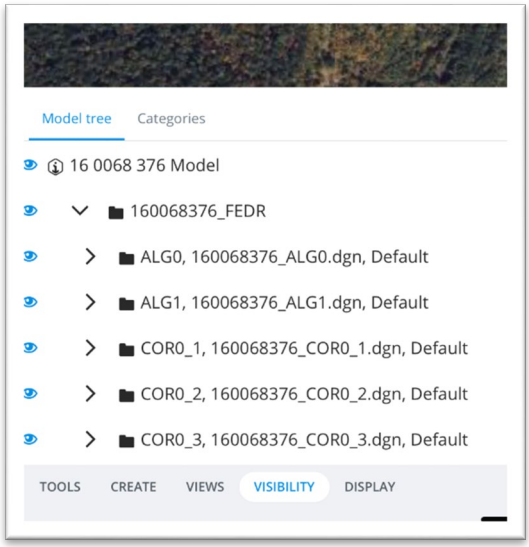


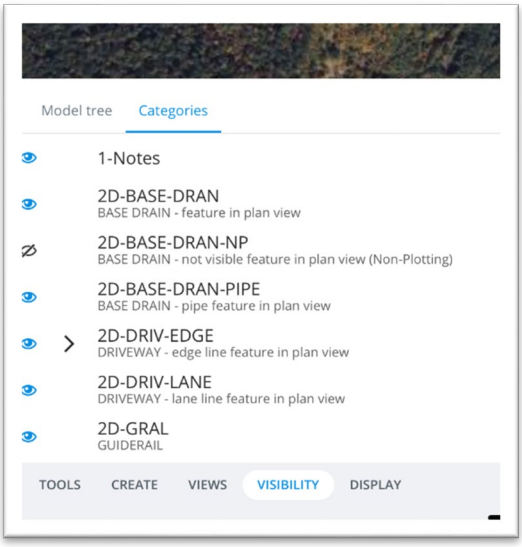
Visibility

Tapping on the Visibility button will open a file tree that allows you to control both the visibility of the models and the individual levels that appear under the Categories tab.

By toggling models and levels on and off you can drill down to the data you need to see. Try turning a few things off by navigating the Model Tree and tapping the blue eye icon

Select a Saved View to return to a standard model view.





CHAPTER 6. Measurement and Civil Tools

The Tools menu will provide you access to various application tools for measuring, creating profile and cross section views, as well as selecting objects to investigate their properties. We will start with an object selection and a look at the object properties.

Object Selection & Properties

The Select tool allows you to highlight objects within the model and perform various actions. We will explore this functionality in the next few steps.

1. Tap on Tools at the bottom of the application to bring up the Tools menu. From here, Select is already active by default. This will allow you to tap on the various objects and lines in the model. As you can see from the screenshot below, once selected, the object will highlight and display some basic information on screen. In this case, the pavement was selected and now appears in a bluish-grey color, along with geometry information in orange.

Tap on something similar to this and then tap on the “Selected” button in the lower right. This is a context menu that activates when at least one object is selected. Multiple objects can be selected at the same time and will be indicated with the appropriate number. To the far right is a vertical ellipsis menu that brings up a dialog box as shown above.

2. Tap on “Properties” and the object’s properties can be seen along the bottom of the screen as depicted on the next page.

PennDOT is working to ensure most all ECMS Pay Items are incorporated into the model in the future.

Below are some properties and their descriptions. These may change depending on the type of object that you have selected and is not an all-inclusive list.

- **Feature:** The Feature Definition and Name from the Bentley model. This may provide you with information that will help them identify the exact nature of the object selected based on standard naming conventions.
- **0413 SECTION PAY ITEM-SY-SUPERPAVE…:** This section of the properties provides custom information that was set in the design model via an Item Type. In this example, the pavement information, along with ECMS pay item number and a quantity**,** are displayed.
- **Civil Quantities:** This section provides the civil quantity information harvested from the model. In this example, the area and volume of the pavement is shown.
- **Component Layer:** This information is also harvested from the design model. In this example, the Start and Stop Stations are listed, along with the Volume Option that is set to “Design” from PennDOT’s CADD Standards.
- **Model Source:** Lists the source file where the model information comes from. Per PennDOT naming conventions, this example is from a federated Corridor Model file.
- **Selected Item(s):** internal mapping for the iModel and other applications.
- **Source Information:** Same as “Model Source” but adds the specific GUID for the selected object.

The user can select multiple objects at once. However, the Properties display will be less helpful as it will likely only list ***Varies*** in any field that is different across the selected objects. It is recommended that you only investigate one object at a time from the model.

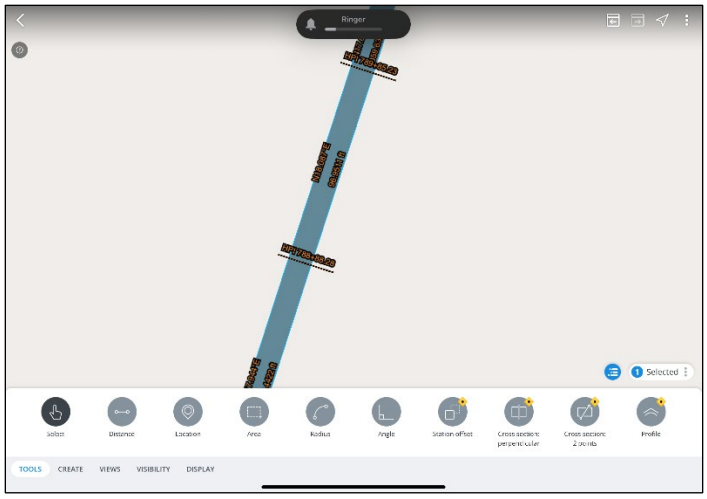
If you have suggestions for useful information that can be added to objects in design in this manner, similar to the pay item and paving information, let the Digital Delivery team know for future development.

Selection Alternate Menu

Now let us investigate the other menu options besides “Properties”:

Hide

Hide will turn off the display of the selected object(s). This may be helpful when an object overlays other objects and obscure their view.



Isolate

Isolate turns off the display of model objects except what is selected. As shown in the screenshot to the left, the geometric properties of the object are visible as well as the object itself.

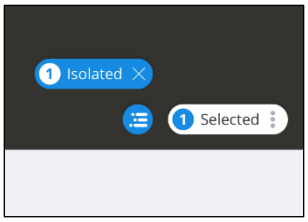
Emphasize

Emphasize changes the display of the model to dither or greyscale the other objects and highlight the selected object.

Deselect

Clears the selected objects. This does not reset the view to show the rest of the model.

The user may tap the blue icon shown in the screenshot to the right to bring up a button that allows them to cancel out of the Isolate or Emphasize views. Note that in order to view the entire model, you must change the view or tap the left arrow in the upper left to return to the project selection screen.

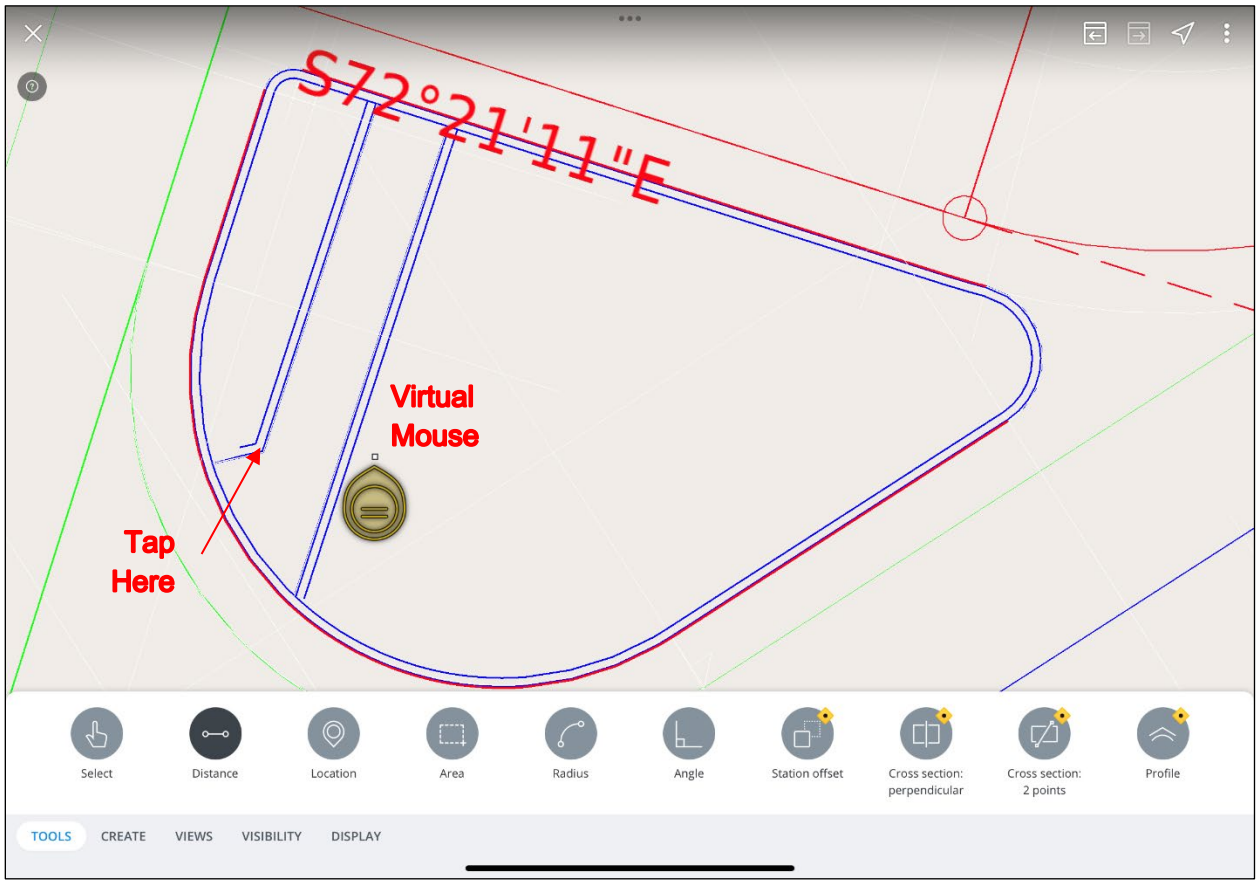


Measurement Tools

SYNCHRO Field has a variety of measuring tools available to use in 3D, Profile, and Cross Section views. In this section of the Guide, we will explore these tools and try out the various methods to measure parts of the model.

Distance

The “Distance” command allows for measuring linear distances between points. The user can measure any two points or “snap” to specific points of interest. Once you tap the “Distance” command, then taps anywhere on the screen, a virtual mouse appears, allowing you to select points of interest more easily than a typical finger tap.

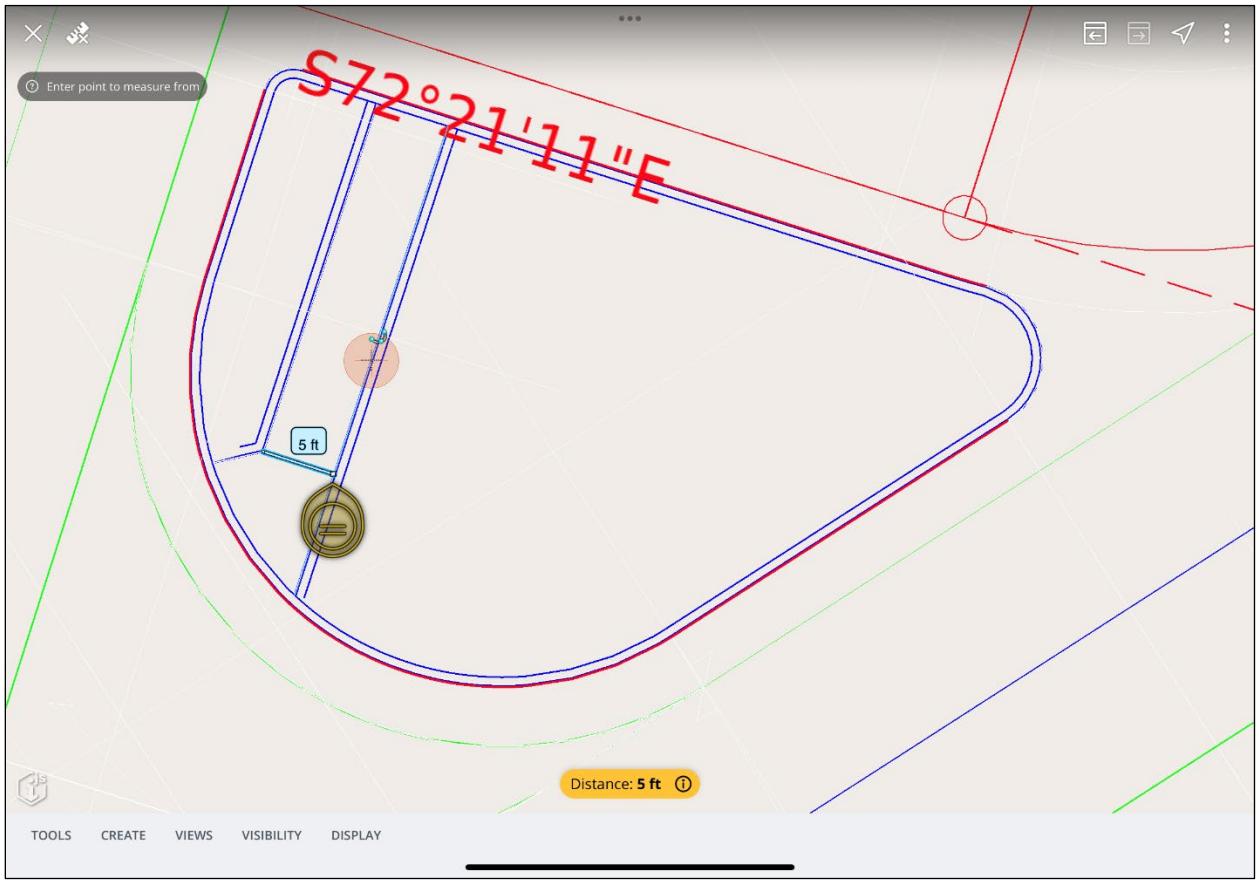


1. Tap the end point of the inside curb line labeled “Tap Here” in the screenshot above. When hovering your virtual mouse over this point, a tentative snap icon will appear when you are close to a tentative point, as can be seen in the graphic to the right. This icon is Keypoint Snap. This means that it will snap automatically to any tentative point nearest to the virtual mouse that is either an endpoint or midpoint **if you are close enough to the point. A yellow X will appear once properly snapped to a point. Otherwise, tapping the screen will select a point wherever you have the virtual mouse.**

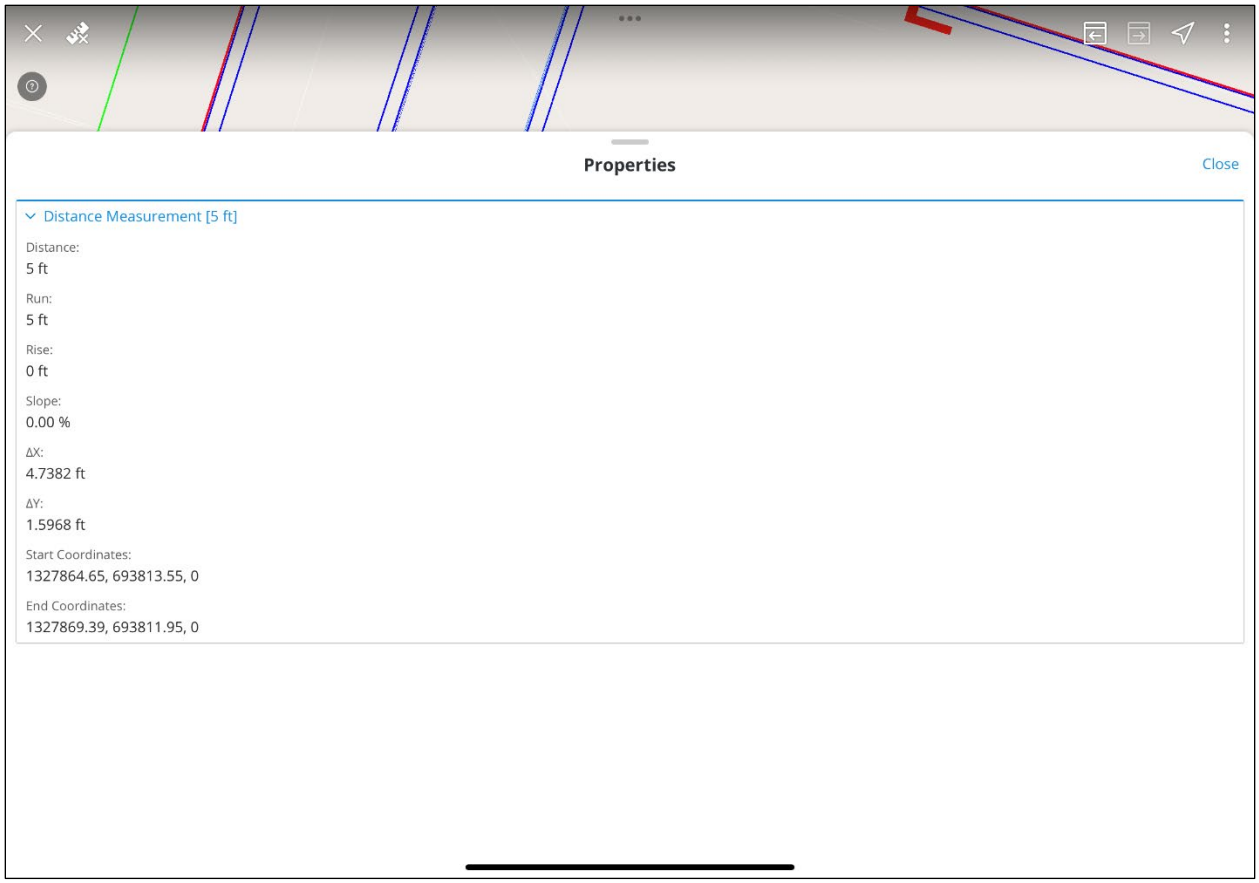
NOTE: Keypoint snap is hard coded into SYNCHRO and is the only option you have for snapping to a point.

2. Next, drag your virtual mouse to the left point shown in the screenshot below. A yellow X will appear once you have successfully gotten close enough to snap to the end of the curb line.

3. Next, drag your virtual mouse across the sidewalk and pick any point that you wish. Select a point that is as close to perpendicular as possible without snapping. The distance readout will float with your mouse as you move it until you tap, locking in the point and giving you distance information.



4. The yellow readout at the bottom of the screen is an expanded readout of the measurement. Tapping on the yellow bubble will open a Properties window at the bottom of the screen showing more information about the measurement. The example on the next page shows the Distance, Run, Rise, Slope, among other information. This is an example of selecting two points on 2D objects. This means that the Z value isn't relative, and the measurement is essentially a top view distance.



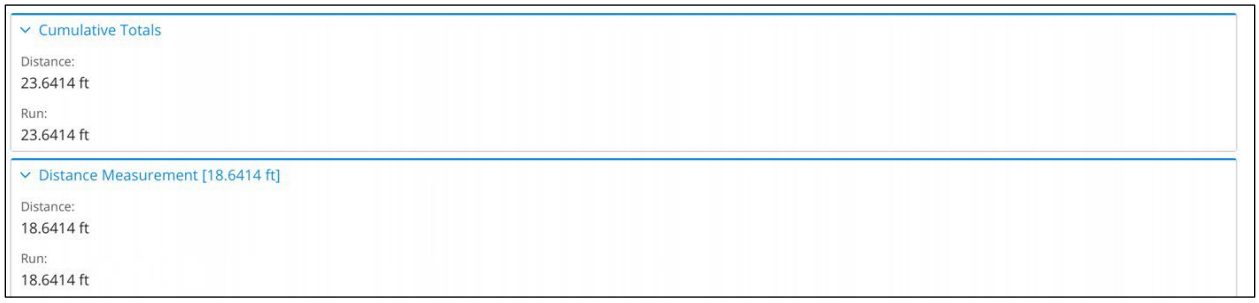
Other information that you can get in this manner are coordinate readouts of the two points in XY format. Note that Z is 0 as these objects are measured in a 2D saved view.

In the upper left corner, next to the X, is an icon of a ruler with an x on it. This will undo the measurement(s) and clear out the Properties bubble. Tapping the X to the left of the ruler icon will reset the command out of "Distance".

Now let us look at measuring cumulative points along a path to get a total distance and segment distance measurements.

5. Once you have measured between two points, hover the virtual mouse near the end of the first measurement line. You will see a yellow X indicating you are snapping to that end point. Now you can direct the mouse to any other point and tap the screen. You should see something like the screenshot on the next page.

6. The yellow Distance bubble now says Cumulative Distance. Tap on the yellow bubble to open the Properties window and see a Cumulative Totals section at the top of the Properties window. Scrolling down will then show you the individual measurements.

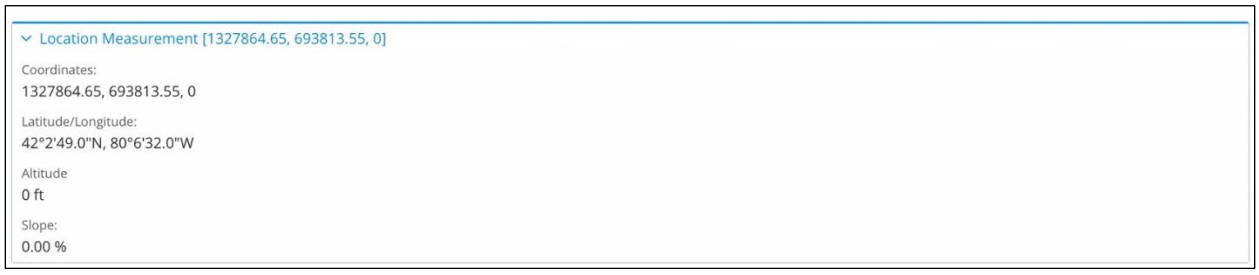


Location

The “Location” command allows you to select a point and get coordinate information such as XYZ, Lat/Long, and Slope.

1. Tap on the same curb end point as before to show a floating XYZ point readout in a blue box.

2. Tap on the yellow bubble at the bottom to open Properties and show an expanded information table about the selected point.

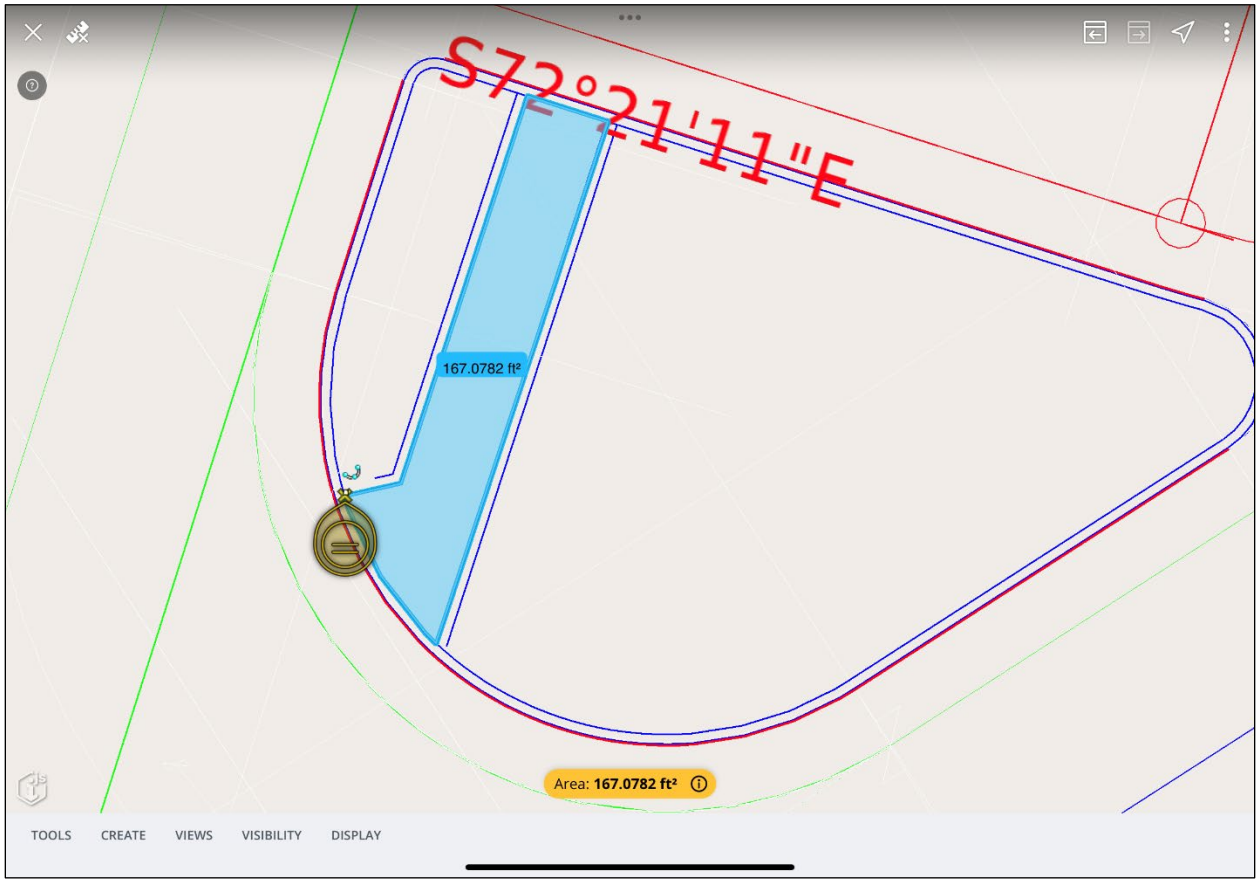


Area

The “Area” command allows for the measurement of a 2D or 3D area. In the screenshot below, the light blue highlighted area was measured, now displaying the square footage. The area measurement was created by tapping on snap points in a similar manner to the previous “Distance” command.

