NavView User Guide – 15 Connections

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Table of Contents

15. Connections 1
15.1 Overview 1
15.2 Add a Connection 2
15.3 Remove a Connection 3
15.4 Configure a Connection 3
15.4.1 Straight Line Connection 3
15.4.1.1 Configuring a Straight Line Connection 3
15.4.2 3D Polyline Connection 6
15.4.2.1 Configuring a 3D Polyline 6
15.4.3 User Observation Source Connection 10
15.4.3.1 Configure a User Observation Source 10
15.4.4 Towed Body Connection 10
15.4.4.1 Configure a Towed Body 11
15.4.5 Observation Distributor 14
15.4.5.1 Configure Observation Distributor 14
15.4.6 Cable Distance To Go (DitGo) Connection 15
15.4.6.1 Configure DitGo Connection 15
15.4.7 Articulated Frame Connection 20
15.4.7.1 Configure an Articulated Frame 20
15.4.8 Crane Connection 24
15.4.8.1 Configure a Crane 24
15.4.9 Layback Connection 28
15.4.9.1 Configuring a Layback Connection 28

15. CONNECTIONS

This section provides an overview of how connections are added and configured in the NavView software.

15.1 OVERVIEW

NavView's approach to towed or layback vehicles, ROV operations with a tether management system (TMS) and cranes utilizes the concept of a Connection. A Connection is an object associated with (connected to) a vehicle that in most cases subscribes to the body state published by that vehicle and uses it as a reference for its own specific application. The results of the respective connections are published and available for display in the 2D and 3D views and available for display in alphanumeric windows and output via the configurable output device.

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In/User	Cannot add, edit or remove connections
Online/Supervisor	Cannot add or remove connections, can edit connections
Administrator	Can add, edit and remove connections

Connections are accessed and configured via the Setup ribbon (see Figure 15-1) or Explorer (see Figure 15-2). There is not a specific monitoring window as this depends upon the connection type and configuration.

FIGURE 15-1 CONNECTIONS - SETUP RIBBON

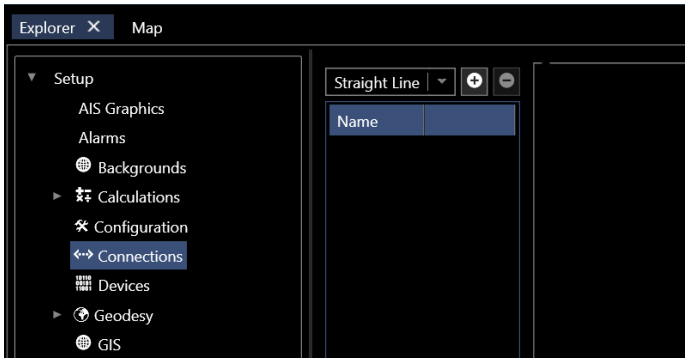


FIGURE 15-2 CONNECTIONS – EXPLORER

The connections supported are as follows:

- Straight Line Connection
- 3D Polyline Connection
- Towed Body Connection
- Observation Distributor
- Cable DitGo
- Articulated Frame Connection
- Crane Connection
- Layback Connection

These are detailed in the following sections.

15.2 ADD A CONNECTION

To add a connection, click the  button in the Connections dialog window. This will display a list of the supported connections, select the desired connection type then click the  button to add the connection.

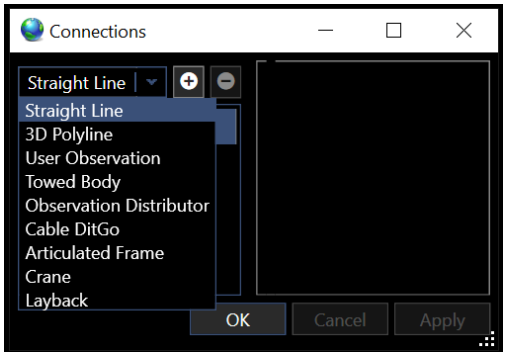


FIGURE 15-3 CONNECTIONS - SUPPORTED CONNECTIONS

The Connections configuration dialog will open with the default settings for the respective connection. Figure 15-4 shows the configuration dialog resulting from selecting Straight Line.

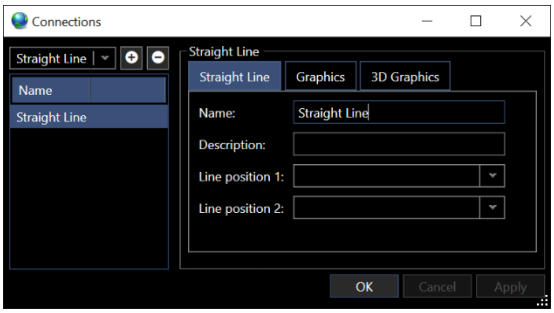


FIGURE 15-4 CONNECTIONS – ADD A CONNECTION

15.3 REMOVE A CONNECTION

To remove a connection, select the connection to be removed in the connection list under Name and click the button.

Note: When a connection is removed, the configuration is lost and needs to be reconfigured upon re-adding.

15.4 CONFIGURE A CONNECTION

The configuration of a connection is done via the Connections dialog.