1. Try to duplicate this area measurement.

2. Tap on the yellow bubble to expand the Properties to show Area (a 3D measurement), Area XY (2D measurement), and Perimeter.



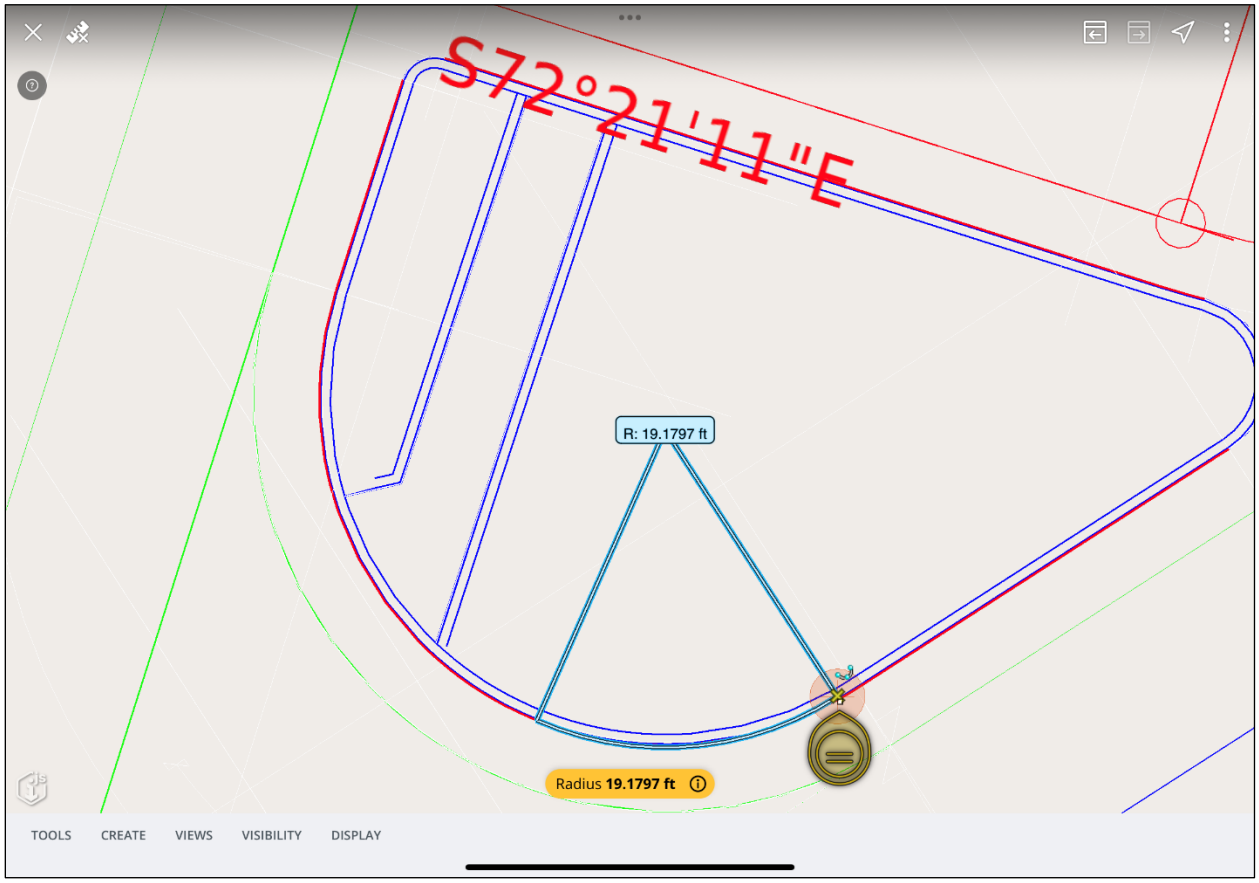
The linear elements being measured in this example are on zero elevation, so effectively a 2D measurement. Tapping on elements in a 3D view will show slope areas, as well as a 2D top-down area measurements.

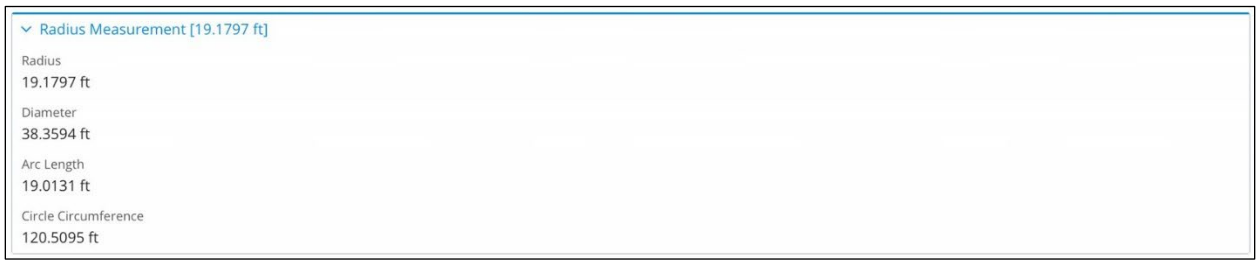
Arc

The “Arc” tool allows you to measure an arc distance. Hovering the virtual mouse over snappable points allows you to select two points along an arc and get Properties for the measurement. Below, you will see a screenshot of the traffic island nose being measured around the arc.

1. Try to duplicate this arc measurement.

2. Tap on the yellow bubble to open Properties and review the Radius, Diameter, Arc Length, and Circumference. Practice measuring arcs now.



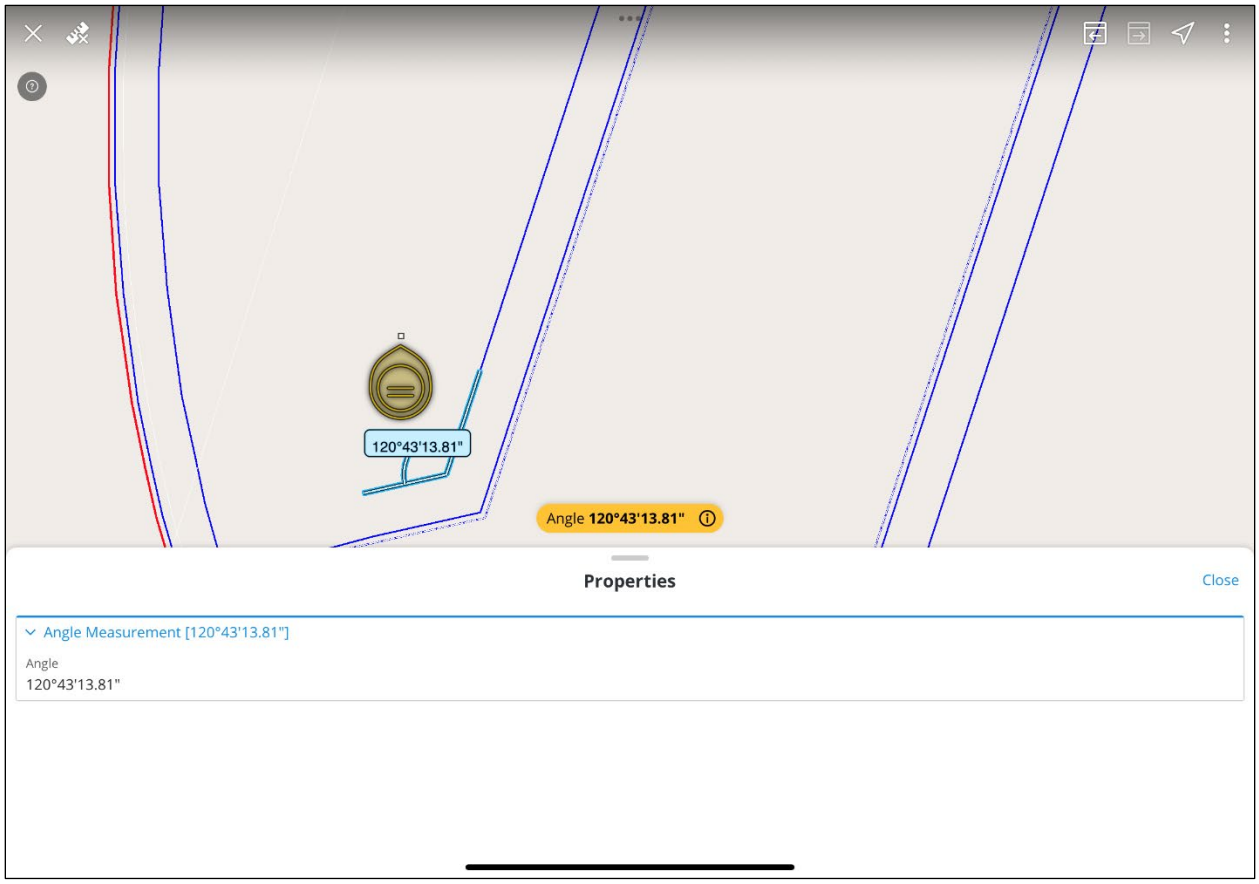


Angle

The “Angle” command allows you to measure the angle between three points. By tapping on the three points shown in the screenshot below, you can get an angle measurement.

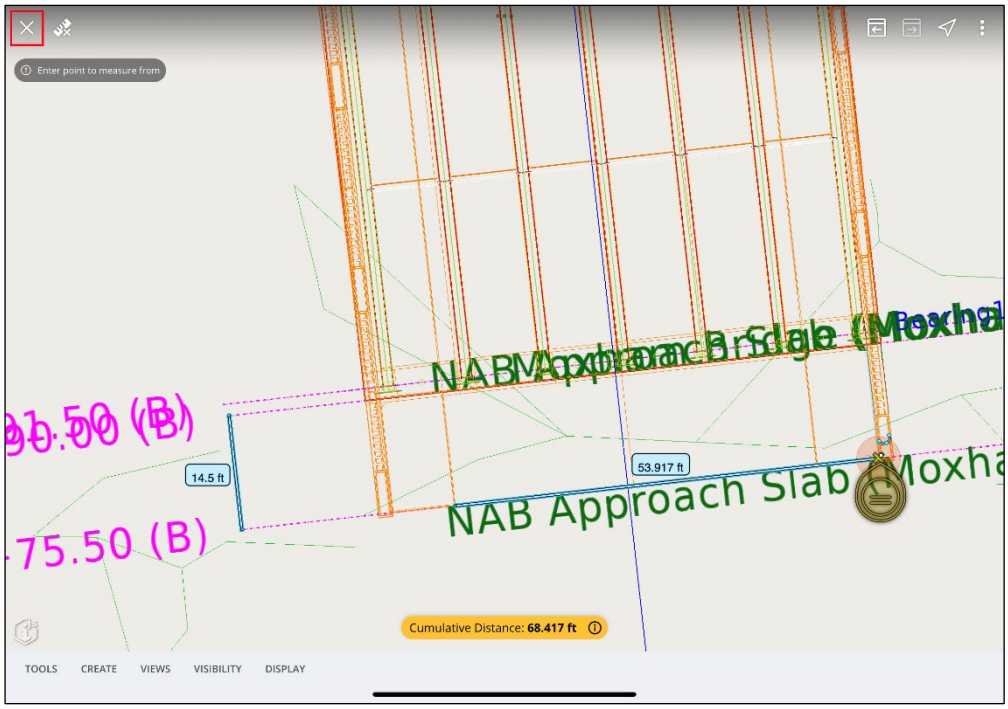
1. Try to replicate the angle measurement as shown below.

2. Expand the Properties to review the various angle information provided.

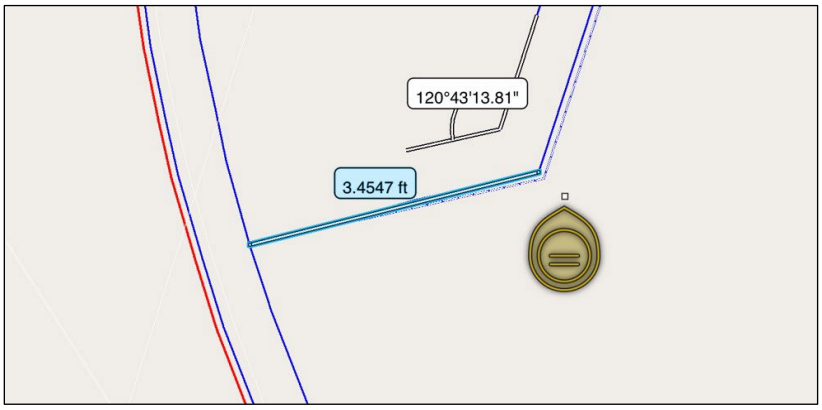


Clearing out the Measurements

When you wish to exit the measurement command, tap the X character beside ruler icon in the upper left will stop the measurement. However, the measured items and readouts will remain until the ruler with the X icon is tapped to clear all measurements during your session.

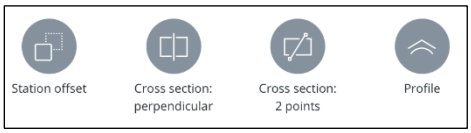


As shown below, the previous measurement will persist even across different measuring commands.



NOTE: the length readout is highlighted blue. This means that the Distance measurement is active. The user may tap on the angle readout to set it as active and access the expanded Properties of the Angle measurement.

Civil Tools

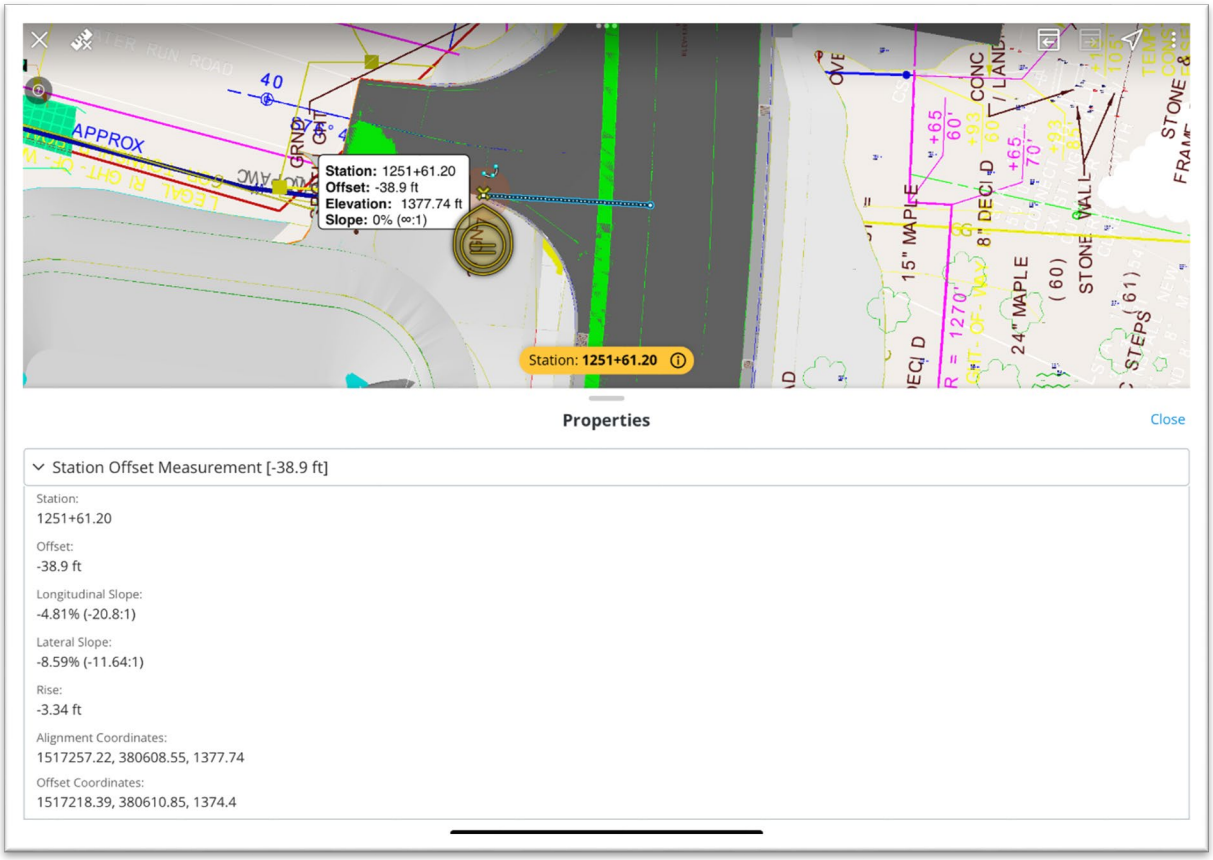


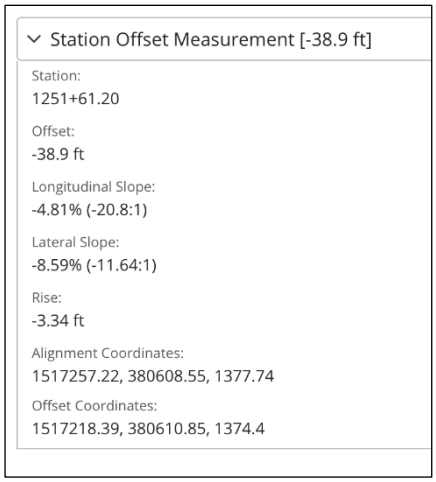
The following commands leverage the civil data in the model to provide information for you. In this version of the training Guide, the commands are in beta access status, denoted by the yellow diamond on the icon. In the future, these will be absorbed into the standard deliverable commands of SYNCHRO.

Station Offset

This command allows you to track station and offset information on selected points along the model.

1. Tap the command and then again on the screen to bring up the virtual mouse.
2. Next, identify a geometric element, centerline, baseline, etc. For this example, we will use the alignment near the approach road. Select the line representing the centerline and it will highlight in blue and a floating readout appears that will now follow your virtual mouse.
3. Snap to a point on the edge of pavement to see station and offset information. Now click on the yellow bubble at the bottom to expand the Properties of the readout.





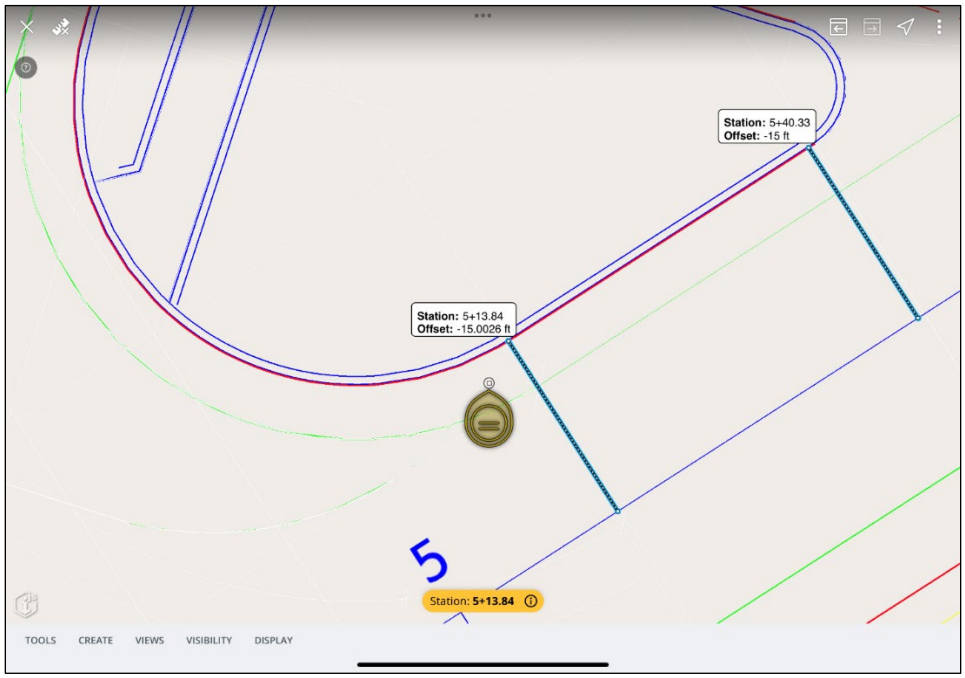
The expanded Properties dialog contains the Station and Offset readout, along with:

- **Longitudinal Slope:** Snapshot of the vertical grade (profile) slope at the selected Station point.
- **Lateral Slope:** slope between the measured point and the station reference point.
- **Rise:** change in elevation between the measured points.
- **Coordinates:** XYZ readout of the point along the alignment and the offset point selected.

NOTE: if you need an elevation, you must access the Properties and look for the Z value on "Offset Coordinates". And you must be in a 3D view and snap to a 3D object.

Multiple points can be measured in a single Station/Offset session.

4. Pick multiple points as shown in the screenshot below. Note that each time, you must select the alignment first to get the correct reference information. Once finished, tap on the yellow bubble to see multiple point information. Then tap the ruler icon in the upper left to clear out the measurements.

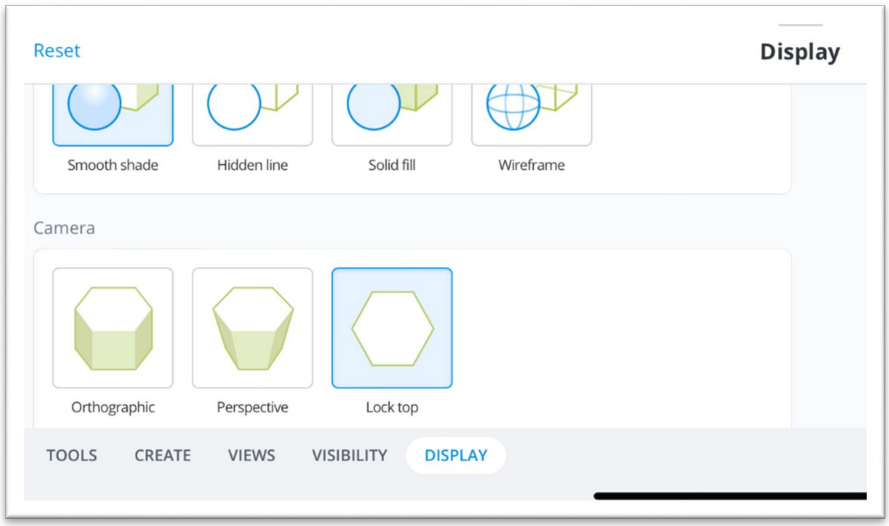


Create Perpendicular Cross Sections – Roadway Model

SYNCHRO does not yet have the ability to save a cross section or set of sections as a saved view (future development). The user will need to follow these steps each time they wish to view a cross section and perform measurements.

1. Go to Views and select the Default view.

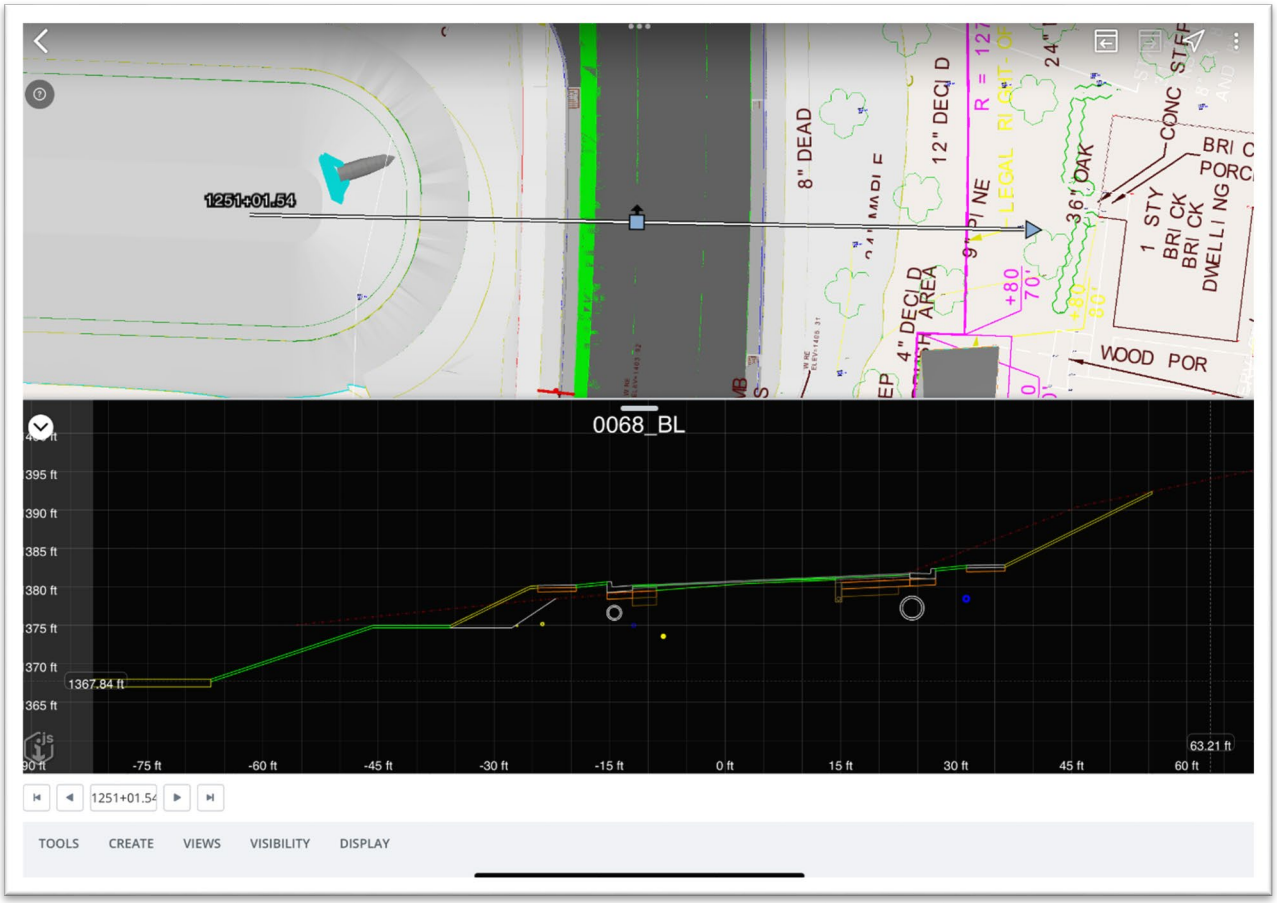
2. As previously covered, the “Lock Top” camera setting has been reset since the Saved View has changed. At this time, reset the “Lock Top” camera aspect from by navigating to the Display and selecting Lock top.



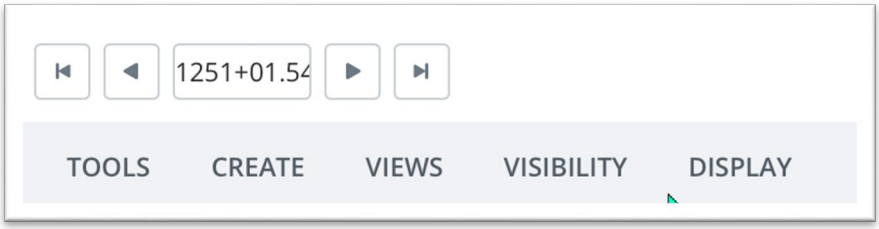
3. Once you have finished the camera setting, tap on Tools and then the “Cross Section: Perpendicular” command and then tap on the plan view to pull up the virtual mouse reticle. On the screenshot above, notice the pulldown in the upper right. By default, this is set to Alignment and needs user input to graphically select the reference alignment for creating cross section views. The user can tap that pulldown to see a list of alignments in the model that can be selected from the list. However, for this exercise, we will select the alignment with the virtual mouse.

4. After tapping on the screen to pull up the virtual mouse, the view changes to highlight selectable alignments and dithers out the rest of the model. This is for ease of selecting an alignment. Tap on the centerline shown in the screenshot above and move the virtual mouse around the screen to select the initial station that will be displayed. Note that this station is only the first one displayed after executing the command. We will change the station later to an even station for the sake of simplicity.

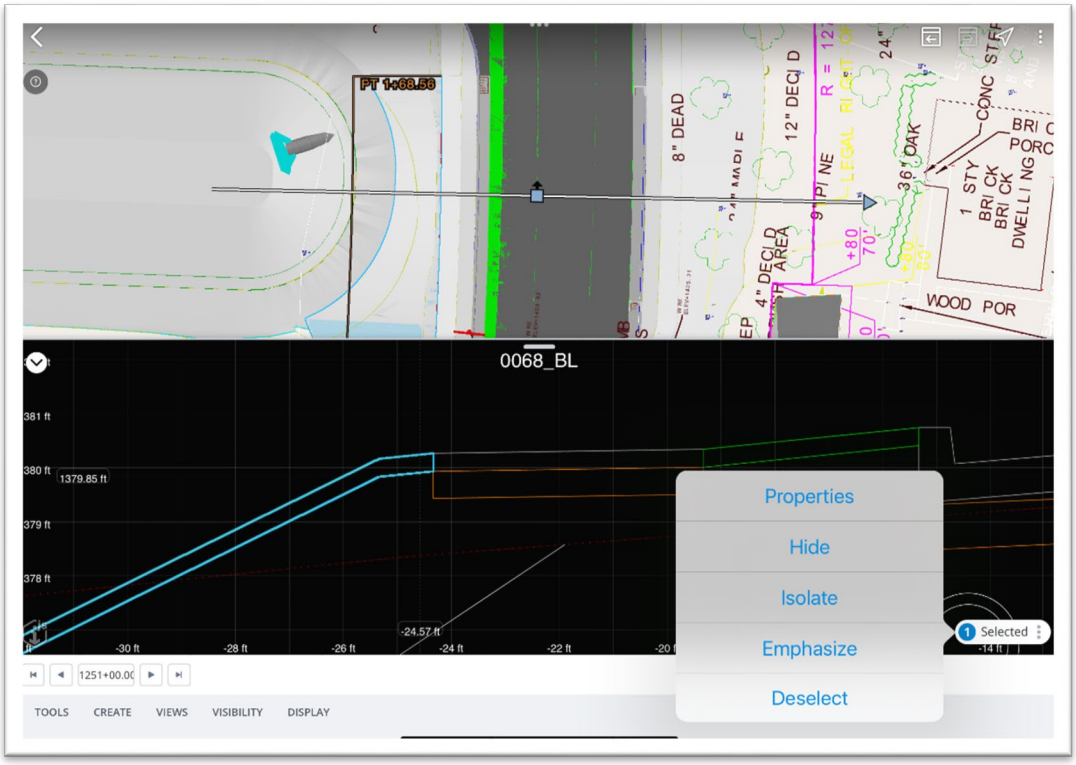
5. Tap on the screen to open a cross section view at the bottom of the application and zoom to the extents of the section, based on the extents of the terrain model from which the data set was created.



Sections can be indexed by selecting the arrows in the lower left corner or, typing in a desired station.



You can zoom and pan in the cross section window just as you are able to in the model. Information can be pulled from the elements in the cross section.

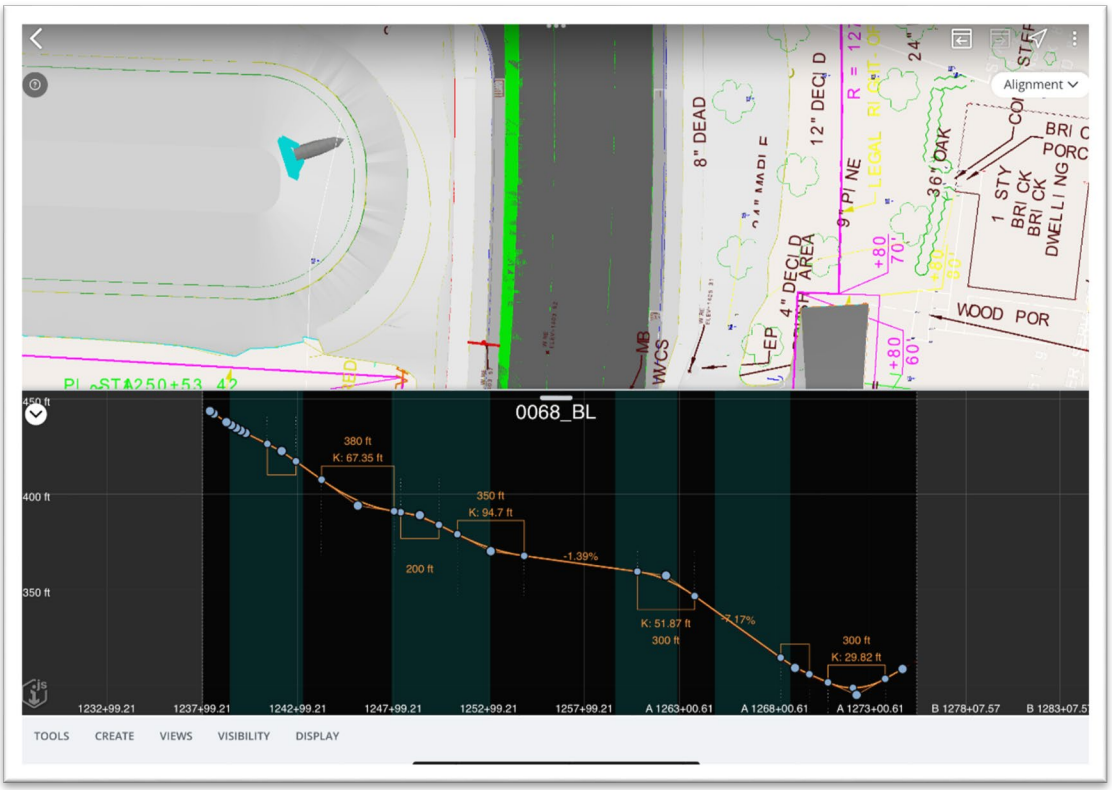


The distance measurement tool can be used to get distances along elements in the profile.

Create Profile – Roadway Model

Next, let us look at creating a profile view. Like the cross section view, a profile view cannot be saved in this current version of SYNCHRO Field.

1. Tap Tools and then Profile.
2. Tap in the top view to bring up the virtual mouse. Again, you can use the mouse to select an alignment or use the pull down list in the upper right. For this exercise, tap on the alignment shown below and a profile view will open below the top view.



If you wish to increase the profile view size, swipe up on the top center of the view to resize.

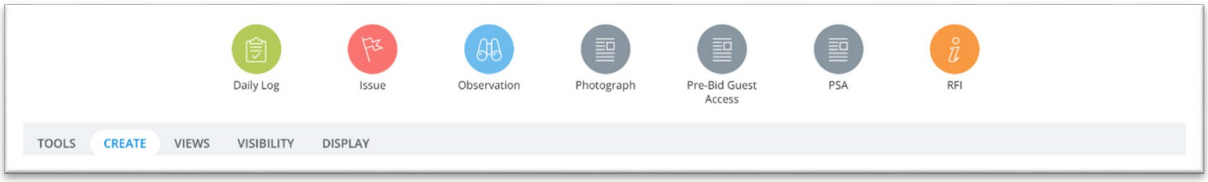
Similar to cross sections, you can pan and zoom on within the profile view and tap on elements or points. However, information on the profile is not as abundant. Selecting the proposed vertical alignment will provide property information.

CHAPTER 7. Forms and Reports

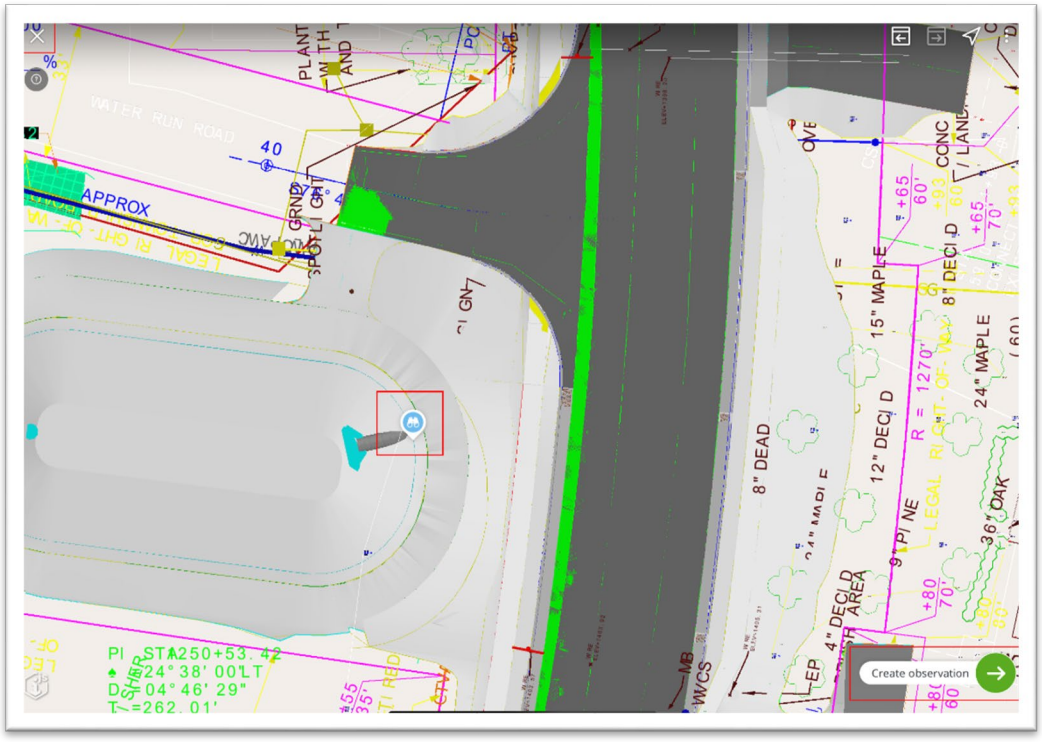
Forms

In this section of the training Guide, we will cover the creation of various activity reports. **These are optional for the first round of pilot projects. We encourage you to experiment with the functionality, but at this time, your current workflows will still prevail for creating Project Site Activity Reports (PSAs), Requests for Information (RFIs) or logging any issues that need addressed by the contractor or someone else in PennDOT.**

This section will demonstrate how to create and complete a SYNCHRO Form. There are six forms available through the CREATE tab. CHAPTER 3. Overview of SYNCHRO Field outlines the function of these forms:



Placing a form is as simple as selecting the form you want to place and then selecting the model element you want to place it on. It is a good idea to navigate to the location where you want your form to reside before beginning the process of placement.
Once placed, select the “Create (*your form*) button at the lower right corner of the view.



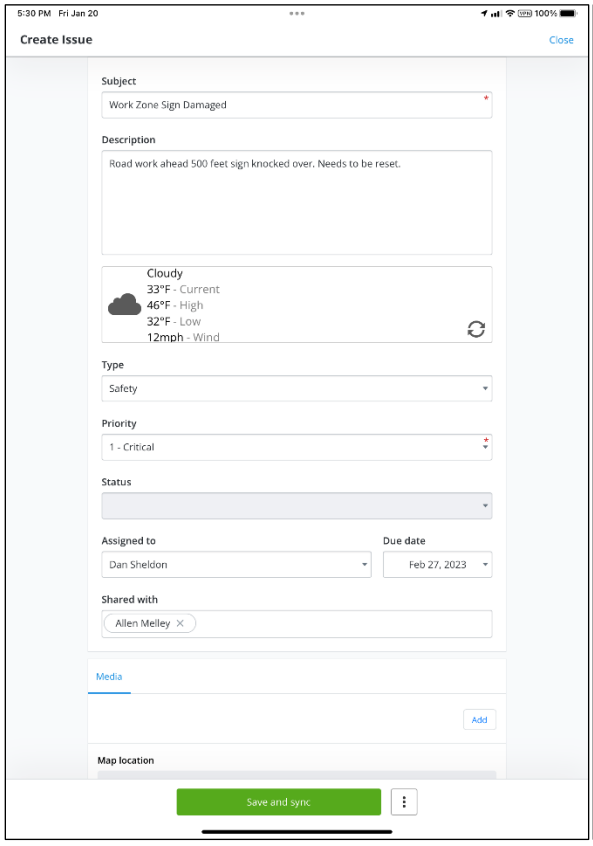
If you change your mind, you can tap on the X in the upper left corner to cancel the operation.

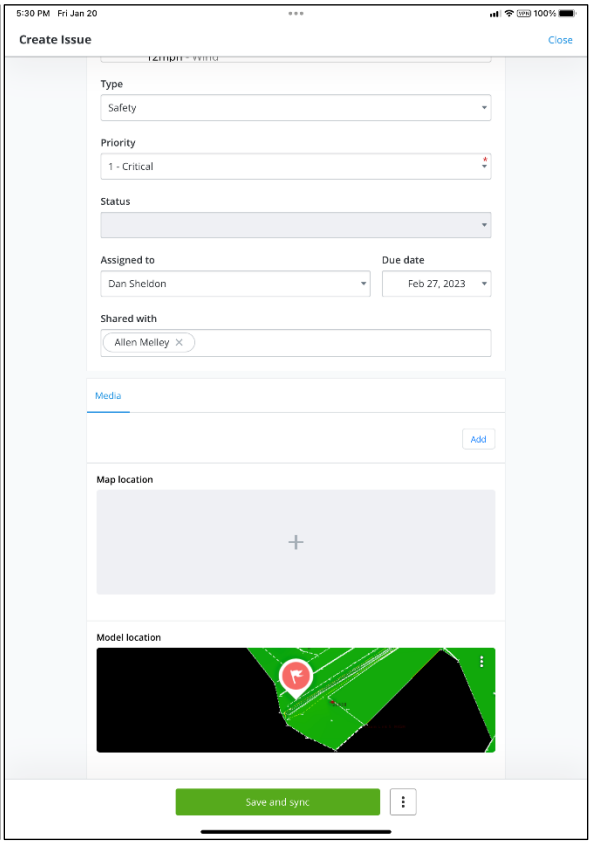
Create Issue

Now let us create an issue. For this exercise, we will note that a contractor has a downed work zone sign or needs to clean out and repair their silt fence after a hard rain.

This is very similar to the previous exercise, so recall those steps and tag an issue somewhere on the model.

1. Now create an issue with a photo and tag someone to provide a review like the example screenshots below.

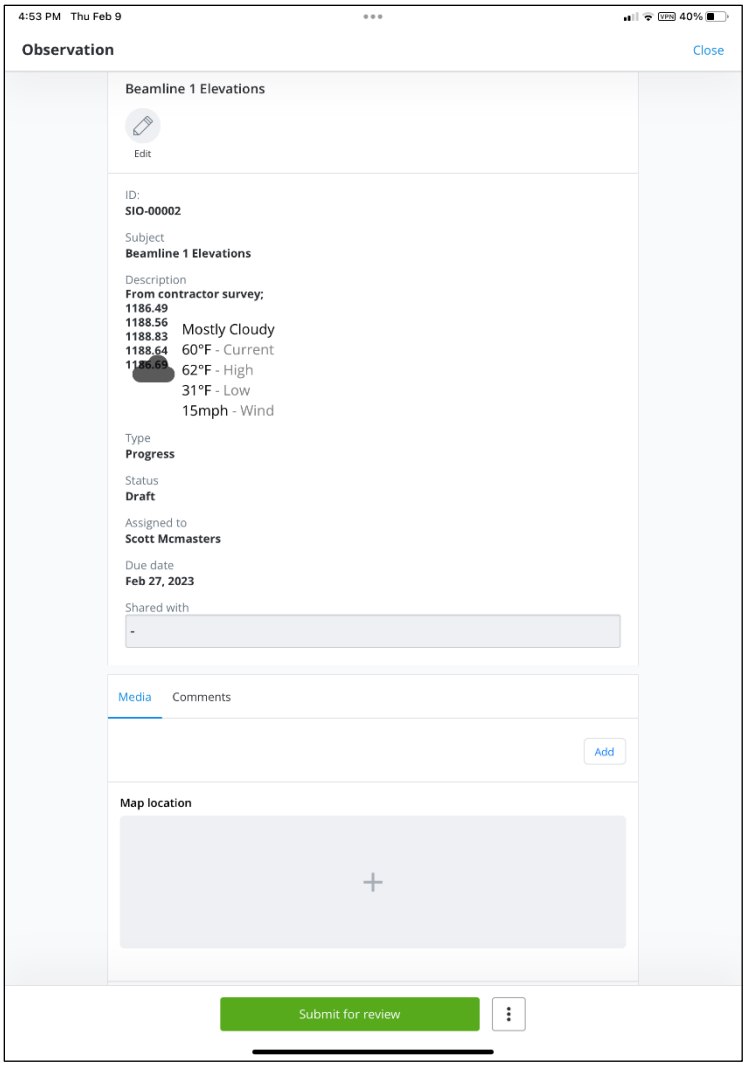




NOTE: RFIs and Observations work similarly to the Daily Log and Issue workflows above. Spend some time creating some additional RFIs and/or Observations. When finished, you may close out of SYNCHRO Field, and we will look at SYNCHRO Control.

Create Observation

Now we will look at documenting beam elevations as checked by the contractor. The current workflow has the contractor's surveyor checking beam elevations as they are installed and presenting the survey output in a spreadsheet. We will cover how to use the Observation form to collect and track that information.



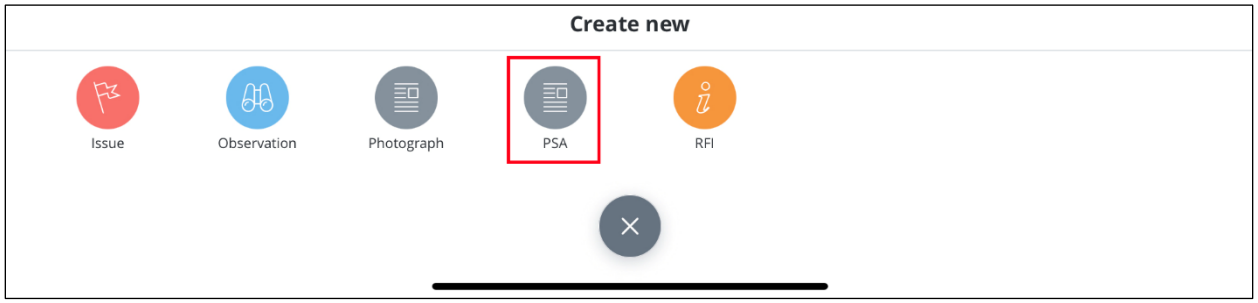
1. Open the steel bridge model and select the ***4.01 Steel Girder View*** Saved View.
2. Zoom into the model to the beamline furthest left of centerline.
3. Tap on the "Create" menu at the bottom of the screen and then tap "Observation".
4. Tap on the end of the beamline.
5. Now tap on the green button in the lower right to "Create Observation".
6. Fill out the appropriate fields, placing some elevation notes in the Description field like you normally would record on the bridge plan sheet.
7. Once you have finished, scroll to the bottom and notice that the observation is now tied to the model. The image shown will not reflect the Saved View that you are in. It will display the rendered bridge model.
8. Tap "Save and Sync" to capture the observation and store it with the project's model. You may be asked to pick the status of the form. Will not matter for this example, but "Draft" does not send the form to the assigned reviewer.

Project Site Activity (PSA) Report

Utilizing SYNCHRO to capture your sight activities will allow you to tag the model in the exact location of your recorded activity. The forms, PSA-Roadway and PSA-Structures have been created to provide a quick way of recording your inspection activity. The current workflow of a final recording in the PennDOT PSA mobile application will remain until further potential development of linking SYNCHRO to ECMS. This section will direct you through the initial workflow of recording a sight activity within the model using the form PSA-Structures form. Both the PSA Roadway form is similar in appearance with the exception of roadway model elements for inspection.