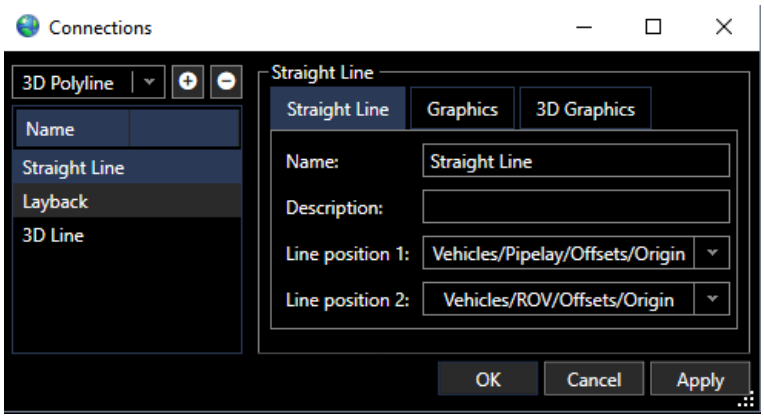


FIGURE 15-5 CONNECTIONS - CONFIGURE CONNECTIONS DIALOG

Selecting the connection to configure in the list in the left panel of the dialog will present the respective configuration options in the right panel. Upon completing the configuration, click the Apply button to apply the changes and leave the dialog open, or click the OK button to apply the changes and close the dialog.

15.4.1 STRAIGHT LINE CONNECTION

The Straight Line connection is the simplest form of connection. It is used to associate selected points on two objects for the primary purpose of showing a simple straight line connection between them. An example application is the representation of an umbilical from a construction vessel to a suspended TMS and from the TMS to the ROV. The line between the objects is displayed in the 2D and 3D views and the spatial relationship information range, bearing and vertical separation is available for display and output.

15.4.1.1 CONFIGURING A STRAIGHT LINE CONNECTION

1. Open the Connections dialog, select Straight Line from the drop-down list and click the button.

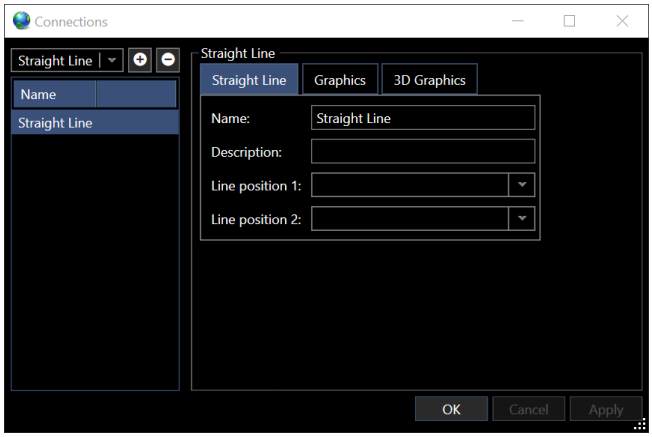


FIGURE 15-6 CONNECTIONS – CONFIGURE STRAIGHT LINE DIALOG

2. Select the Straight Line to be configured in the list in the left panel to display the respective configuration options in the right panel.
3. Configure the **Straight Line** options.
    - **Name:** Enter the Name of the straight line, it is recommended that this be representative of the application
    - **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection
    - **Line Position 1:** From the Line Position 1 drop-down list, select the start point of the connection from the available options, see Figure 15-7
    - **Line Position 2:** From the Line Position 2 drop-down list, select the end point of the connection from the available options, see Figure 15-7

Note: The Line Position 1 and 2 drop down lists are populated with Vehicles and their offsets and Waypoints.

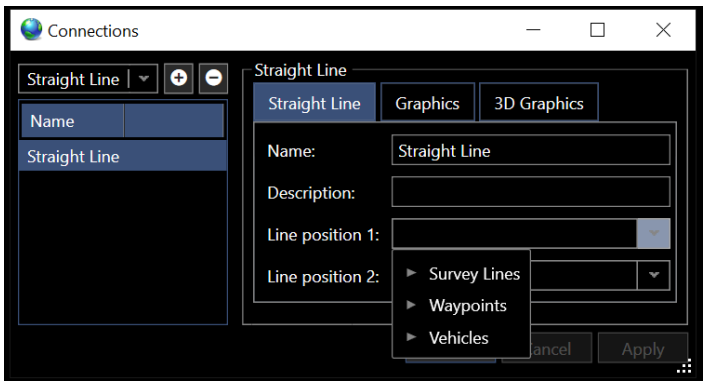


FIGURE 15-7 CONNECTIONS – STRAIGHT LINE - LINE POSITION OPTIONS

4. Configure the **Graphics** options.

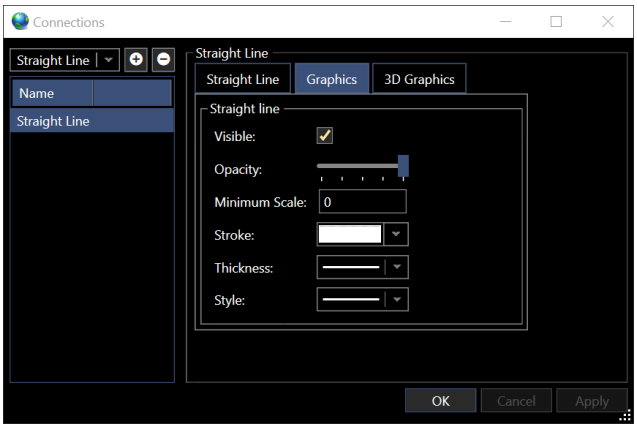


FIGURE 15-8 CONNECTIONS - STRAIGHT LINE GRAPHICS TAB

- **Visible:** Select whether the straight line connection will be Visible in the 2D Map
- **Opacity:** Drag the scroll bar to control the Opacity of the straight line connection in 2D Map
- **Minimum Scale:** The connection line will be displayed in 2D Map if the map scale is greater than the value set here
- **Stroke:** From the drop-down list, select the Color to use to display the straight line in the 2D Map
- **Thickness:** From the drop-down list, select the Thickness to use to display the straight line in the 2D Map
- **Style:** From the drop-down list, select the Style to use to display the straight line in the 2D Map

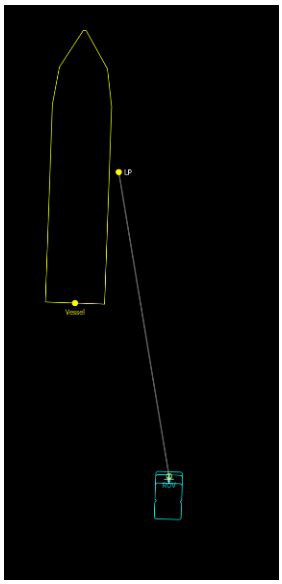


FIGURE 15-9 CONNECTIONS - STRAIGHT LINE 2D EXAMPLE

5. Configure the **3D Graphics** options.

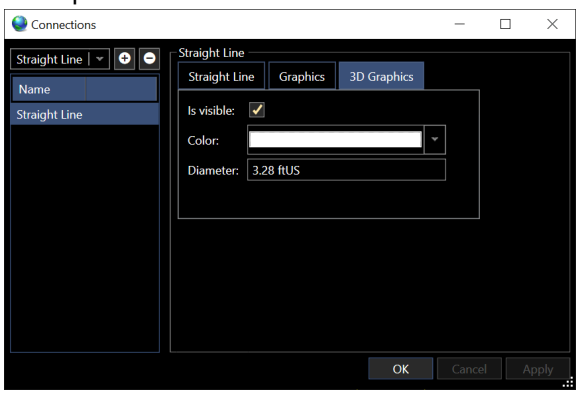


FIGURE 15-10 CONNECTIONS - STRAIGHT LINE CONNECTION 3D GRAPHICS TAB

- **Visible:** Select whether the straight line connection will be Visible in the 3D Map/Map3Dx
- **Color:** From the drop-down list select the Color to use to display the straight line in the 3D Map/Map3Dx
- **Diameter:** Enter the Diameter of the line to be drawn to form the connection in the 3D Map/Map3Dx

Note: The diameter applied to the 3D graphics setting may need to be larger than the actual diameter of the line being represented in order for it to be visible in the 3D Map/Map3Dx view.

15.4.2 3D POLYLINE CONNECTION

The 3D Polyline connection is created by entering or importing multiple X, Y, Z points to generate a 3D line. This line is then available for CPA Guidance Calculations and display in the 2D Map and 3D Map/Map3Dx views.

15.4.2.1 CONFIGURING A 3D POLYLINE

1. Open the Connections dialog, select 3D Polyline from the drop-down list and click the  button.

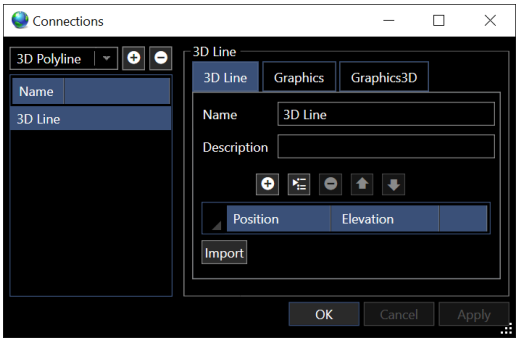


FIGURE 15-11 CONNECTIONS - CONFIGURE 3D POLYLINE DIALOG

2. Select the 3D Polyline to be configured in the list in the left panel to display the respective configuration options in the right panel.
3. Configure the **3D Line** options.
    - **Name:** Enter the Name of the 3D Polyline, it is recommended that this be representative of the application
    - **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection
4. Import 3D Polyline (if not importing a line, just entering points, go to step 5).
    a. Click the Import button
    b. Browse to the file containing the X, Y and Z data defining the 3D line and open it to open the Import 3D Line Data dialog