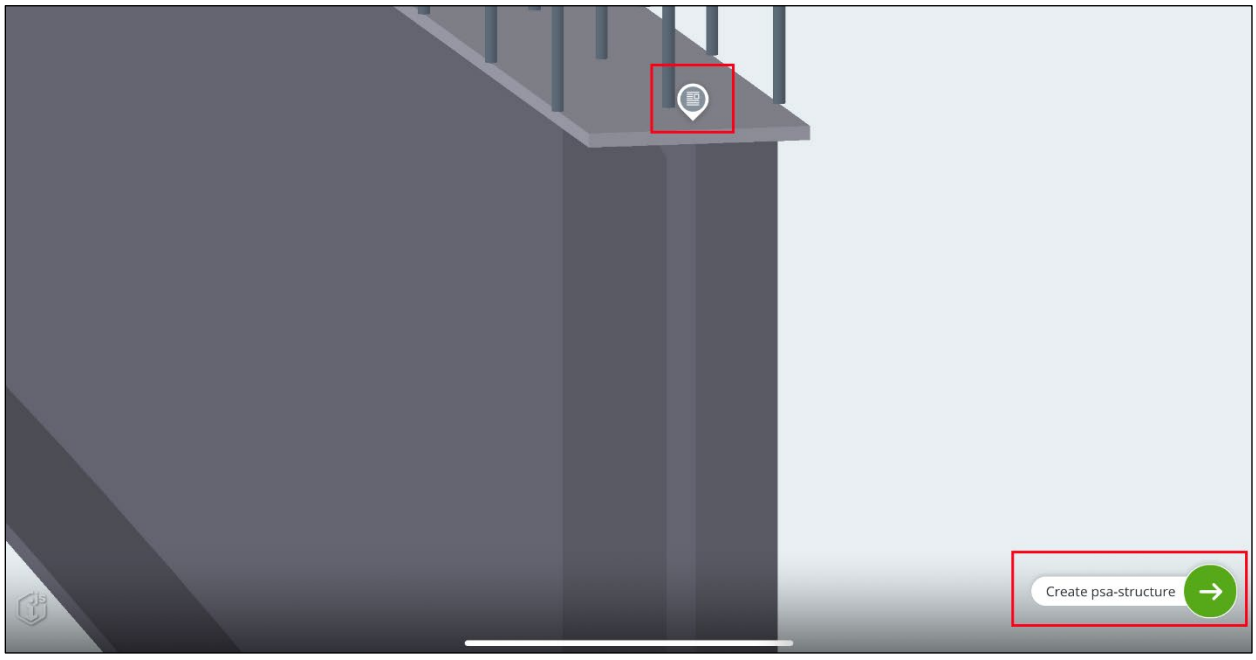
A sight activity can be recorded in several different ways. All initial screens of the SYNCHRO Field application have the green circle with a plus sign that gives you access to all the available forms.

This is the “Create New” button where you will be able to start a new form. Select the PSA form for this exercise.



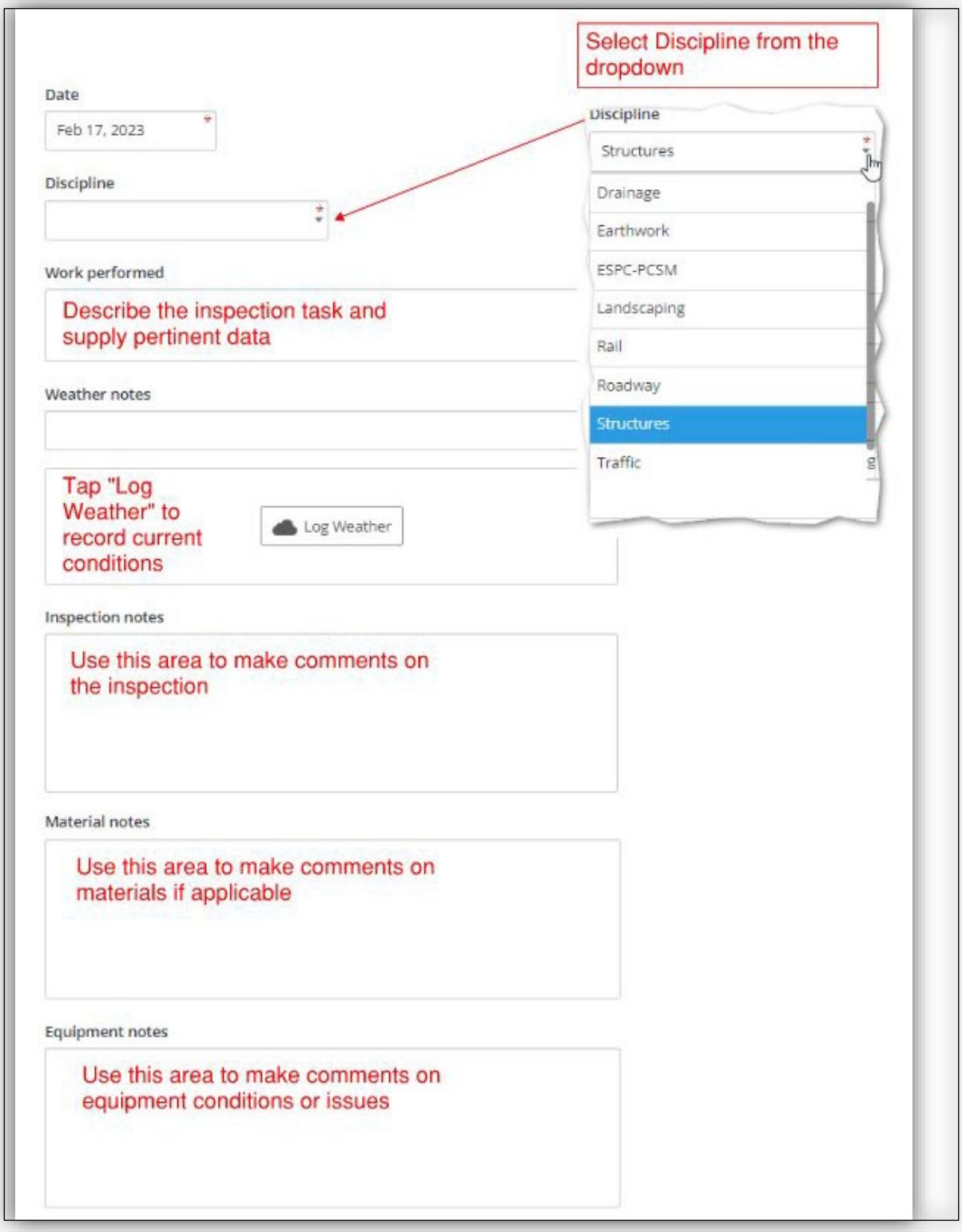
Creating this form outside of the model allows you to record the activity but only tags to the model if you select the “Model Location” button at the bottom of the form.

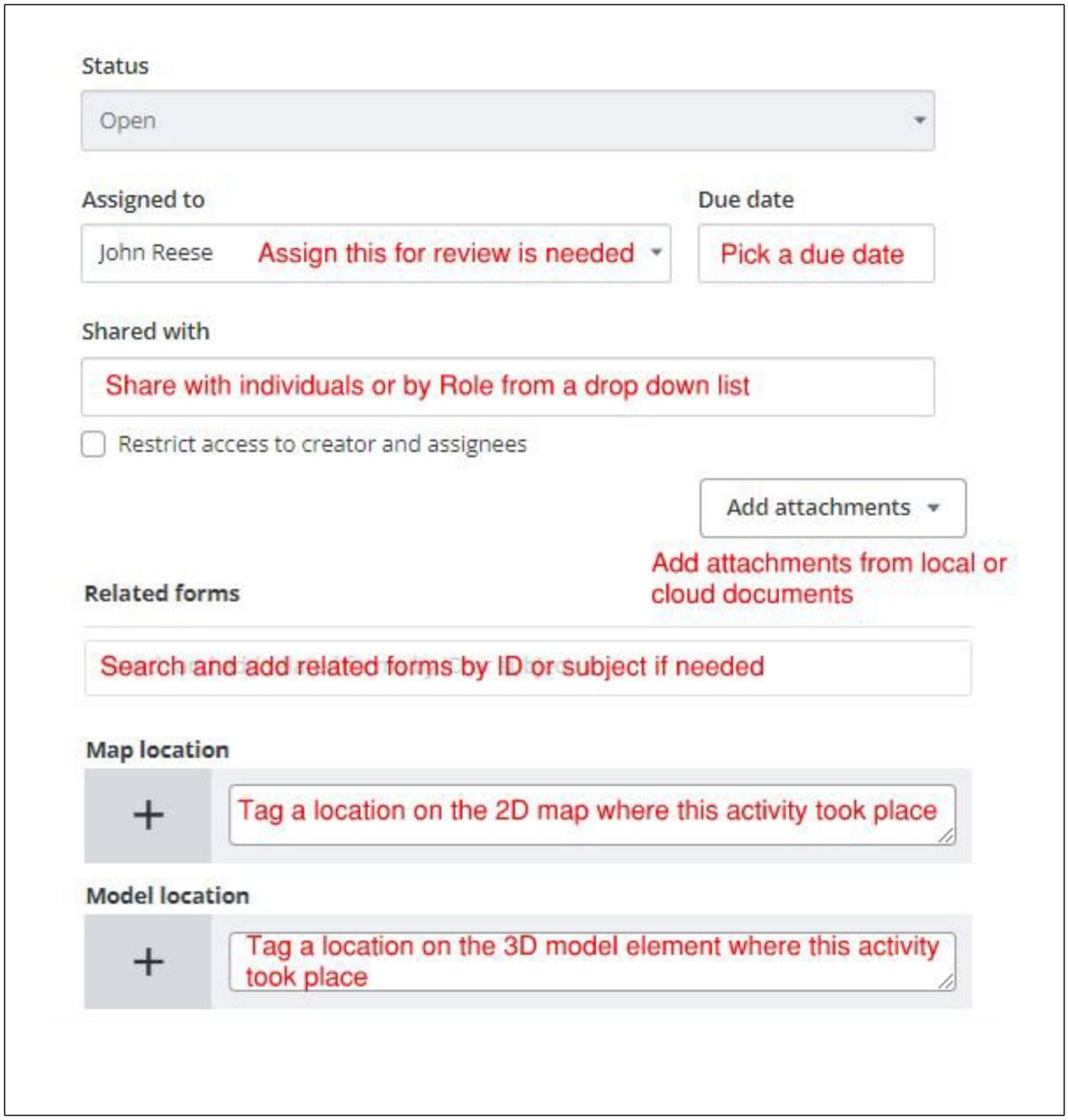
Selecting the model location In SYNCHRO Filed only allow you to tag the model as it is shown in the default view. SYNCHRO Control will allow you to select a saved view and then tag a specific model element. The optimal way of using the form is to create it while in the model view. To create a form inside the model first, zoom to the model element you want to tag then, select the “Create” button in the bottom menu bar, select the form, select the location for the activity then, select “Create PSA-…” in the lower right hand of the screen.



Selecting “Create PSA-…” will take you to the form where you can add the data from your activity.

The images below and on the next page will guide you through the details of filling in the PSA-Structures form. Try filling out a sample PSA form, then we will discuss this method compared to your current workflow.




Status
Open
Assigned to
John Reese
Assign this for review is needed
Due date
Pick a due date
Shared with
Share with individuals or by Role from a drop down list
Restrict access to creator and assignees
Add attachments
Add attachments from local or cloud documents
Related forms
Search and add related forms by ID or subject if needed
Map location
Tag a location on the 2D map where this activity took place
Model location
Tag a location on the 3D model element where this activity took place

Editing Forms

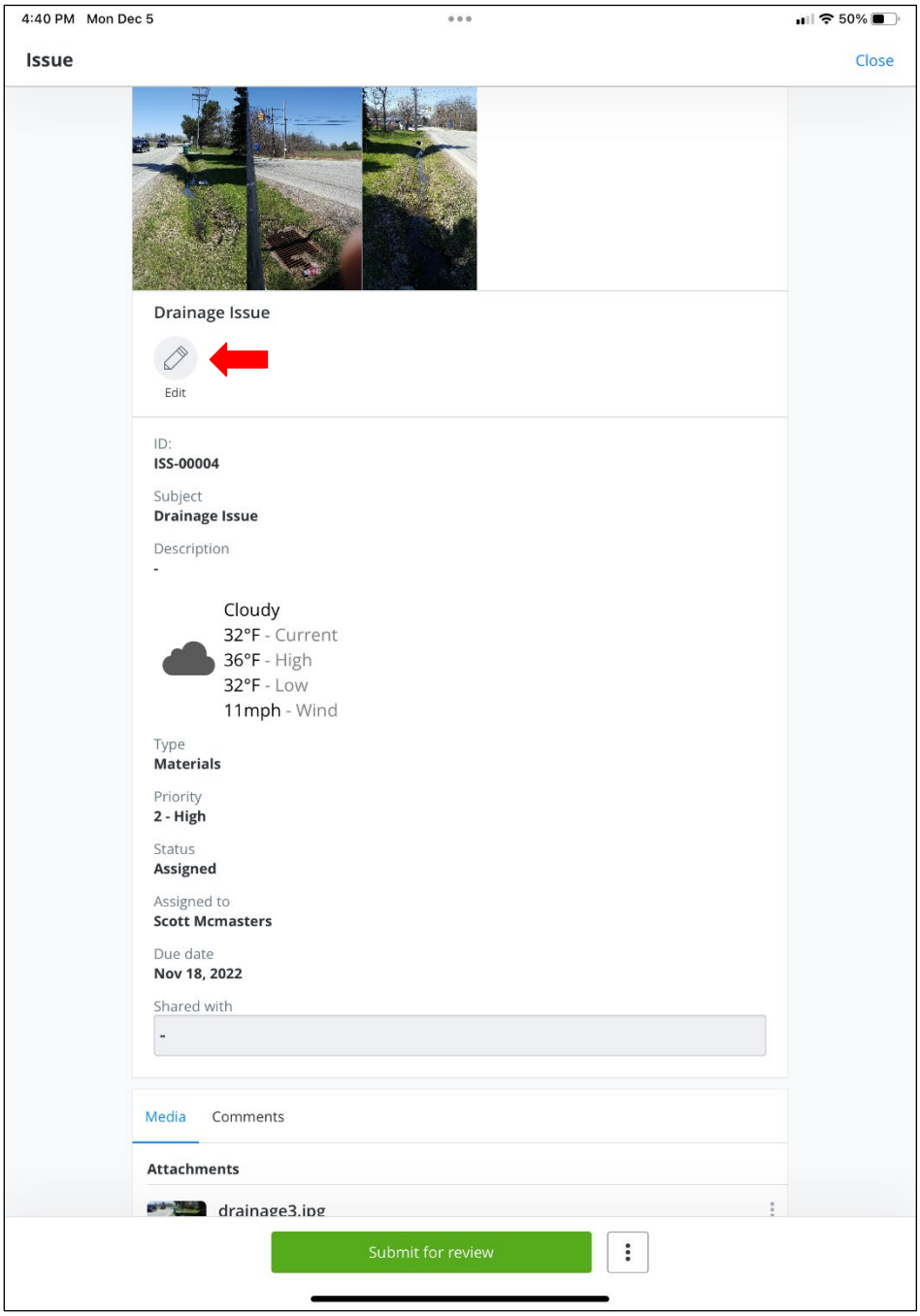
Editing a form is a similar process for all forms. There are some differences in the workflow that are explained the examples here.

1. From the My Work screen, tap on an Issue form to view the content.

2. In order to edit an existing form, tap on the pencil icon next to “Edit” as shown below.

3. Now you will have the ability to update fields on the form. You can look at the various fields here, then close out the form without saving.

4. Other forms are editable in the same manner.

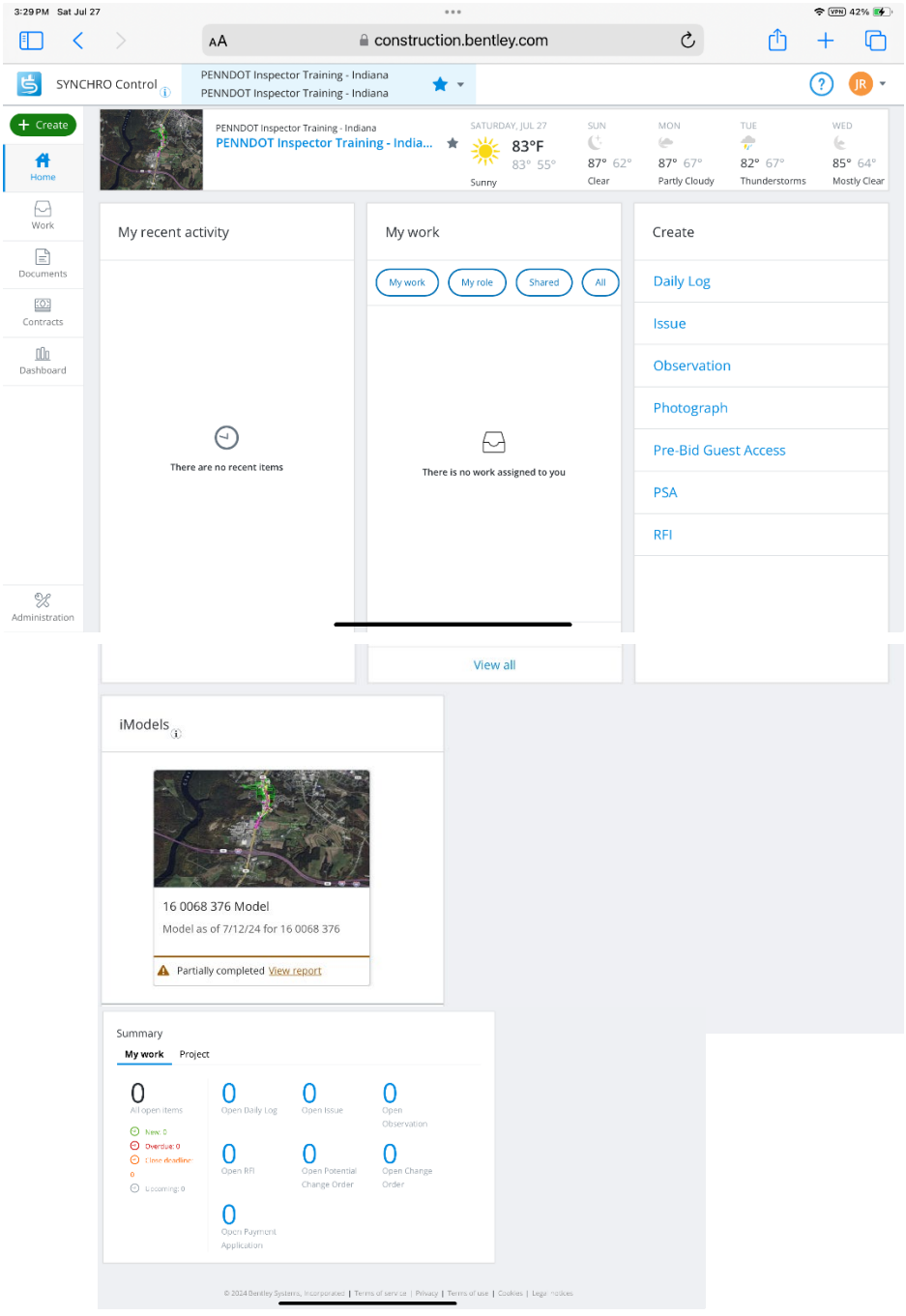


CHAPTER 8. SYNCHRO Control

SYNCHRO Control is a web-based interface that will feel similar to Field but is geared towards project management and administration. It can be accessed from a mobile device using the Safari browser but requires continuous internet connection. This interface provides functionality that isn't yet integrated with Field. We will discuss those functions later in this Guide.

For those with laptops, you will access Control via Chrome or another approved browser. Open your browser and go to https://construction.bentley.com/login

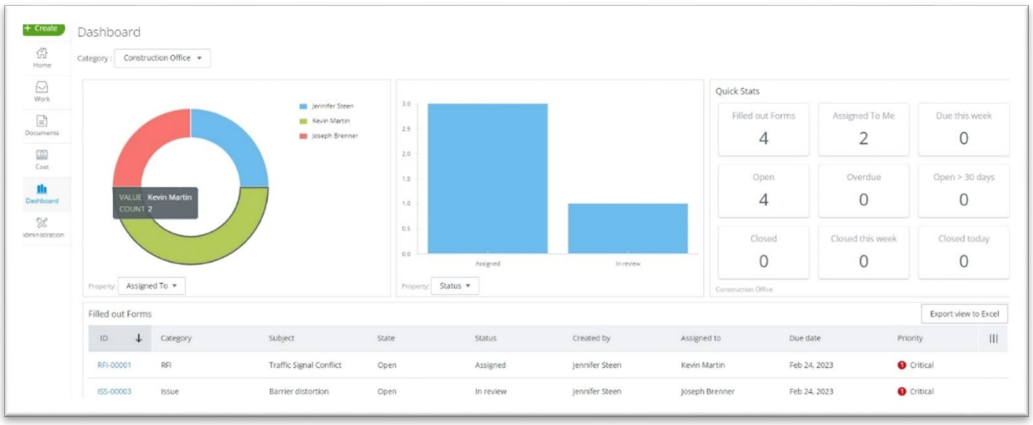
The figure below show the home page of SYNCHRO CONTROL on the iPad:



Notice the similar functions to Field. We will discuss the additional functionality of Dashboard next.

Dashboard

First, let us look at the Dashboard. This is a customizable interface of at-a-glance metrics.

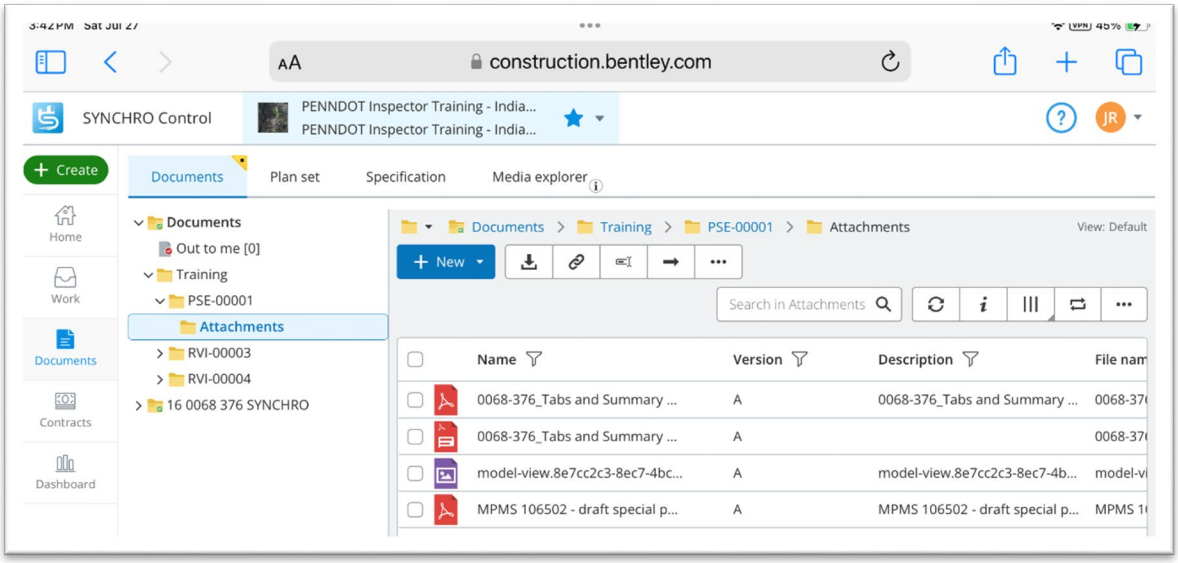


The “Category” pulldown lets you filter on Office and Field data. For this example, we will leave it set to “Construction Office”. Spend some time looking through the various modules.

If you have any issues or concerns about the way the project is configured, you can contact the Digital Delivery Section.

Documents

This is like the Field interface, with a couple of additional options for document storage. “Files”, “Connections”, and “Plan Set” are the same as in Field, with one functional difference. When accessing a PDF, the default is to open it in the Markup tool instead of a read-only viewer.