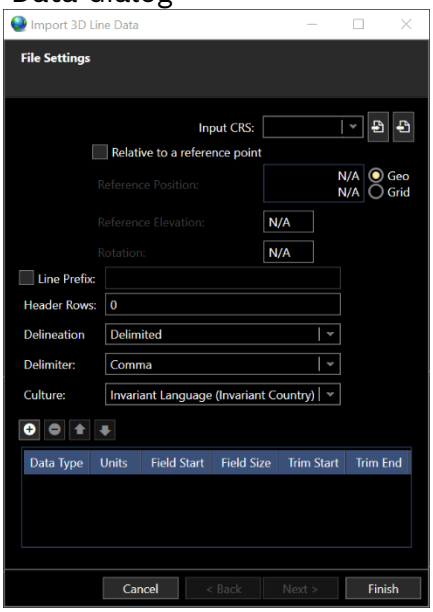


FIGURE 15-12 3D CONNECTIONS - POLYLINE FILE IMPORT DIALOG

    c. **:** If the import settings for the selected file format were previously saved to a *.4dr file, click this button to navigate to and select it to load
    d. **:** Once the import settings are set, click this button to save the settings to a *.4dr file for future use
    e. **Input CRS:** Select the Horizontal CRS that the coordinates are referenced to from this drop-down list, it is populated with the CRS that have been added to NavView in Horizontal CRS
    f. Relative to reference point: If the position data is relative to a specific location rather than absolute coordinates and elevations, i.e. delta X, delta Y and delta Z, check this box and enter the reference position, reference elevation and if the data is rotated relative to North, the rotation

g. **Line Prefix:** If the file records have a prefix identifying those records with the position and elevation, check this box and enter it
h. **Header Rows:** If the file contains a header, enter the number of header rows
i. **Delimited/Fixed Length:** Select the data field format. In the case of Delimited, **s**elect the delimiter type. Selecting Custom allows the entry of a character not listed in the options
j. **Culture:** Select the culture the data is in. The default is Invariant (not local specific) where the decimal point is represented by a point. If French is selected, the decimal point is represented by a comma
k. Configure the fields

```
3D Polyline Data
#,E 756576.4,N 500196.9,D 0.0
#,E 756586.4,N 500206.9,D 50.0
#,E 756596.4,N 500216.9,D 150.0
#,E 756606.4,N 500226.9,D 250.0
#,E 756616.4,N 500236.9,D 350.0
#,E 756626.4,N 500246.9,D 450.0
#,E 756636.4,N 500256.9,D 650.0
```

```
#756576.4500196.9000.0
#756586.4500206.9050.0
#756596.4500216.9150.0
#756606.4500226.9250.0
#756616.4500236.9350.0
#756626.4500246.9450.0
#756636.4500256.9650.0
```

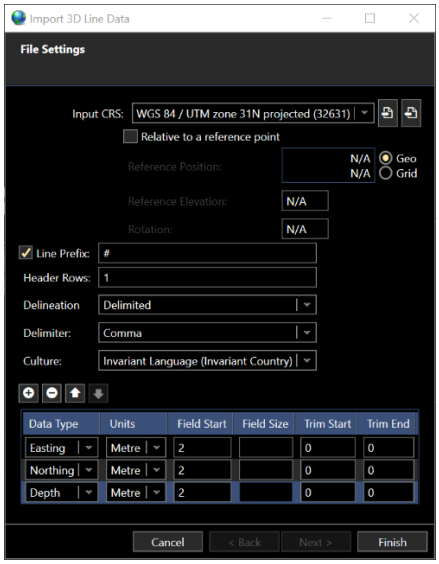


FIGURE 15-13 3D POLYLINE IMPORT - DELIMITED

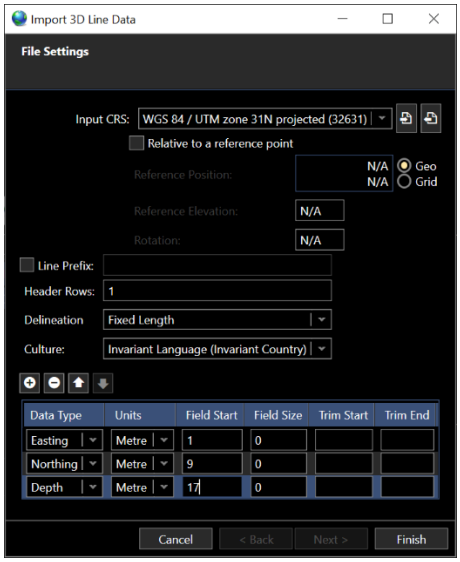


FIGURE 15-14 3D POLYLINE IMPORT - FIXED LENGTH

- Click to add a field to the end of the list
- Click to remove the selected field
- Click to move the selected field up
- Click to move the selected field down
- **Data Type:** Click in the cell and select the data type from the drop down list
- **Units:** Click in the cell and select the units from the drop down list
- If **Delimiter** (see) where the configuration shown will import the text file shown
- **Trim Start:** Enter the number of characters to ignore at the start of the field, e.g. if the field starts with “E “ enter 2
- **Trim End:** Enter the number of characters to ignore at the end of the field, e.g. if the field ends with “ E “ enter 2
- If **Fixed Length** (see Figure 15-13 3D Polyline Import - Delimited) where the configuration shown will import the text file shown
- **Field Start:** Enter the column the field starts in
- **Field Size:** Enter the length of the field

Note: When entering the Field Start, note that the first character of a record is ‘0’.

l. Click **Finish** to import the file

m. Go to step 5 to review and edit the imported data

5. Enter/edit polyline point positions using the toolbar and clicking in Position and/or Elevation cell to edit that value