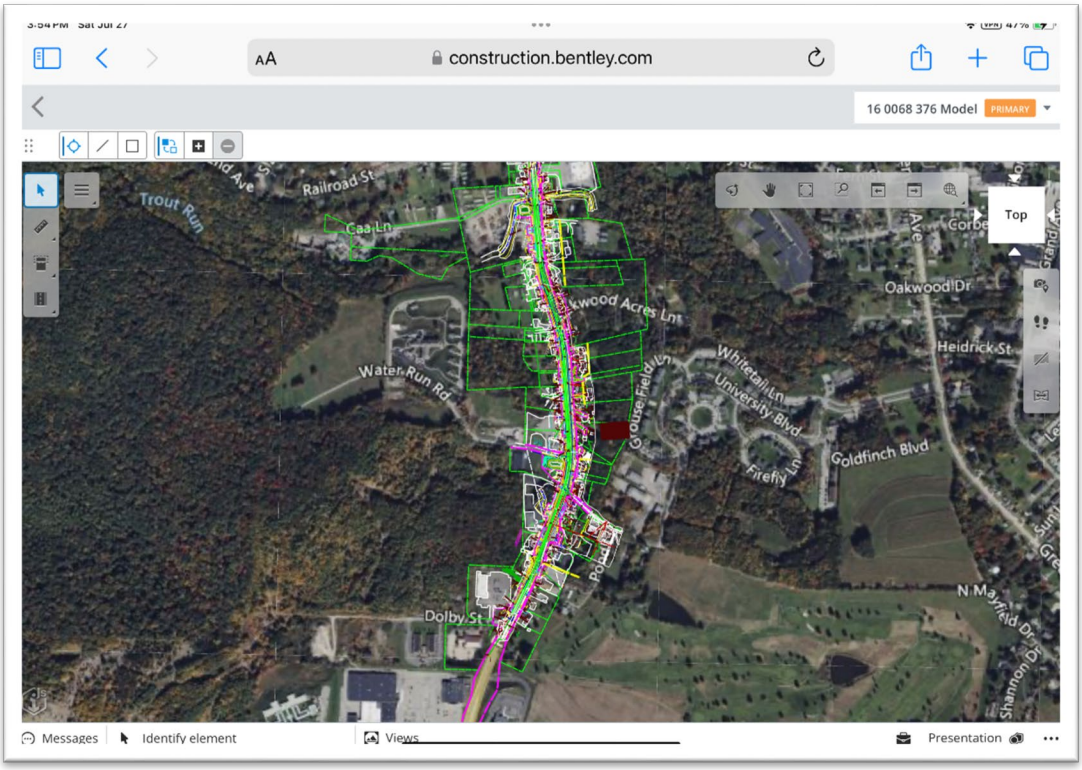


Specification is a custom Bentley storage location that isn't used today but can house any specs and notes that are provided to the Contractor at bid.

Media Explorer houses all media that has been cataloged on the project.

Model Navigation

1. Start by clicking or tapping on "Home" and then scroll down to the iModels.
2. Select *16 0068 376 Model*
3. Once you tap to open the model, your interface will look like the screenshot below, somewhat consistent with Field, but with additional functionality.



The model navigation tools are slightly different from Field. While Control can be set to use a touch screen, by default we are working with a mouse. The View Cube is your friend. Get to know it well! If you find yourself lost in 3D space, clicking on "Top" will change any view to a top or plan view. If that view is rotated, you can click on "Top" again to rotate to geographical north orientation.

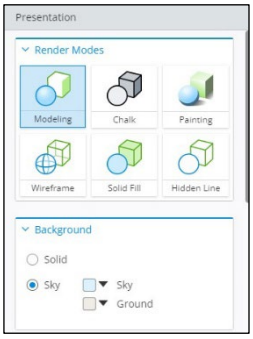
The other Navigation tools are as follows, left to right:

- Rotate About Point**:** allows you to rotate on any point on the model. Make sure your first selection is on the 3D model. If you select off the model you will “fly”off into space. Your way back is either view previous (see below) or, a saved view.
- Pan**:** allows you to grab the model view and move in a 2D plane.
- Fit View**:** pans the camera out to view the entire extent of the model.
- Window Area**:** allows you to zoom into a defined window area.
- View Previous & Next**:** Allows you to scroll through views that have been saved to memory this the current session.

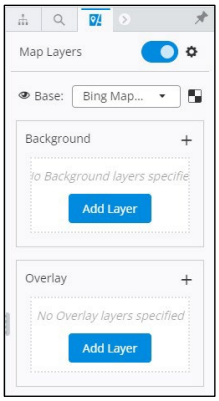
Spend some time navigating the model, then return to a “Top” view. Now we will look at the bottom menu, as shown below:

Bottom Menu Bar

- Messages: Provides application messages and errors.
- Command Instructions**:** This location is where the application gives you instruction regarding your next step with each tool. Look here for guidance when using new tools.
- Views**:** This is the same as “Views” in the Field application. The user can access various saved views to help in navigating and working within the model.
- Presentation**:** This menu is like the one found in the Field application. The user can change the way the model information is presented on the screen. So far, we have spent our time in “Modeling” render mode. Another useful mode is “Wireframe”. The user can also change the background colors of the sky and ground or change to a uniform solid color. This can be handy when working in bright sun or whenever you feel that the background color clashes with the model element colors.



- Snap Mode (Only on desktop CONTROL)**:** Similar to Field, controls how you can tentative snap to objects within the model. NOTE: Control has more functionality than Field when setting snaps. Look through the available snap options.
- Scope**:** refers to the method of selection of objects and their hierarchy withing the attribution schema. This will stay set to Element for the use of SYNCHRO at this time until the model information is more rigidly structured.

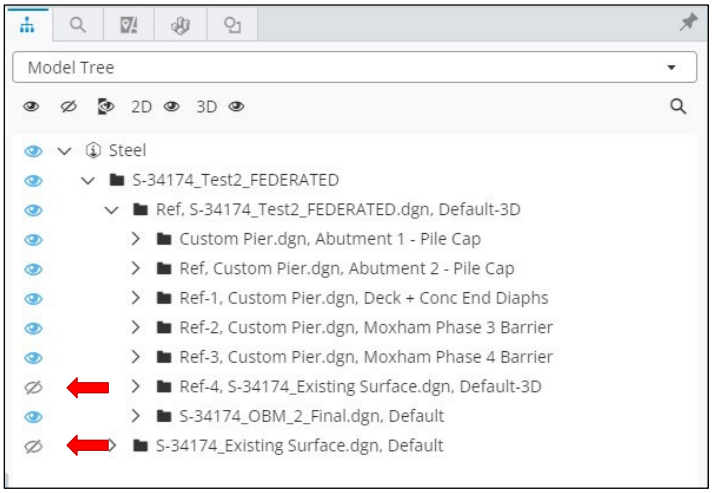


Another useful view control is Map Layers located in the right widget pane. This pane can be pull out by dragging the side bar or double click on the side bar. Here, you can turn on and off the background map, as well as select the type of Bing map to stream. Click on the pulldown menu to see these options:

- **Bing Maps: Aerial Imagery –** aerial map without labeling.
- **Bing Maps: Aerial Imagery with Labels –** adds in road labels, names, and route numbers. Additionally, this provides neighborhood name labels.
- **Bing Maps: Streets –** provides a street map as opposed to an aerial image.

View Controls Within the Model

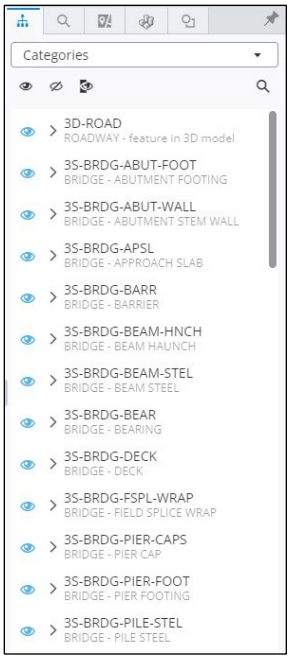
Now we will look at the "Model" tree. This menu can be accessed in the same location as the previous "Map Layers" menu. "Model Tree" provides you with level control of the model. This is where you can turn levels on or off withing a hierarchy. For example, you can turn off the graphics for an entire file, all the way down to the individual levels.



The Eye icon indicates if something in the model is visible or not. Also, along the top of the tree are further view control options, such as turning on and off all 3D objects or all 2D objects.

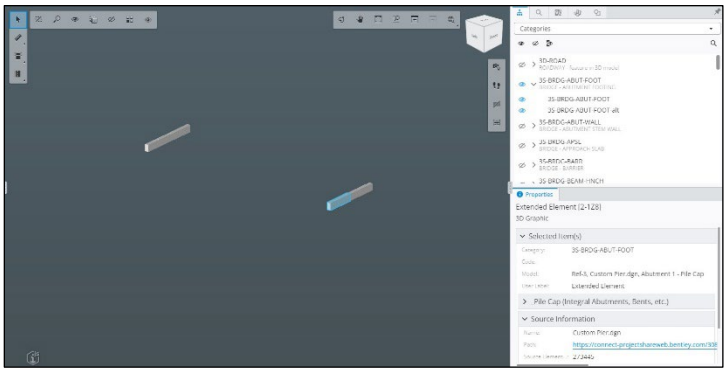
1. Spend some time exploring the "Model Tree" view control pane and then turn off the existing surface file (two locations as shown above).

Now change the "Model" tree to "Categories" in the pulldown list. "Categories" are classified with a field within the object's property that is populated by the design authoring software.



2. Once you have selected “Categories” from the pull down, scroll through the list to see how the list is organized. Clicking on the right arrow will expand the category to show two sub-categories. For this sandbox, the category designated as “-alt” controls the visual elements within the model.

3. Try clicking on a few “eye” icons and turn various objects on and off.



Civil Tools

SYNCHRO Control offers expanded civil tools from SYNCHRO Field. Let us explore some of the different functionality.

The vertical menu ribbon in the upper left of the view contains the Civil Tools. We will look at this in a moment. Other useful tools are under “Measurement Tools” indicated by the ruler icon (red outline). This tool set contains various measurement options like Distance, Area, and Perpendicular Distance.

Selection tool.

Measurements

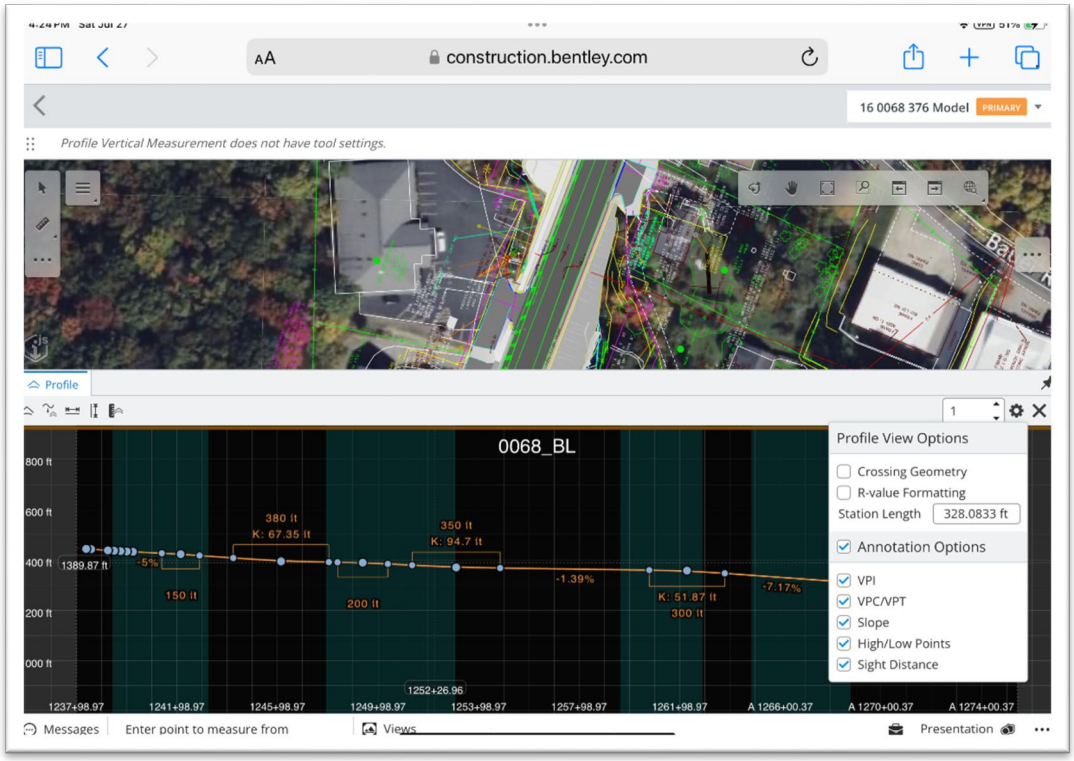
Sections by plain

“Civil Tools” will provide you with various options to query the model. This can include creating a Profile view or a Cross Section view dynamically. You are not able to save profile views.

PROFILE

Profile much the same way in CONTROL as it does in Field. There are a few advantages that we will cover.

Click on “Profile” and either tap on the control line or select 0068_BL from the “Identify” pulldown at the top of the screen. This will open a profile view along the bottom of the screen as shown below.



Settings can be found by selecting the gear icon in the upper right of the profile view.

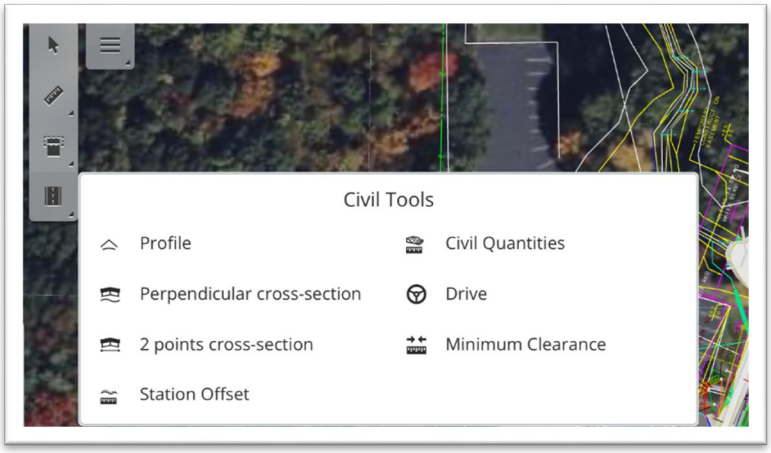
Profiles in CONTROL have measurement tools that allow you identify offset and elevation as well as horizontal and vertical measurements.

Another setting that may be handy is the vertical exaggeration. This is 10 by default. The user can change this in the dialog box in the upper right of the profile window as shown below.

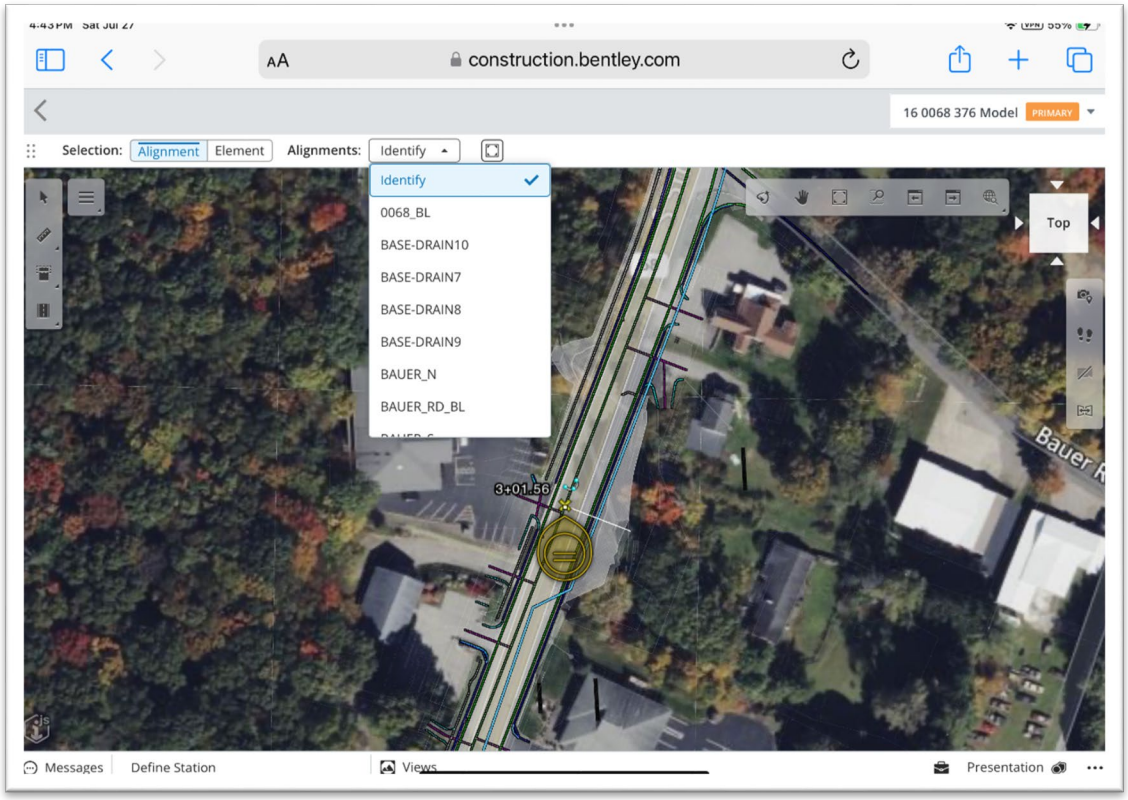
Once you are finished looking at the profile, click the X located in the upper right corner of the profile view to exit.

CROSS SECTIONS

Dynamic corss sections can be created by accessing the Perpendicular cross-sections tool in the Civil Tools fly-out.



1. Select the “Perpendicular Crosss-Section” tool from Civil Tools. You may click on the blue centerline as shown in the screenshot below or pick *0068_BL* from the Alignments pulldown menu. If selecting the alignment graphically, make sure that you get a similar floating dialog box to the one shown in the screenshot below, indicating that you have managed to select the proper alignment graphic.

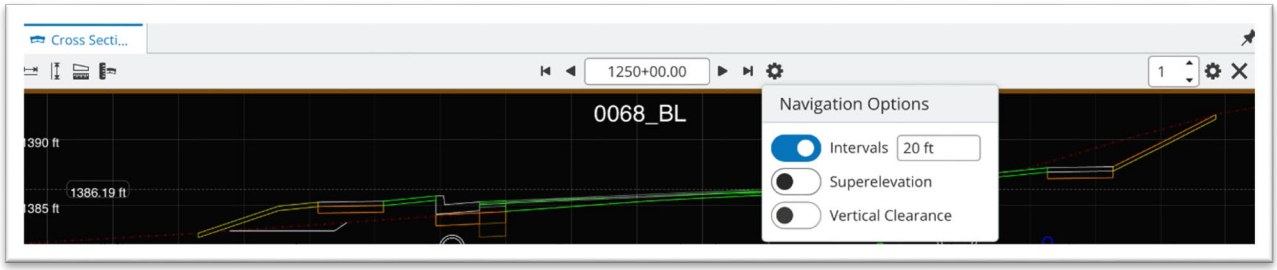


2. Now You will be asked to select the beginning cross section station. The station can be adjusted in a few ways later, so for this exercise, drag your cursor to an area near the alignment location shown in the screenshot to the left, somewhere around STA 2+50.

Notice the line representing the cross section location. This is a dynamic section line that will also allow you to set the offset width as you move your cursor. The cursor will snap to elements in the model, which is fine for this exercise, as it will ultimately create the section width automatically based on the iModel extents.

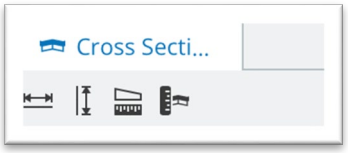
First, let us look at the station input field. Clicking on the gear icon opens a Settings menu that allows you to set the station interval to any distance you desire.

In the upper right of the cross section window is an input field that allows you to set a vertical exaggeration for the cross sections. By default, this is set to 1, or no exaggeration vertically. By clicking on the gear icon to open “View Options”, you can toggle on “Linear Geometry” and set a point weight. It is recommended to turn this on and keep it on at all times.



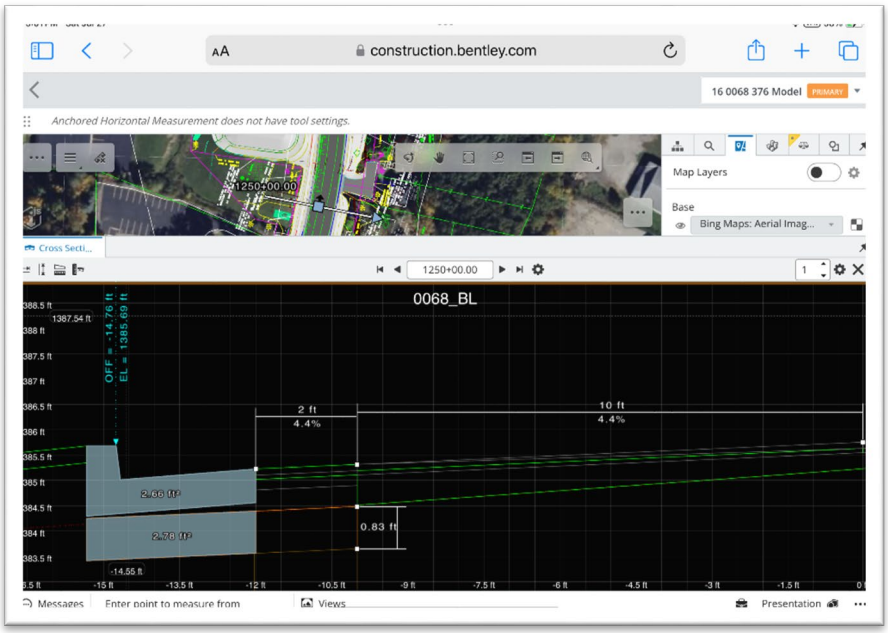
On the far upper left of the cross section view are three icons shown in the screenshot below. These will provide you some dimensioning and measuring tools that SYNCHRO Field does not yet have. If these tools are of significant use to you, accessing Control via a mobile browser will be the only option for now, until these tools are integrated into the Field app.

Let us take a quick look at the three tools, from left to right:



- Create horizontal dimensions of distance and slope
- Create vertical dimensions of distance
- Measure a 2D area
- Identify offset and elevation

3. Pan to the left side of the road. and click on the horizontal dimension icon. Now click on the crown point of the road in the cross section view. It is helpful to get close enough with your cursor that the keypoint snap engages. Now click on the left edge of road. This will draw the horizontal dimension. Now pick a place vertically to display it and left click once again to accept.
4. Now, click on the vertical dimension icon and zoom into the subgrade block of the left shoulder. Click on the right top and bottom points of the subgrade edge and then left click to place the dimension in a visible location.
5. Now click on the area icon and hover over the orange subgrade block. Click in the block and the area will flood and report the square footage.



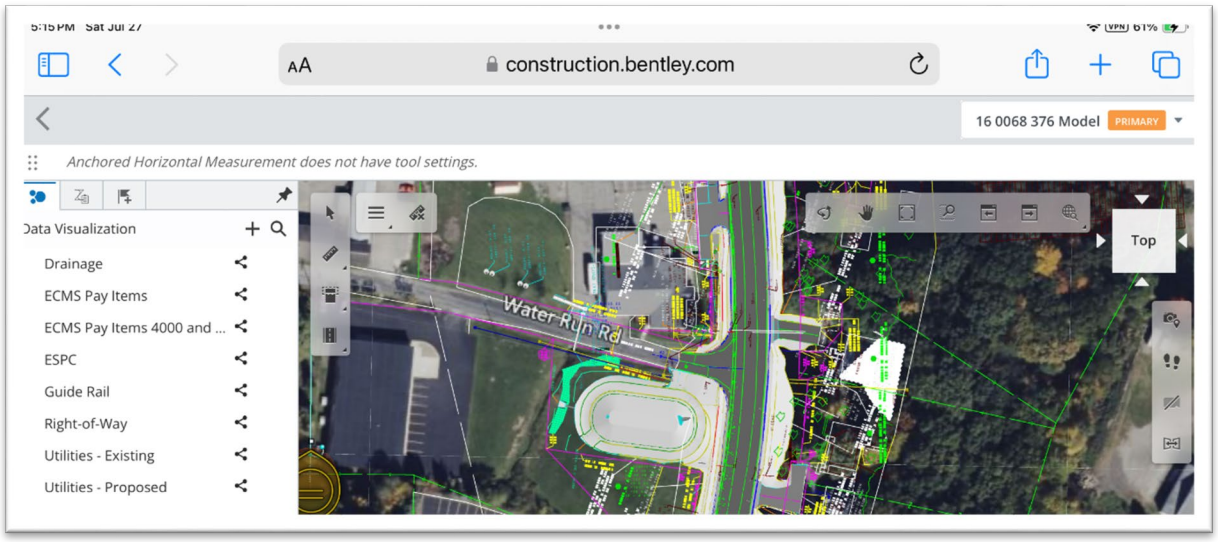
These dimensions will persist as you index to you next station unless the point change in the roadway template. In this case, you will need to re-set your dimensions.

Left Widget Pane

The left widget pane gives you access to Data Visualization and, Civil Reporting. This pane can be accessed by dragging out the sidebar or double clicking on it.

DATA VISUALIZATION

The user can create preset views based on specific criteria found within the model objects. The difference between a saved view and Data Visualization is in the filtering and classification capabilities of the data associated with the model elements.



The list of visualizations has been created by the Design Team. Select Drainage and you will see that all elements that are not part of the drainage system are faded and the drainage elements have been made available.

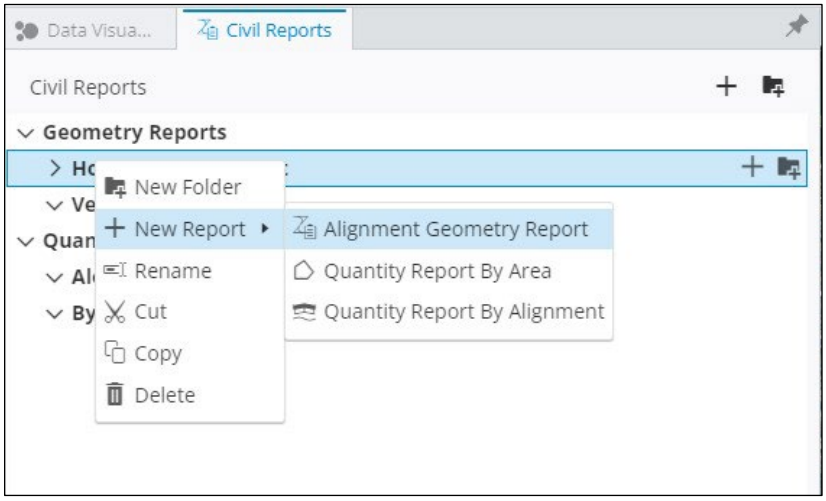
- **Emphasize:** enhances the view of the rebar by making all other elements more transparent and greyscale.
- **Isolate:** turns off the view of all other elements besides the rebar.

Model elements must be initially visible to show up under data visualization.

CIVIL REPORTING

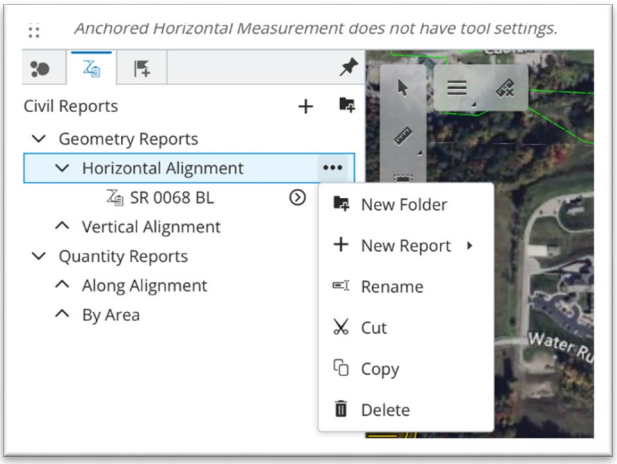
Civil reports can be created in a couple of ways. The user may click the + icon to the far right of the report type as shown below by the red arrow. Conversely, you may right click on the type of report to bring up an alternate menu that allows for the creation of subfolders and new reports, as well as some organizational commands, such as Rename, Cut, Copy, and Delete.

1. Right click on the Horizontal Alignment/New Report/Alignment Geometry Report. You can create any of the standard reports, but for the sake of organization, it is recommended

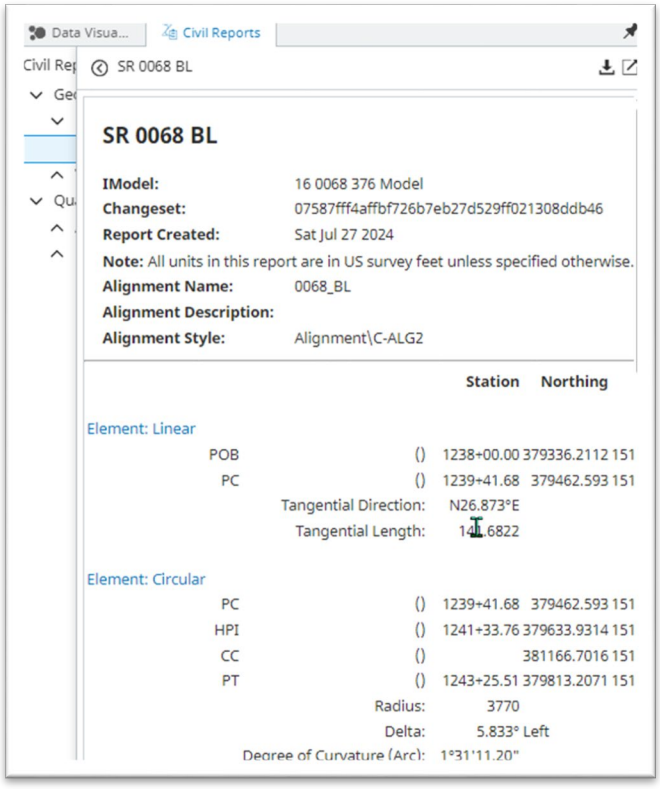


to keep Geometry reports here and Quantity reports within the Quantity Reports section.

The horizontal and vertical reports for SR 0068 BL have been created by the Design Team. Click on the report to view it in either a pop-up or separate browser window.



As shown in the screenshot to below you will see the Alignment name, description, and style, if properly noted within the design model. You will also see the iModel name and a date the report was created.



If you wish to save this report as a spreadsheet, you can export it using the button denoted by the icon in the upper right corner of the report. You can also open the report in a new window with the button to the right of the Export button.

The report will look like the screenshot below:

	A	B	C	D	E	F
1				Station	Northing	Easting
2	Element: Linear					
3		POB	()	782+31.84	693042.6551	1327585.9172
4		HPI	()	788+88.28	693667.1683	1327788.1536
5			Tangential Direction	N17.944°E		
6			Tangential Length	656.4422		
7	Element: Linear					
8		HPI	()	788+88.28	693667.1683	1327788.1536
9		HPI	()	789+85.23	693759.3285	1327818.2536
10			Tangential Direction	N18.087°E		
11			Tangential Length	96.9511		
12	Element: Linear					
13		HPI	()	789+85.23	693759.3285	1327818.2536
14		HPI	()	793+44.86	694102.0522	1327927.2309
15			Tangential Direction	N17.639°E		
16			Tangential Length	359.6325		
17	Element: Linear					
18		HPI	()	793+44.86	694102.0522	1327927.2309
19		POE	()	796+71.48	694414.1918	1328023.392
20			Tangential Direction	N17.123°E		
21			Tangential Length	326.6162		

NOTE that unless you rename the report, the exported spreadsheets will all have the same name with a numerical suffix.

SYNCHRO CONTROL FORMS

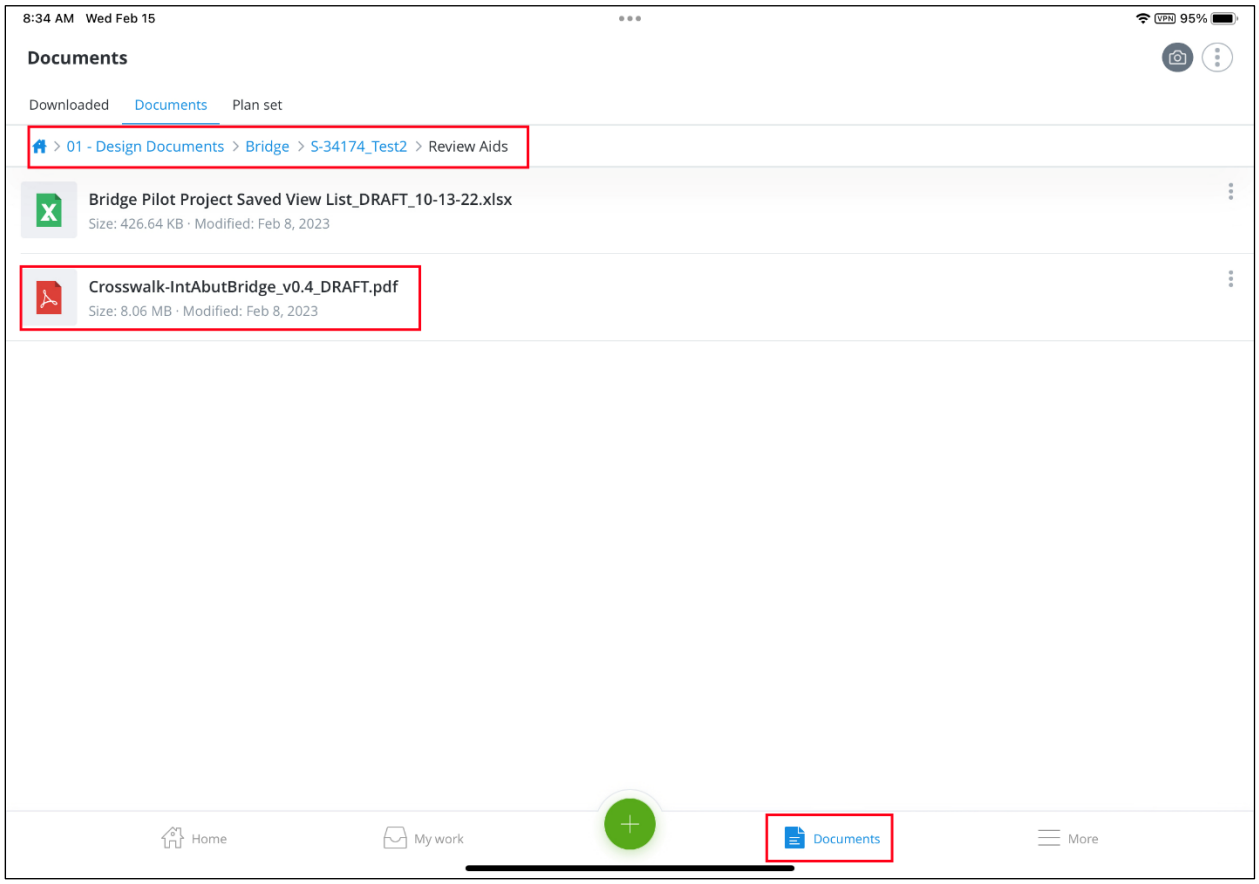
Forms in CONTROL function identically as they do in Field. The location and method of placement are different. Issue can be placed by selecting New in the bottom widget pane.

Navigate to the location of the issue and select New then select the type of form and place the issue. The form will pop up you will be able to fill in the form as discussed in CHAPTER 7. Forms and Reports.

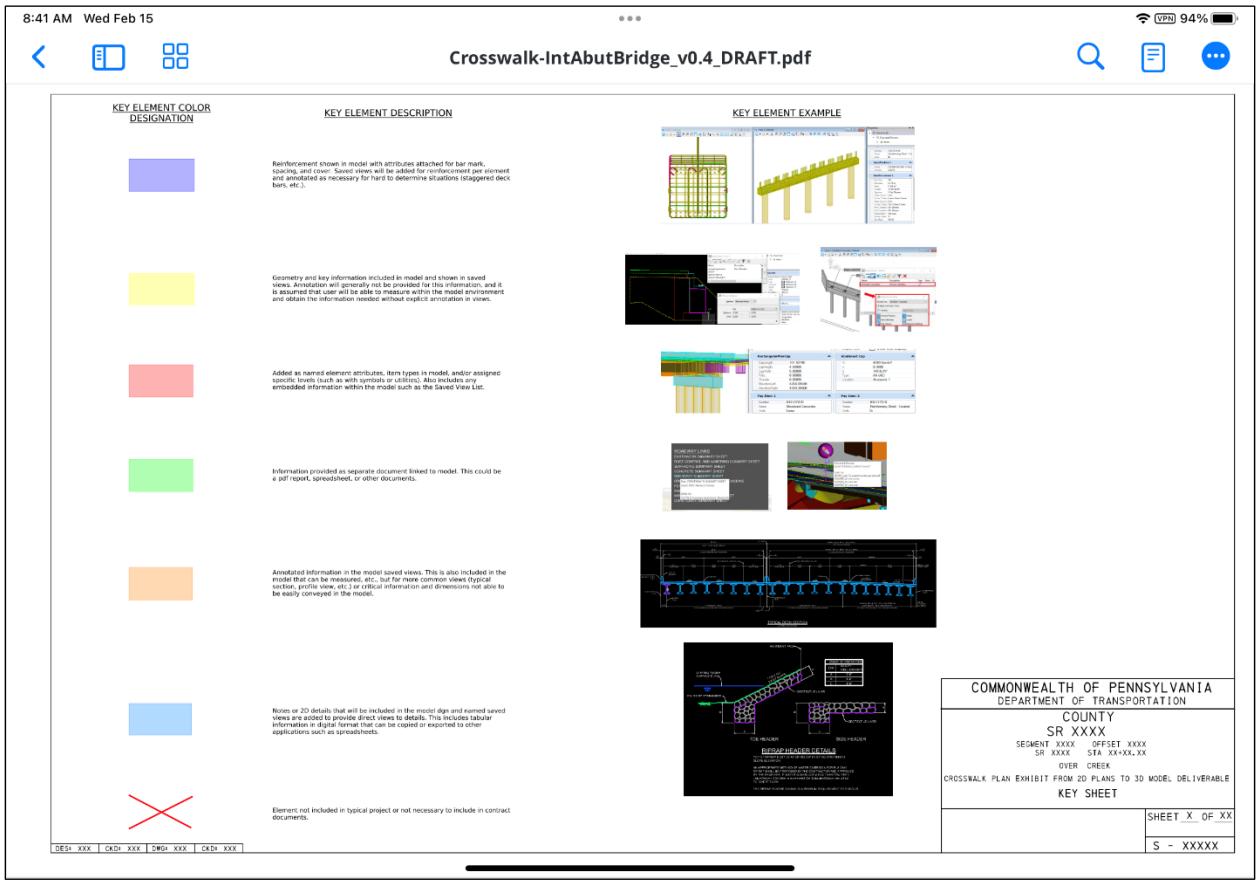
CHAPTER 9. Model Based Bridge Inspection

Structure Data Cross Reference Sheet

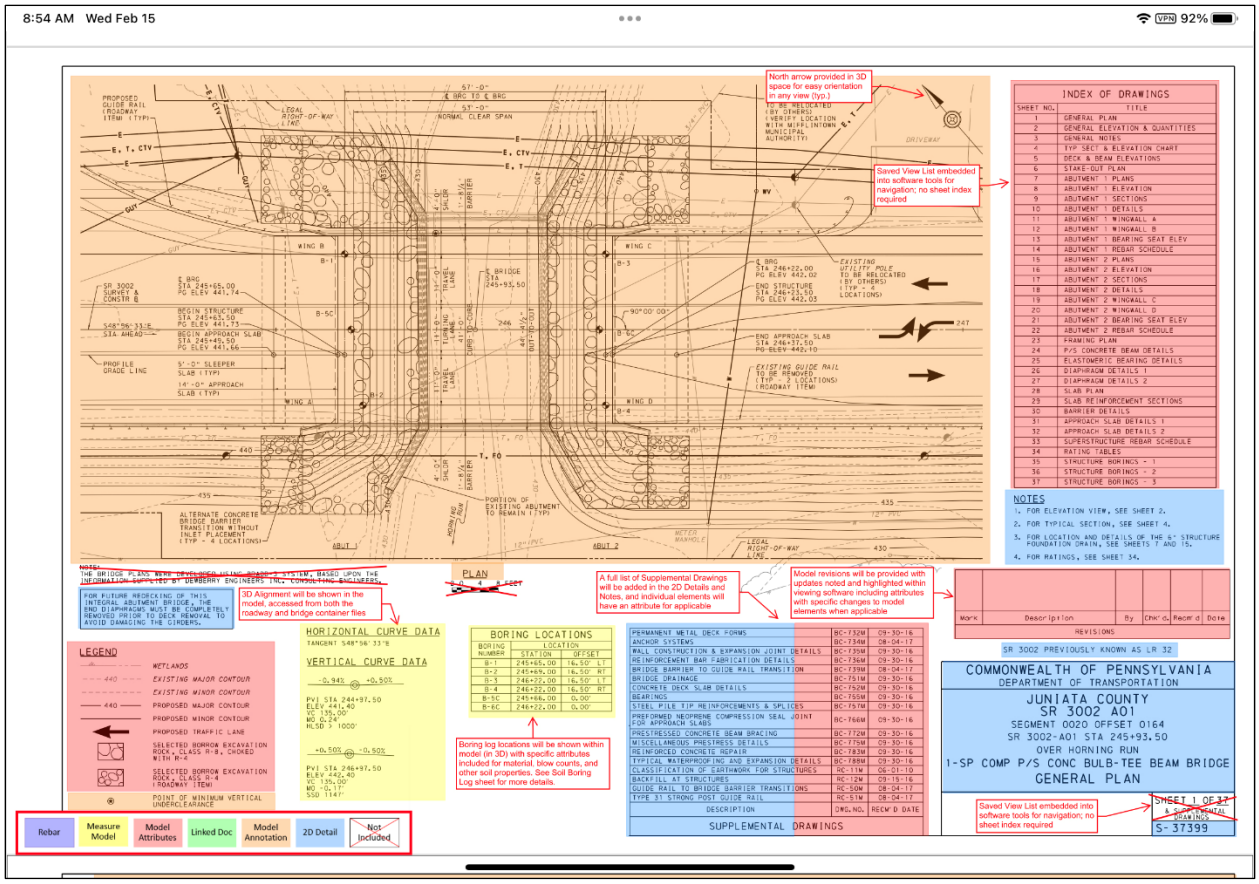
The Digital Delivery team has developed a markup up traditional bridge plan set that will help you understand how data will be transitioned from a 2D plan set to 2D and 3D models along with other documents. This PDF document is named “Crosswalk-IntAbutBridge.v0.4.DRAFT” and located in the Documents section of SYNCHRO.



Page one, of this document, provides a key to the markups. Each group of data is blocked in a specific color that indicates the type and location of the data that you will encounter. Some information will be in the iModel as 3D data others will be included in the model as 2D Views and finally there will be other documents in PDF or spreadsheet form.

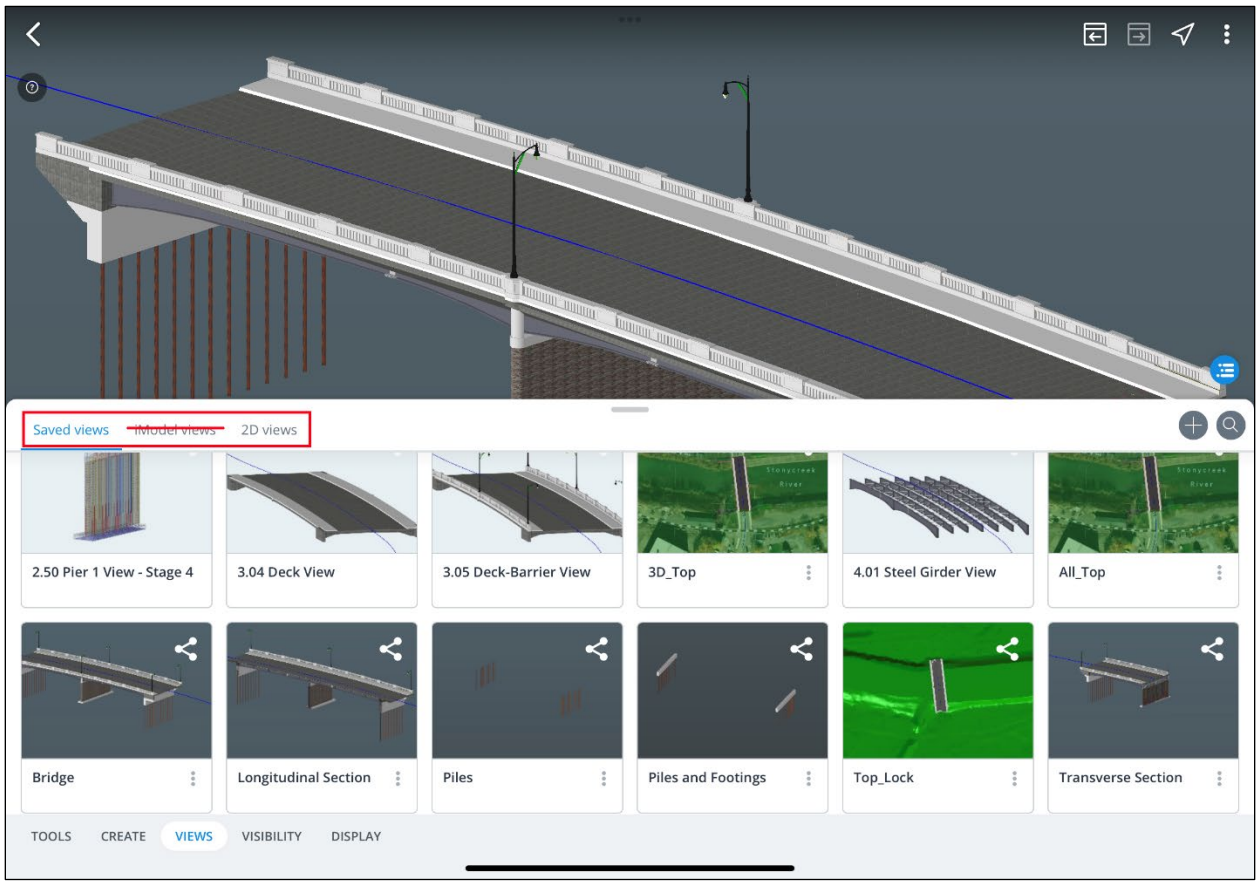


This example shows how each sheet will be color coded to clearly indicate the location of each data set. There will be a legend at the bottom of each sheet that will provide a reminder of the coding.



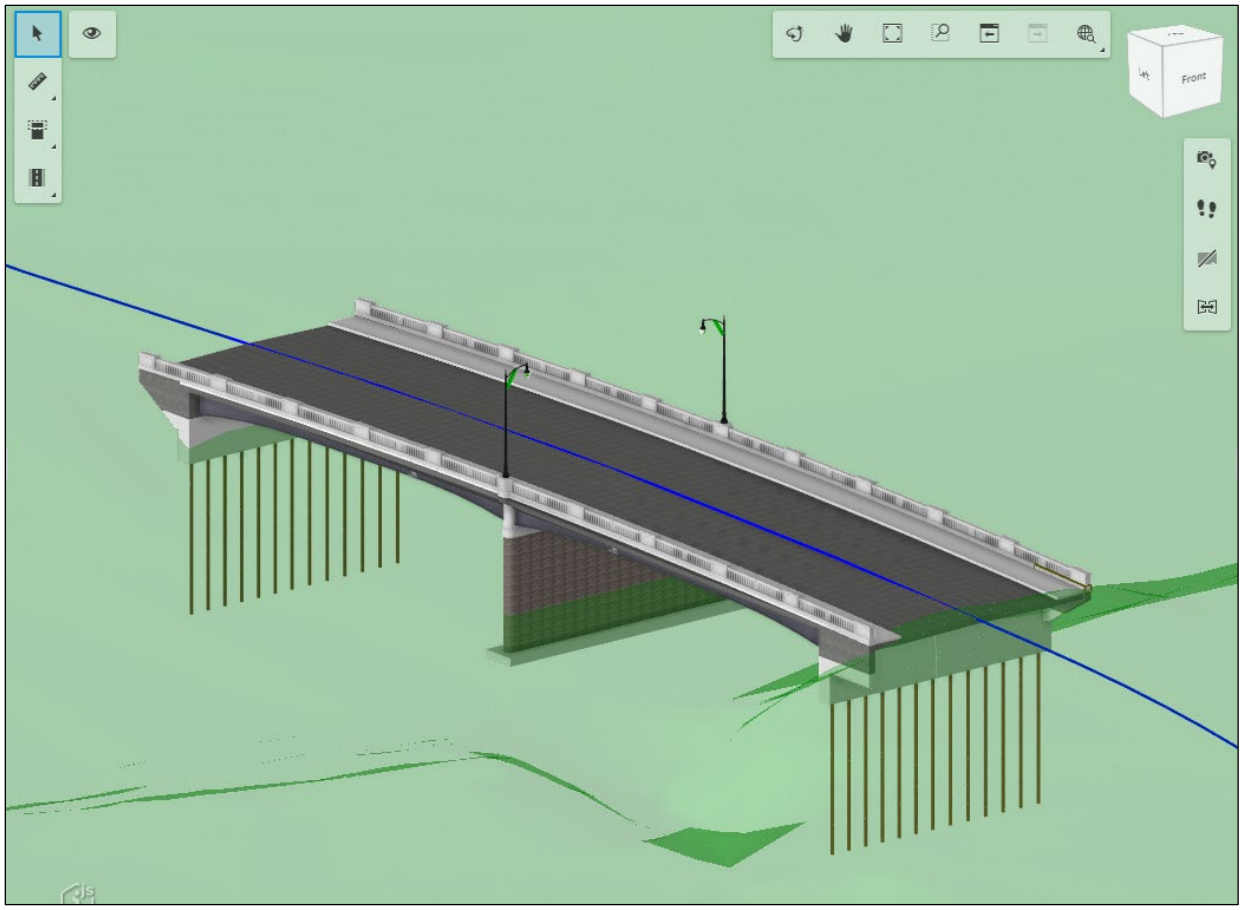
Structure Saved Views

Specific structure views have been created to allow you to quickly reach a view where you can get properties, measurements and other information while navigating the model. There are three different view selections; Saved View, iModel Views, and 2D Views. Saved Views contains the pre-selected view states of the structure for your use. You are able to modify the model and create your own view by tapping on the **plus mark** in the grey circle located in the upper right corner of the Saved View dialog. Each view has been created to provide with easy access to various bridge elements.