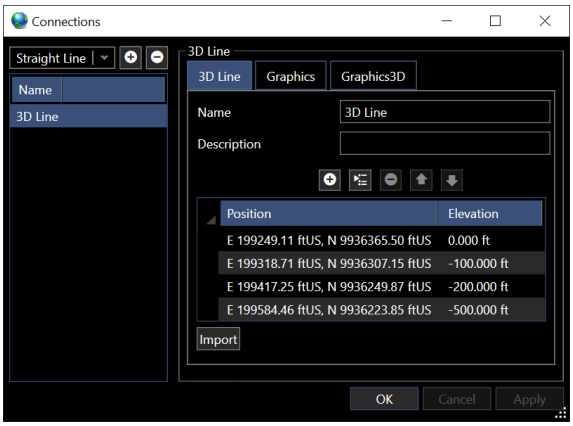


FIGURE 15-15 CONNECTIONS - 3D POLYLINE CONNECTION DATA GRID EXAMPLE

6. Configure the **Graphics** options. Configuration as in the Straight Line Connection.
7. Configure the **3D Graphics** options. Configuration as in the Straight Line Connection.
8. Click **Apply** to apply the changes and keep the dialog open, **OK** to apply the changes and close the dialog, or **Cancel** to abort the configuration and leave the dialog open.

15.4.3 USER OBSERVATION SOURCE CONNECTION

User observation (simulated observation) will be shared to all remote stations. It provides control of an observation across the network, e.g. fixed heading, that is then available to be applied at any NavView

15.4.3.1 CONFIGURE A USER OBSERVATION SOURCE

1. Open the Connections dialog, select User Observation Source from the drop-down list  .

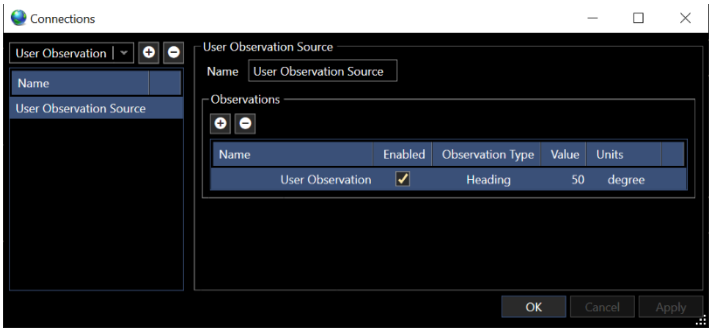


FIGURE 15-16 CONNECTIONS - CONFIGURE USER OBSERVATION SOURCE DIALOG

2. Select the User Observation Source to be configured in the list in the left panel to display the respective configuration options in the right panel.
    - **Name:** Enter the Name of the User Observation Source, it is recommended that this be representative of the application
3. Click the  button to add a specific Observation, Click the  button to remove a selected Observation.
4. **Name:** Edit name of observation
    - **Enabled:** Check the box to enable observation for use
    - **Observation Type:** This opens a list of observation types to choose from
    - **Value:** Enter value to be used for the observation
    - **Units:** This opens a list of units available to assign to the Value

15.4.4 TOWED BODY CONNECTION

NavView supports positioning a *towed body* using a Connection. Three modes are supported:

- **Direction**
    - The towed body is positioned on an operator configured azimuth from the tow point on the reference vehicle, e.g. reference vehicle heading plus 180° for a point directly astern of the tow point
    - At each update of the tow point position the layback distance is applied to the tow point position on the configured azimuth to determine the towed body position
    - The configured Heading is used as the azimuth for each update

- **Follow**
  - From an initial operator assigned azimuth from the tow point on the reference vehicle, the towed body movement mirrors that of the tow point
  - At each update of the tow point position, the change in its position from the last update is calculated and applied to the last position of the towed body to determine the new towed body position
  - The configured Heading is used as the azimuth for the initial towed body position determination
- **Chase**
  - From an initial operator assigned azimuth from the tow point on the reference vehicle, the towed body position chases the tow point
  - At each update of the tow point position, the azimuth from the new tow point position to the last towed body position is calculated and used with the layback distance and new tow point position to determine the new towed body position
  - The configured Heading is used as the azimuth for the initial towed body position determination

The Layback is calculated using the Pythagorean theorem where NavView knows the slope distance and the delta elevation from the tow point to the towed body. The slope distance is calculated from a cable out value and a scale factor called the Catenary factor that enables a rudimentary correction to the cable length to account for its catenary through the water column.

15.4.4.1 CONFIGURE A TOWED BODY

1. Open the Connections dialog, select Towed Body from the drop-down list and click the  button.

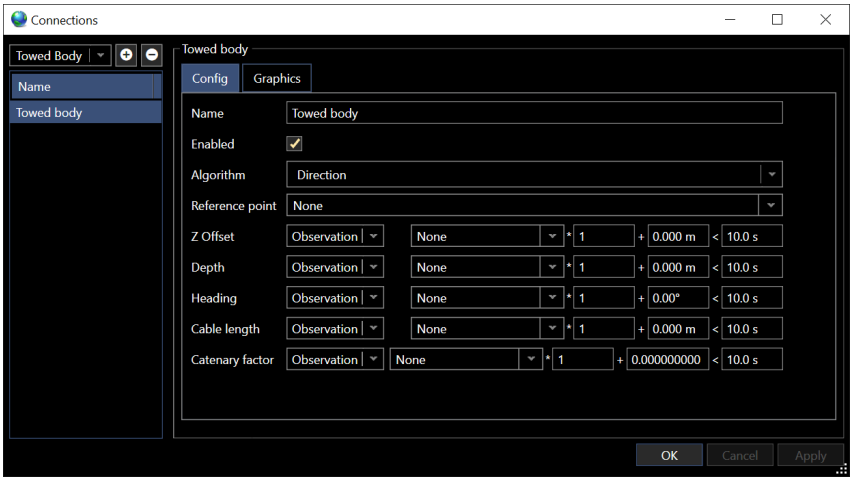


FIGURE 15-17 CONNECTIONS - CONFIGURE TOWED BODY DIALOG

2. Select the Towed Body to be configured in the list in the left panel to display the respective configuration options in the right panel.
3. Configure the Towed Body options.
    - **Config Tab** (see Figure 15-17)
        - **Name:** Enter the name to identify the connection
        - **Enabled:** Check or uncheck to enable or disable the towed body connection calculations
        - **Algorithm:** Select Direction, Follow or Chase mode

Note: The selected Reference Point position, heading and course made good are used in the calculation of the towed body position depending on the Algorithm selected and the Heading configuration. Z Offset and Depth values are applied to the selected object's elevation to calculate the towed body positional data.

Note: It is recommended that an offset representing the tow point be added to the vehicle towing the body and selected as the Reference point.

- **Z Offset:** The vertical distance from the reference point to the tow point, positive is up
- **Depth:** The vertical distance from the reference point to the towed body, positive is down
- **Heading:** The heading from the reference point to the towed body, positive clockwise from north
- **Cable Length:** The length of cable from the tow point to the towed body
- **Catenary Factor:** The scale factor used to convert the measured cable length to a slope distance from the tow point to the towed body

When configuring settings of the Towed Body the user can select between using a **Constant** or an **Observation** as follows:

a. In the first dropdown, select **Constant**
b. In the second control enter the value to use

or

a. In the first dropdown, select **Observation**
b. From the second dropdown, select the data source for the respective Observation type
c. In the third control, enter a scalar if the Observation requires scaling before use
d. In the fourth control, enter a C-O if the Observations requires correcting before use

e. In the fifth control, enter the maximum age of data in seconds. If there is a loss of data, the towed body calculation will continue using last data received until it reaches the value set here

Note: The order of application of the scaler and C-O are as indicated by their order in the control, i.e. (Distance Observation * scaler) + C-O

4. Graphics Tab

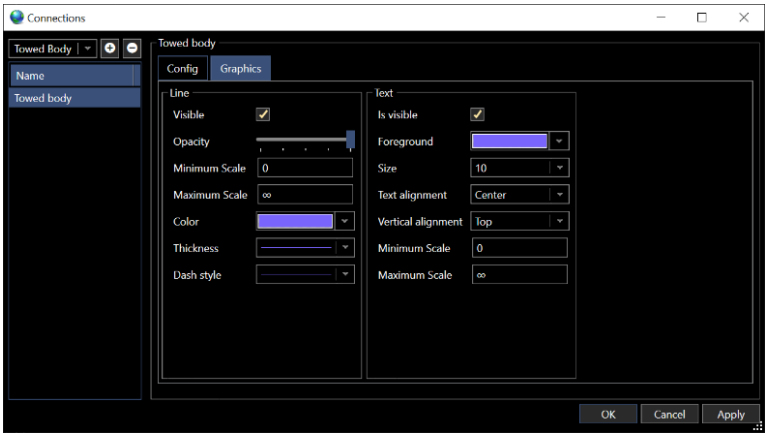


FIGURE 15-18 CONNECTIONS - TOWED BODY DIALOG - GRAPHICS TAB

- **Line:** From the Reference Point to the Towed Body in the 2D Map view
  - **Visible:** Check to control the display of the line on the Towed Body Connection layer
  - **Opacity:** Drag the scroll bar to control the Opacity of the connection line
  - **Minimum/Maximum Scale:** The connection line will be displayed in 2D Map if the map scale is within the values set here
  - **Color:** Select the color to display the line in 2D Map
  - **Thickness:** Select the line thickness to be displayed
  - **Dash Style:** Select the line style to be displayed as, e.g. solid, dashed
- **Text:** Text annotating the connection line
  - **Is Visible:** Check to display the text on the Towed Body Connection line
  - **Foreground:** Select the color for the text
  - **Size:** Select the font size for the text
  - **Text Alignment:** Select the horizontal text alignment (Left, Right, Center and Justify) for the annotation
  - **Vertical Alignment:** Select the vertical text alignment (Top, Middle and Bottom) for the annotation
  - **Minimum/Maximum Scale:** The connection line annotation will be displayed in 2D Map if the map scale is within the values set here

Note: The Text will not display regardless of the **Is Visible** setting or the Minimum scale setting of the Line is not set to Visible and visible, i.e. if the Line is not drawn because its Minimum Scale setting has been exceeded, the text will also not display.