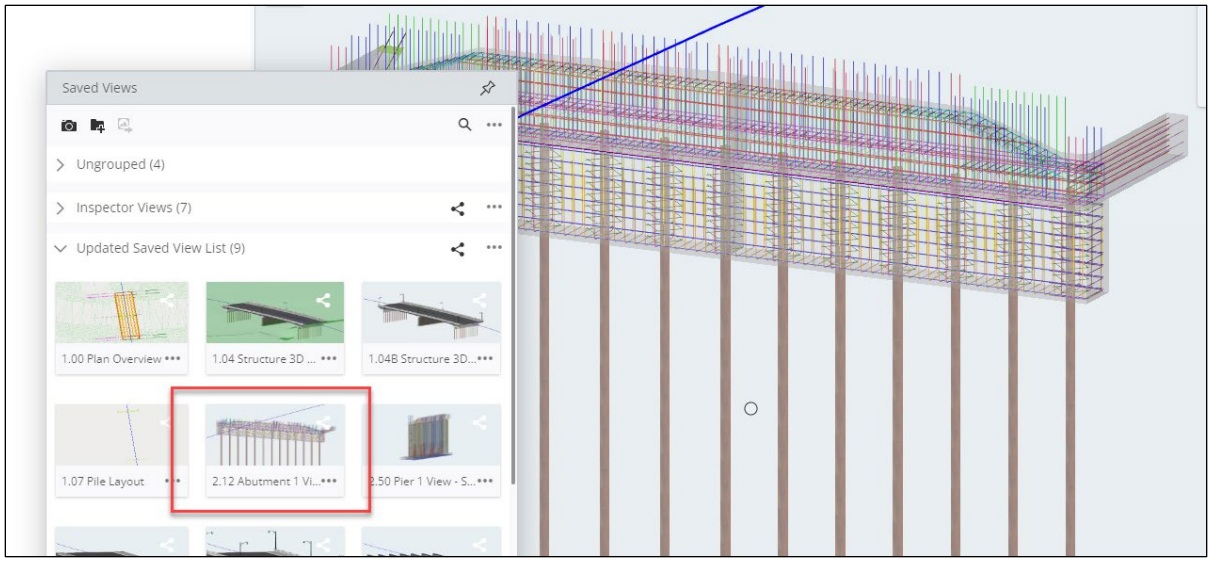
After selecting a view, you will be able to further modify the Display and Visibility by selecting each of these in the bottom menu bar.

1. Navigate to the *1.04 Structure 3D View* Saved View. This is an overall view of the bridge and any available additional 3D elements (ground surfaces, roadway corridors, etc.).

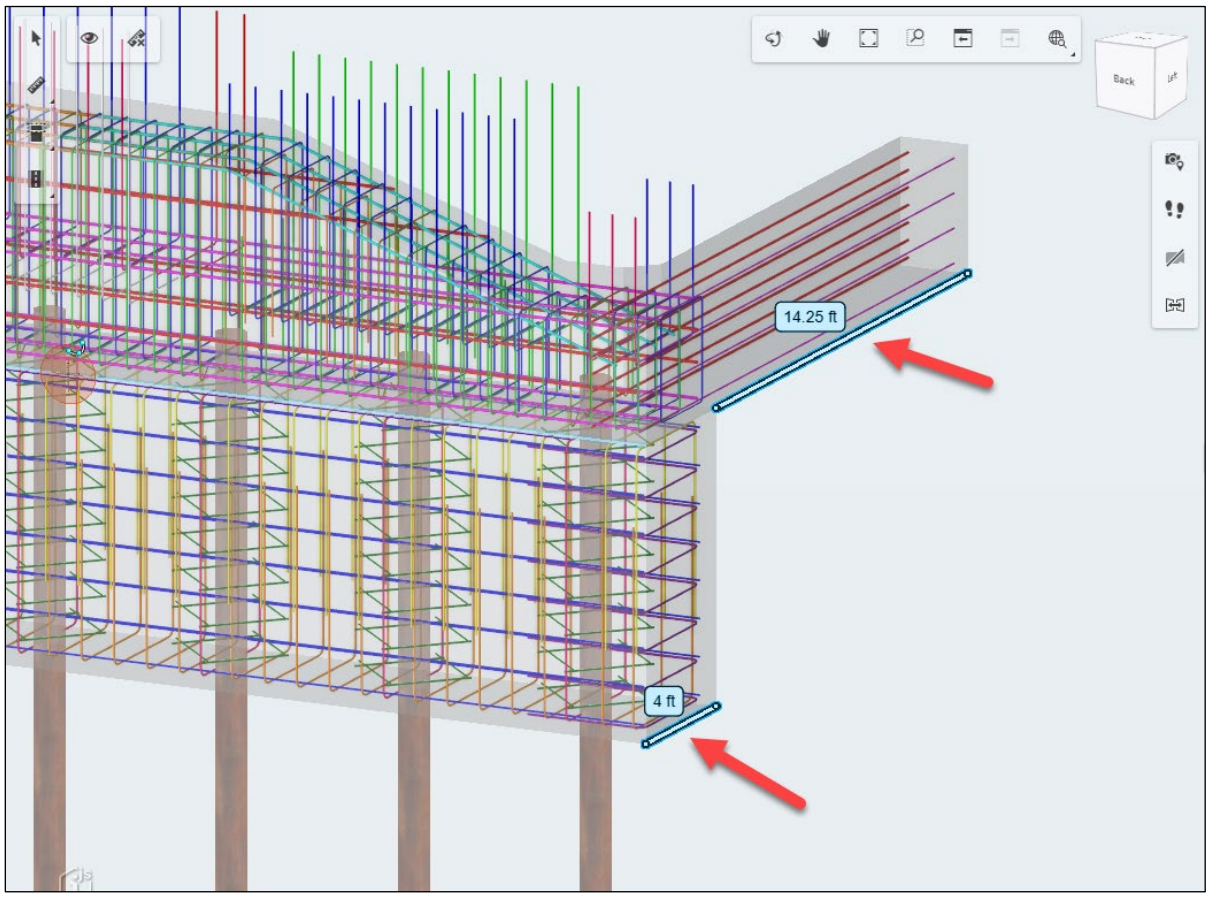


2. Spend some time using the navigation tools previously explored in the earlier chapters. At a minimum:
    a. Rotate the model
    b. Zoom in/out
    c. Change the Presentation (Render Mode, Background Map)
    d. Use Visibility to turn off the following components:
        i. Bridge deck (3S-BRDG-DECK)
        ii. Approach slabs (3S-BRDG-APSL)
        iii. Barriers (3S-BRDG-BARR)
        iv. Sidewalks (3S-BRDG-SDWK)
        v. Existing surface (V-SURF-00)

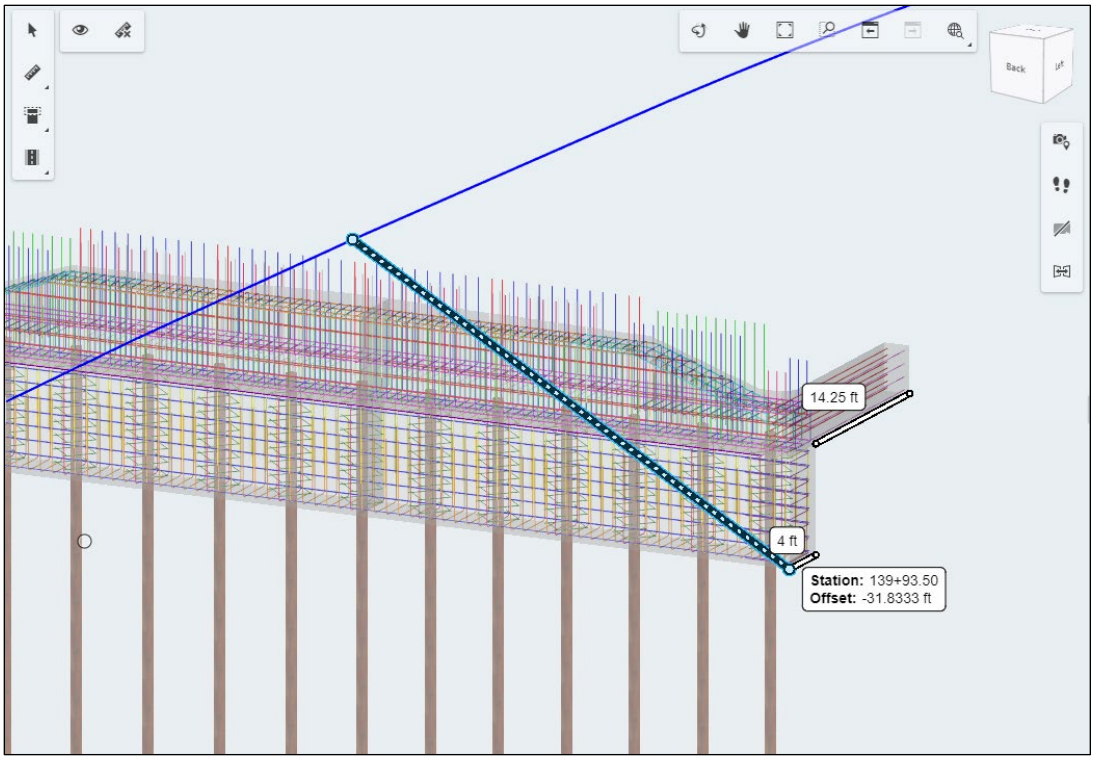
3. Next, navigate to the *2.12 Abutment 1 View* Saved View.



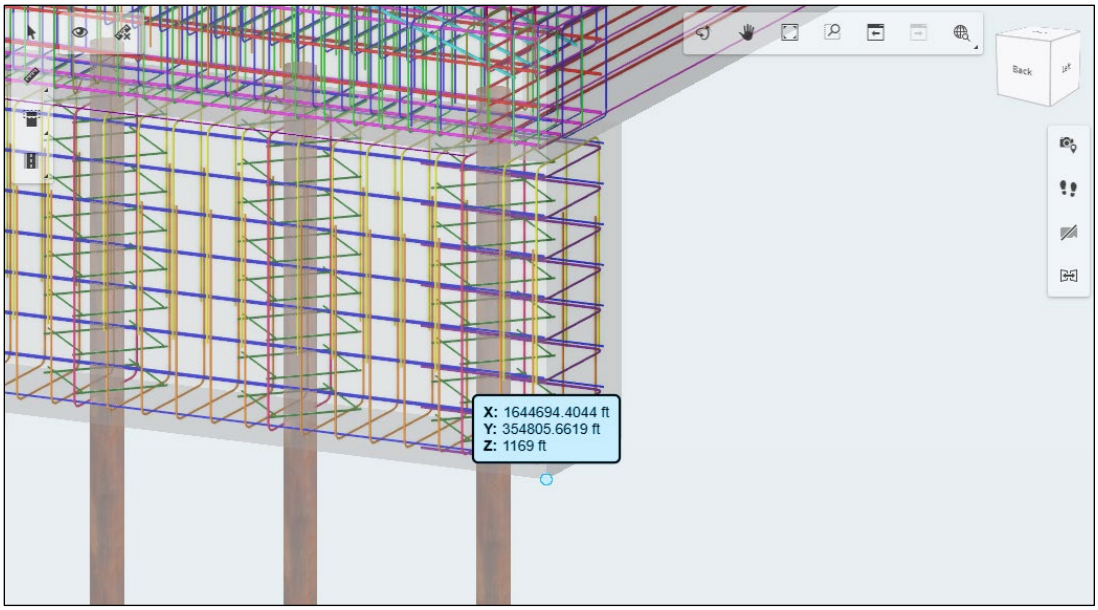
4. Measure the abutment cap width and wingwall length.



5. In the same view, zoom out and use the Station Offset tool for the corner of the abutment.

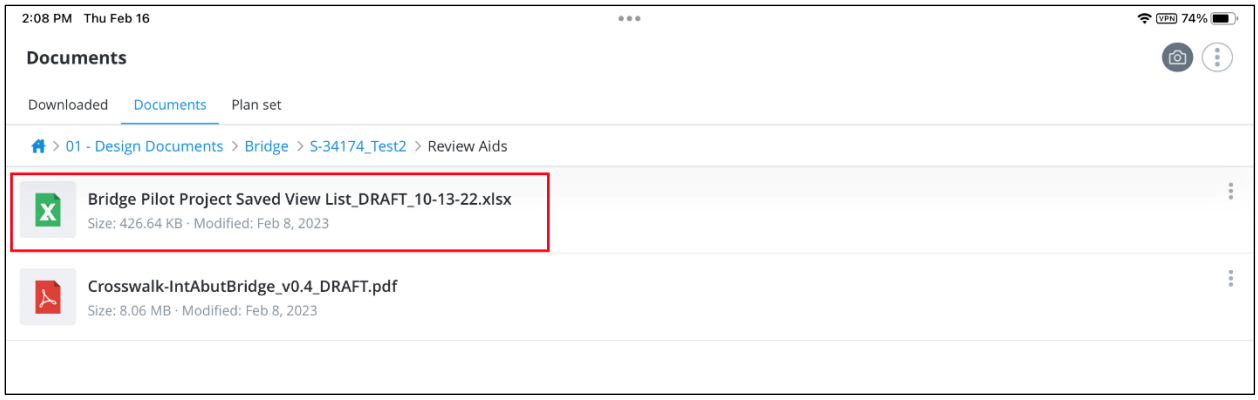


6. Finally, in the same view, use the Location tool to find the Coordinates and Elevation at the abutment corner.



7. Spend some time navigating to the other Saved Views in the iModel. At a minimum, find the following views:
    a. The pile layout
    a. Steel girder
    b. Pier Stage 4

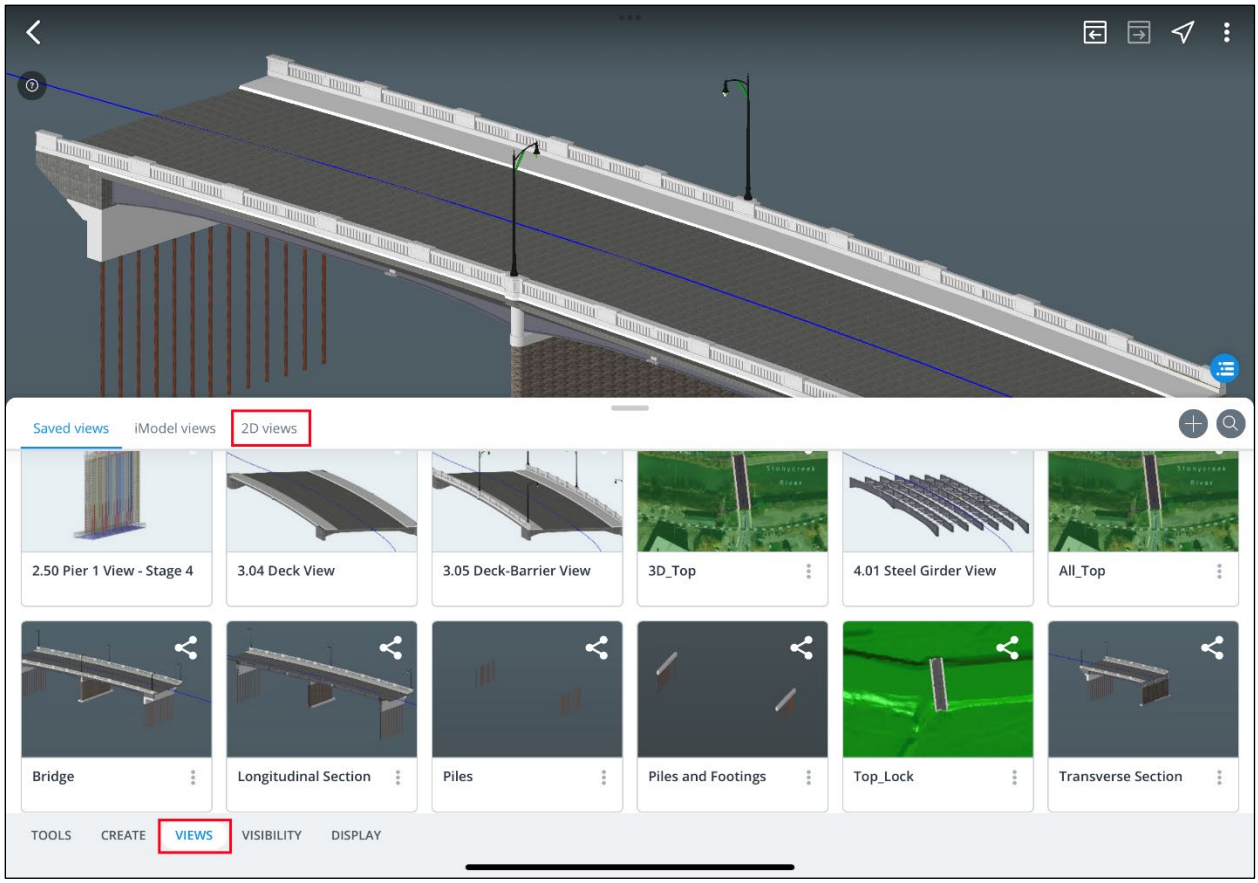
An example of a full list of project-specific Saved Views is included as an Excel Spreadsheet named “Bridge Pilot Project Saved View List_DRAFT_10-13-22.xlsx” and located in the Documents section of SYNCHRO.



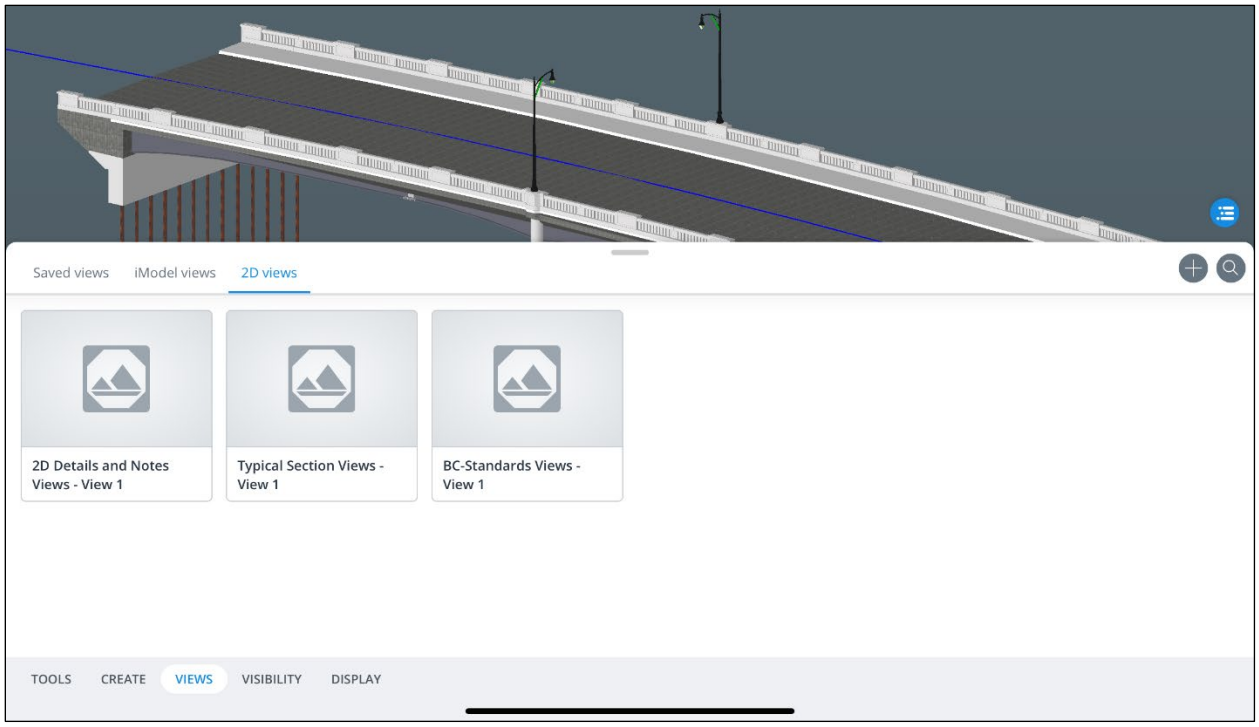
Details and Standard Data

Details and standard data will be supplied as 2D views withing the iModel. These views will consist of required supplemental 2D details (project-specific and BD-Standards), notes, typical sections and PennDOT BC-Standards.

The 2D Views can be accessed through the iModel view, (see Saved Views & Background Map in Chapter 6) by tapping on Views in the bottom menu bar. With this screen you are able to select the 2D Views tab.

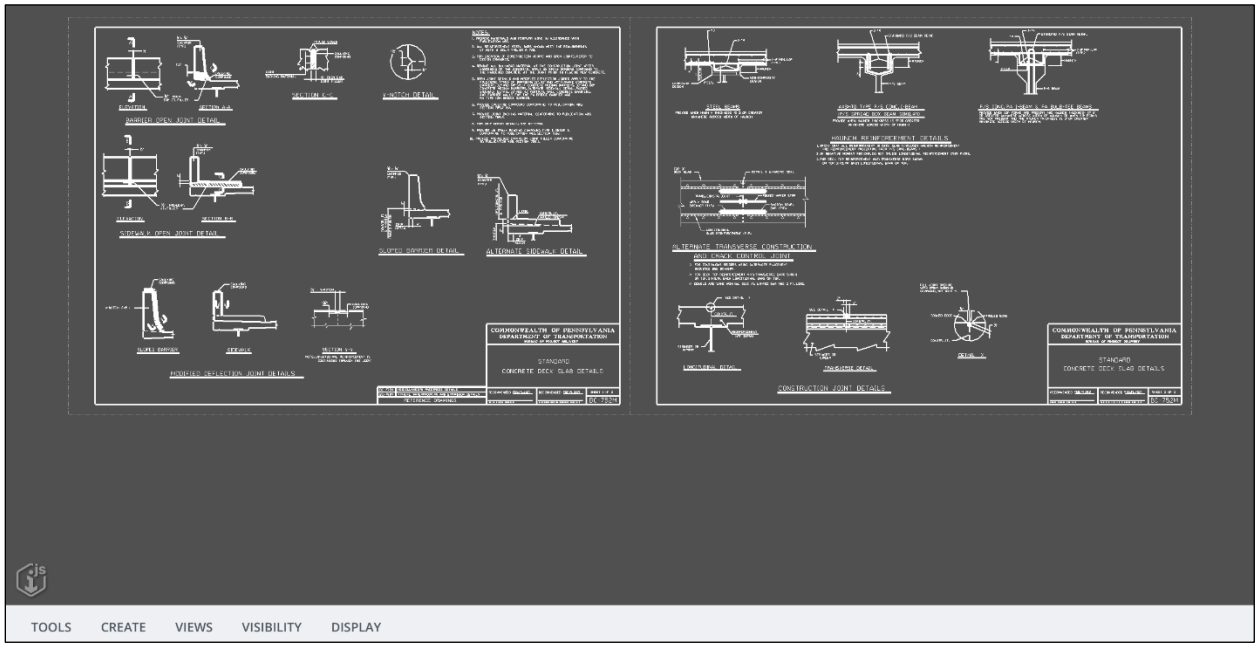


2D Views will provide you with a selection all 2D data included with the iModel. Select the desired data set to view the contents. Use the typical iPad navigation techniques to zoom and pan to you desired information:



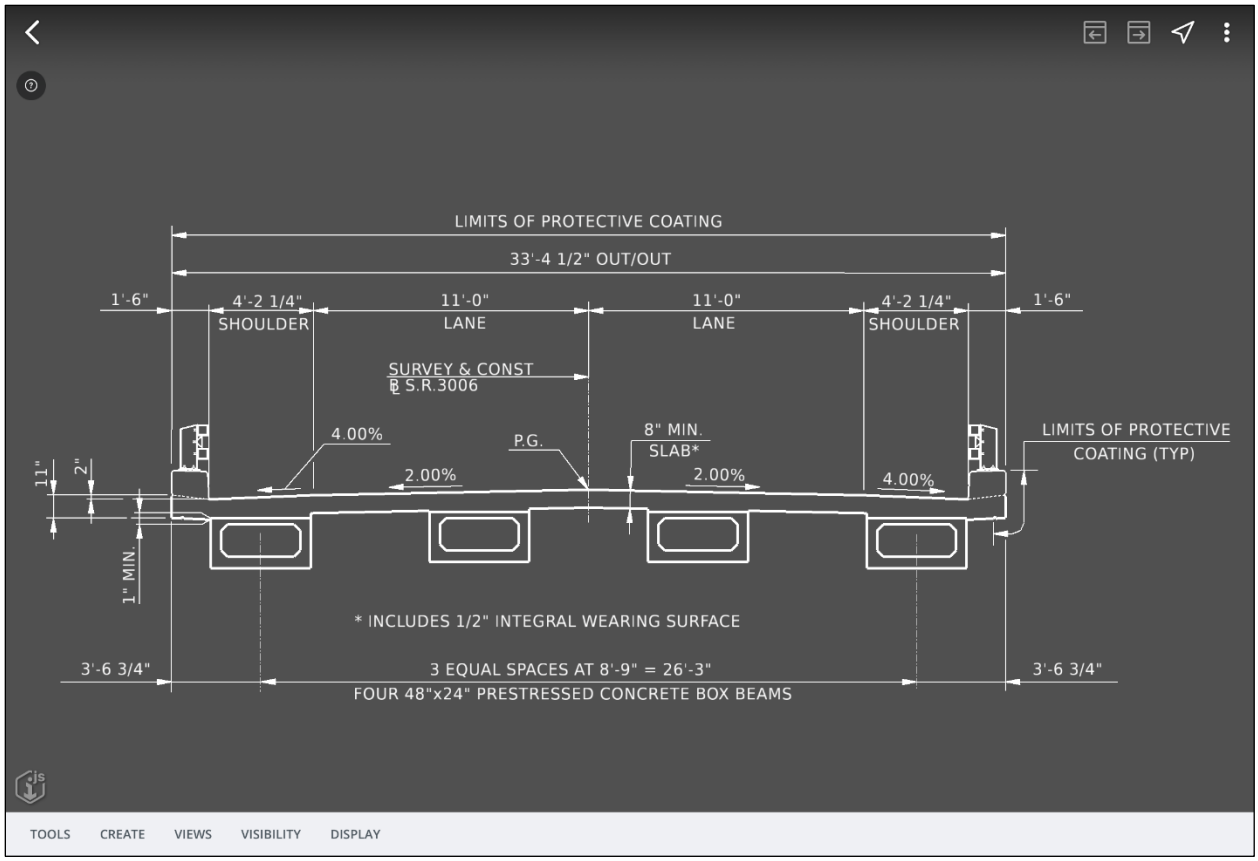
BC-Standards

Tap on the “BC-Standards Views” to open. Use the normal iPad navigation methods to zoom and pan to view the information needed on these sheets. Only the standards required for the project will be available in this view.



Typical Sections

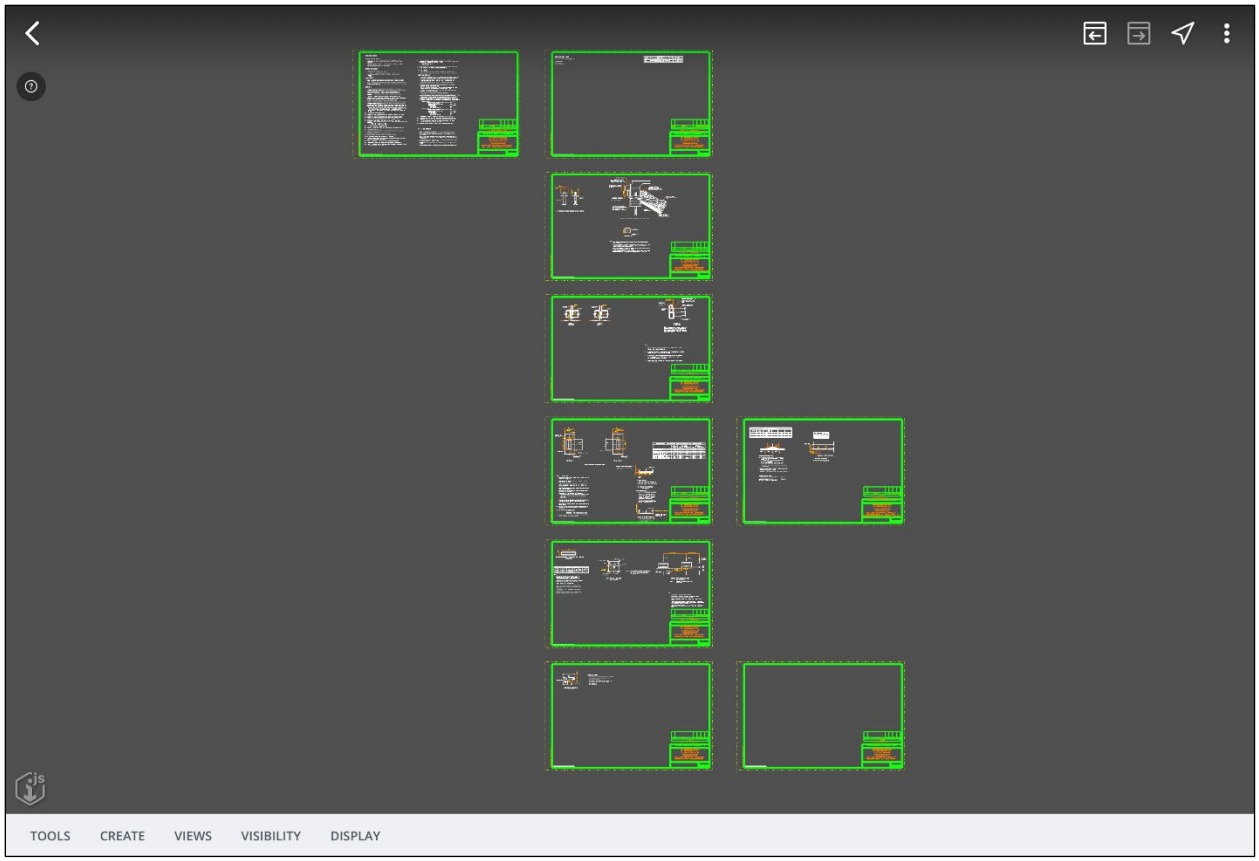
Tap on the Typical Section View to open. Use the normal iPad navigation methods to zoom and pan to view the information needed on these sheets.



This view is indicative of several views that will be annotated 2D views generated from the model. For example, The General Plan and Elevations, Typical Sections, Framing Plan, and others are intended to be model-generated Annotated 2D views. The dimensioning tools in Synchro can be used in these views to provide additional information beyond the provided annotations.

Details and General Notes

Tap on the 2D Details and Notes View to open. Use the normal iPad navigation methods to zoom and pan to view the information need on these sheets.

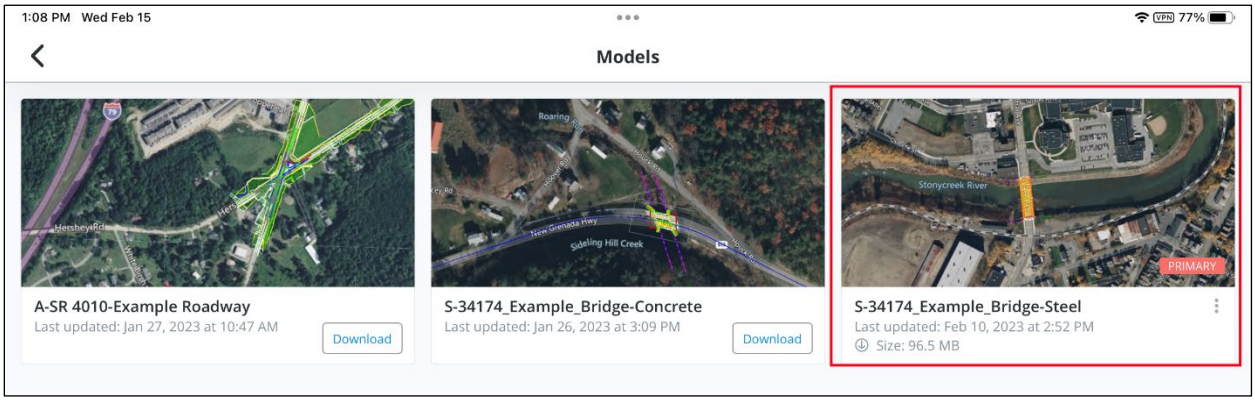


Note that these 2D Details and Notes are not generated from the model and are not typically to scale. These are intended as supplemental details to the model. The recommendation is to review these notes and details first to understand additional detail level for elements that will not be included in the 3D model.

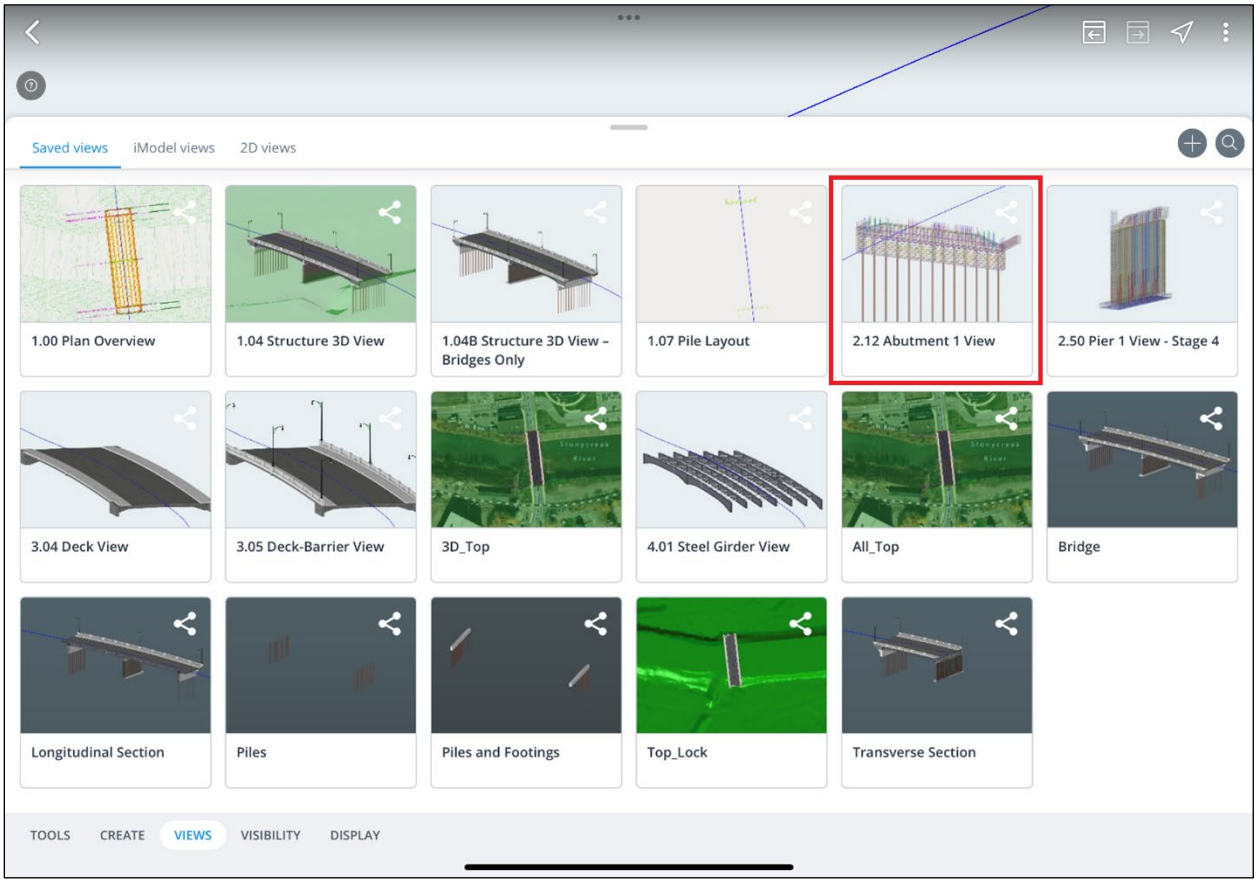
Bridge Element Properties

The Structures modeling program has begun to embed PennDOT specific bridge member data into the model. In this exercise you will data can be revealed from each model element.

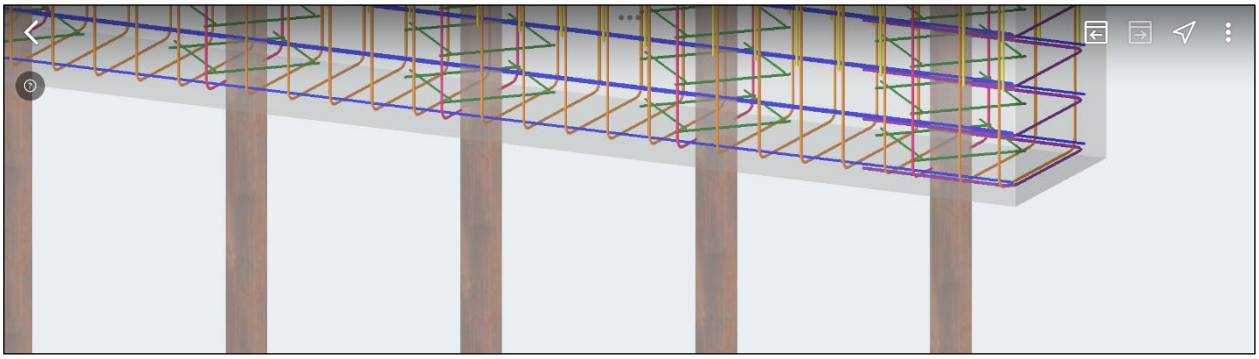
1. Open the S-34174_Example_Bridge-Steel model



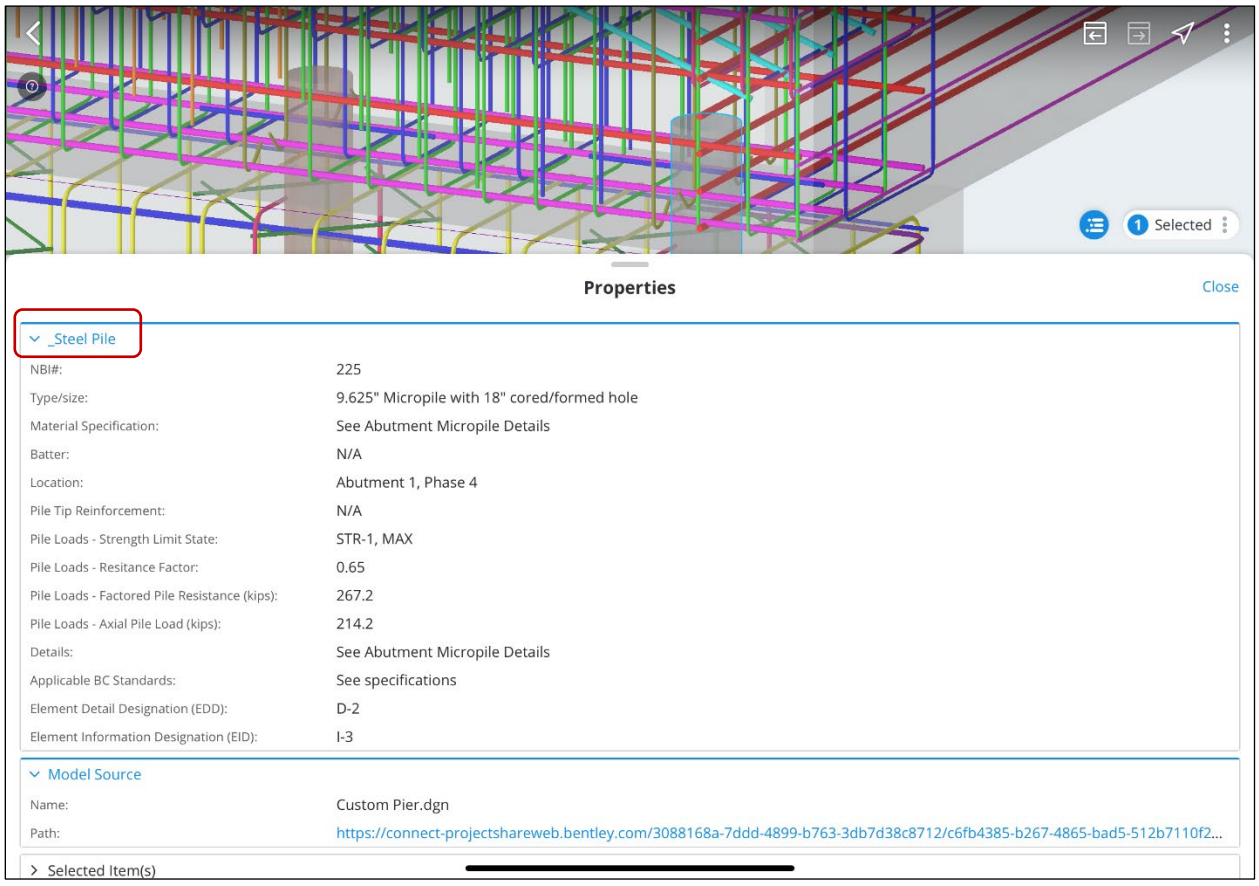
2. From the main model screen, tap on “Views”, then select the *2.12 Abutment 1 View* Saved View.



3. Zoom into the right-most abutment in the isometric view, until you see the rebar layout similar to the screenshot below.

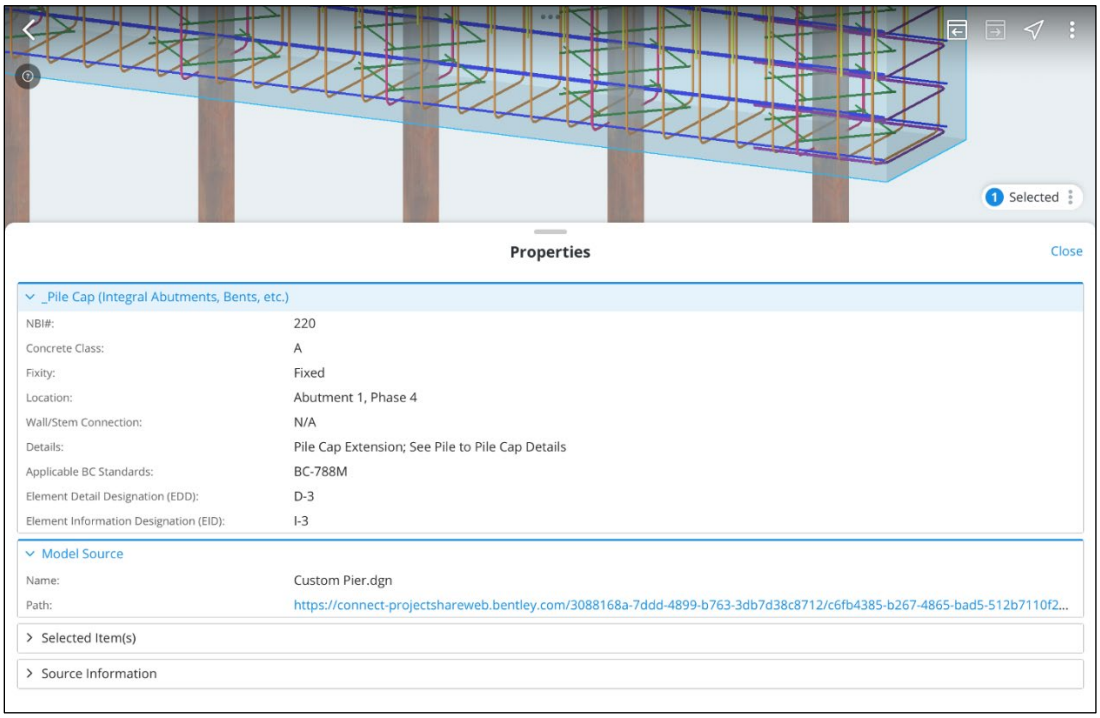


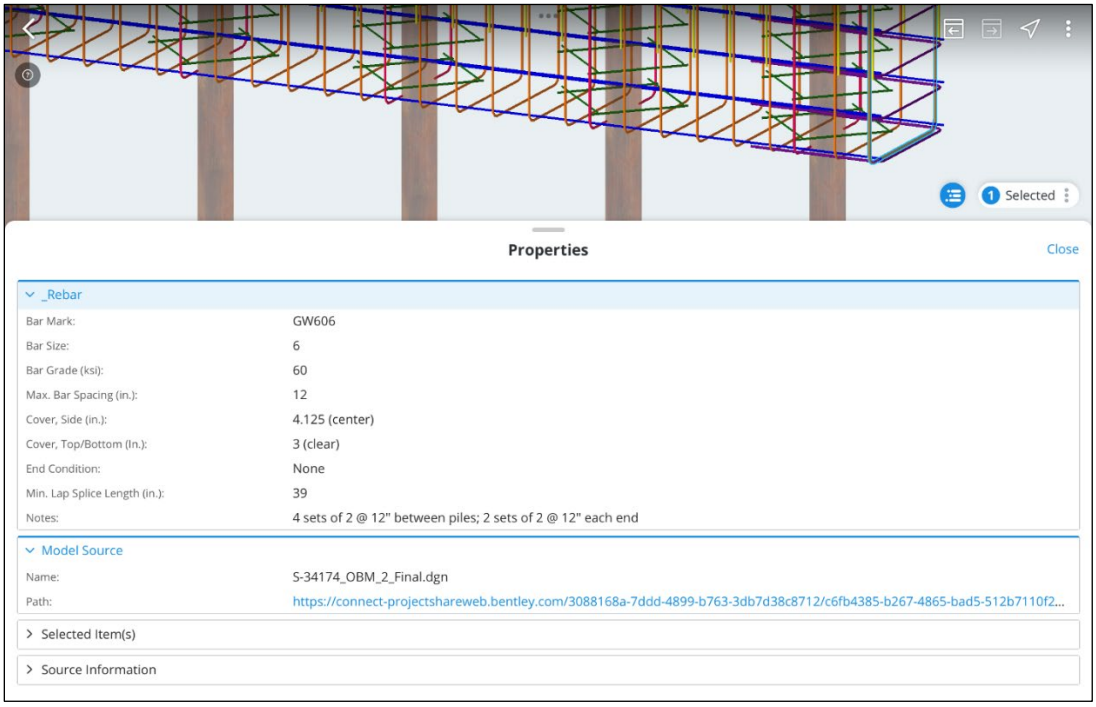
4. Now tap on the pile and then tap on the vertical ellipsis menu in the lower right and then tap on Properties. You should see similar information as shown in the screenshot below. Notice the custom OpenBridge Modeler information contained in the _Steel Pile section.



5. As you peruse through various bridge components, you will see the custom information segregated by the underscore (_) in front of the section name. Now close this Properties pane and use the vertical ellipsis menu to deselect the pile.
6. Now spend time tapping on the pile cap solid and some rebar and viewing their properties. You should see similar information as shown on the next page.

NOTE: Selecting the rebar is very challenging as the abutment model is currently displayed. The pile cap obscures the rebar when trying to select them. To work around this, you may want to select the pile cap and then from the vertical ellipsis menu, tap on Hide. This will help to isolate the rebar and allow selection much easier. Another option is to select “Wireframe” in the Render Mode in the Presentation tab. After you are finished, you can tap on the blue icon in the lower right to unhide the elements.





Questions or Feedback

PennDOT and the Digital Delivery Section thank you for attending and providing any feedback on the content presented in this training course.

It is the desire of the Digital Delivery Section to support you in your digital workflows. Your feedback is extremely important for the success of the 3D2025 initiative. If you have any questions, please contact the Digital Delivery Section.

Please scan this QR code and provide feedback to the team on the quality of this training course.