15.4.5 OBSERVATION DISTRIBUTOR

The Observation Distributor Connection is used to distribute data to remote NavView clients, this will replace the Data tab in the Vehicle configuration.

15.4.5.1 CONFIGURE OBSERVATION DISTRIBUTOR

1. On the Online PC select Connections from the Setup ribbon or in Explorer.
2. Select Observation Distributor from the drop-down menu, Figure 15-19.

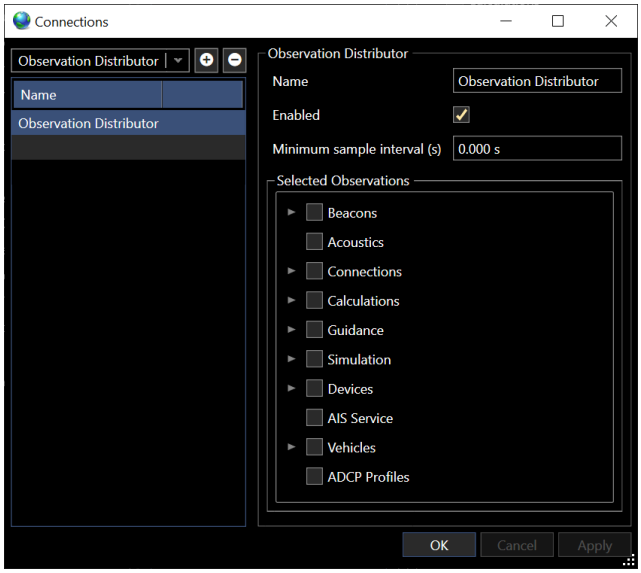


FIGURE 15-19 CONNECTIONS – OBSERVATION DISTRIBUTOR DIALOG

- **Name:** Enter name describing data to be distributed
- **Enabled:** To distribute data the Enabled box needs to be checked
- **Minimum sample interval:** Enter value in seconds for distribution rate

Note: Sample interval rate of 0.00(s) will distribute at same rate observation is received, i.e. if NavView is receiving data from a device at 10hz then that data will be distributed at the same rate.

- **Selected Observations:** Select data to be sent to remote NavView clients

3. Click Okay.
4. On remote NavView clients this Observation Distributor connection will automatically be added to the Connections, select it from the Connections list and check the Enable box. The data will then be available to display in a Text Window, Time Series etc.

15.4.6 CABLE DISTANCE TO GO (DITGO) CONNECTION

The Cable DitGo connection is used to monitor distance to cable bodies using a cable counter/cable speed and imported assembled cable file.

15.4.6.1 CONFIGURE DITGO CONNECTION

1. Open Connections dialog, select Cable DitGo from the drop-down list and click the  button.

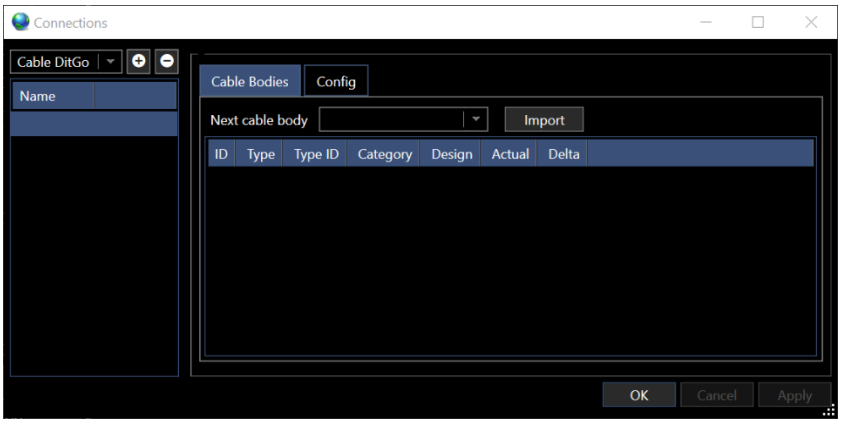


FIGURE 15-20 CONNECTIONS – CONFIGURE DITGO DIALOG

2. There are two tabs to setup the DitGo connection, **Cable Bodies** and **Config.**
   a. The **Cable Bodies** tab is where the assembled cable file containing the cable bodies is imported and viewed.
      I. Click on the **Import** button 

and browse to the required file then select open. This will then open the **Import Cable Data** dialog (See Figure 15-21). The dialog is used to parse out the data from the file for NavView to utilize

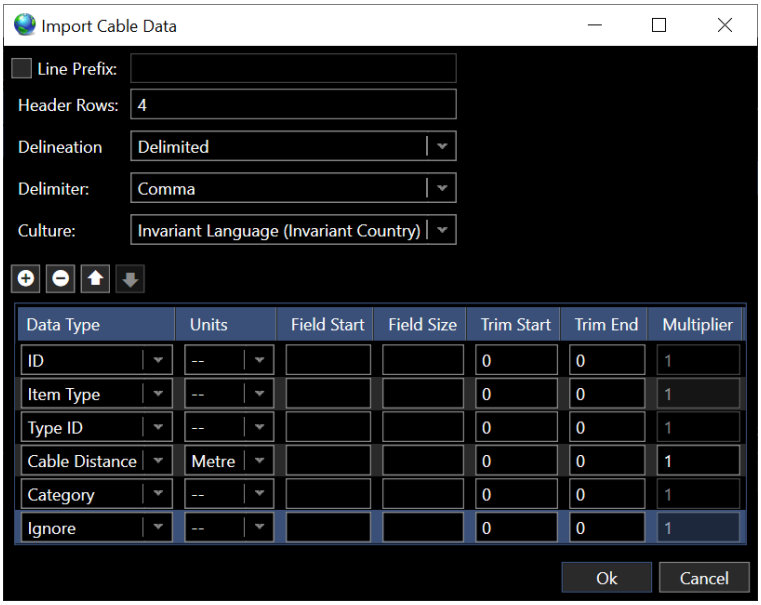


FIGURE 15-21 CONNECTIONS – DITGO - IMPORT CABLE DATA DIALOG

II. The first part of the dialog is used to define the format of the file being imported
   - **Line Prefix:** Check the box if the file records have a prefix
   - **Header Rows:** Enter the number of rows before data
   - **Delineation:** Select the delineation format, options are Delimited or Fixed Length.
     In the case of Delimited, select the delimiter type. Selecting Custom allows the entry of a character not listed in the options
     If Fixed Length is selected, the data is parsed using Field Start and Field Size
   - **Culture:** Select the culture the data is in. The default is **Invariant** (not local specific) where the decimal point is represented by a point. If **French** is selected, the decimal point is represented by a comma

III. To setup the columns of data, a field must be added by clicking on the  button for each column of data in the file
   - **Data Type:** From the drop-down, select the data type for record, this is repeated for each record in the file to be used. Options are ID, Item Type, Type ID, Cable Distance (Accumulated), Category and Ignore. The Data Type cells must reflect the sequence in the file headers
   - **Units:** Click in the cell and select the units from the drop-down list for each Data Type
   - **Field Start/Field End:** If Field Length is selected in Delineation, Enter the column the field starts in and enter the length of the field

Note: The first character of a record is ‘0’.

- **Trim Start/Trim End:** Enter the number of characters to ignore at the start of the field, e.g. if the field starts with “E “ enter 2. Enter the number of characters to ignore at the end of the field
- **Multiplier:** Click the cell to apply a multiplier to the Data Type if required. Default is 1

IV. Select **Okay.** The cable body file is now visible the panel, see Figure 15-22

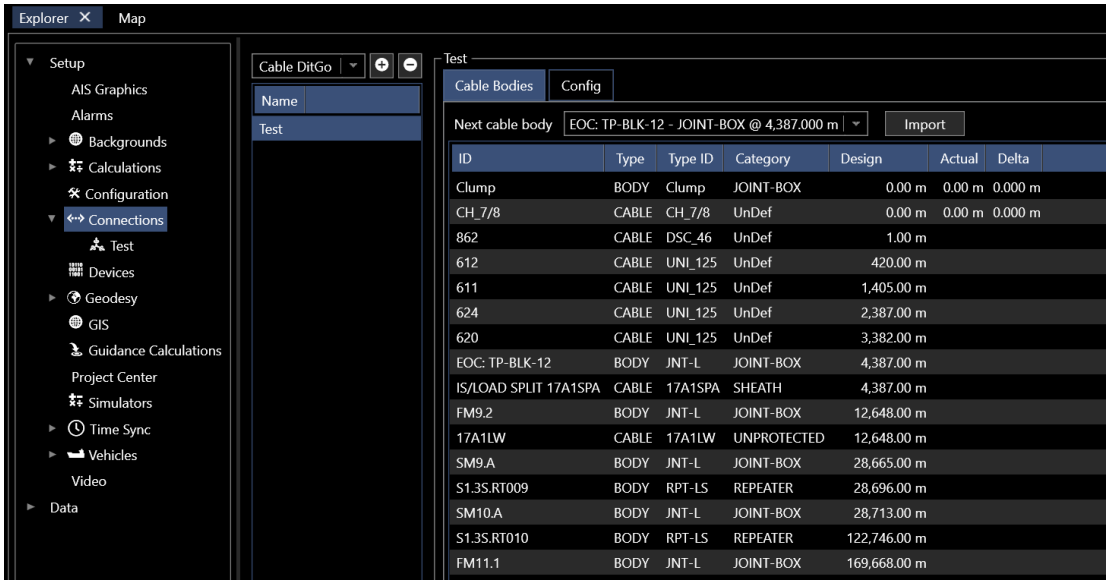


FIGURE 15-22 CONNECTIONS – DITGO - IMPORTED FILE RECORDS

Note: Design header is the accumulated design distance for each cable body in meters.

Note: The Actual header is the recorded accumulated distance for each cable body when the Mark Cable Body is selected.

Note: The Delta header is the difference between the Design and Actual accumulated cable body distance.

V. The **Next cable body** 

is used to manually select the next cable body to monitor distance to go. This is done by selecting the body from the drop- down list or selecting a body in the panel, mouse right click will display 

.

b. Configure Tab is used to assign the Connection name and cable counter data

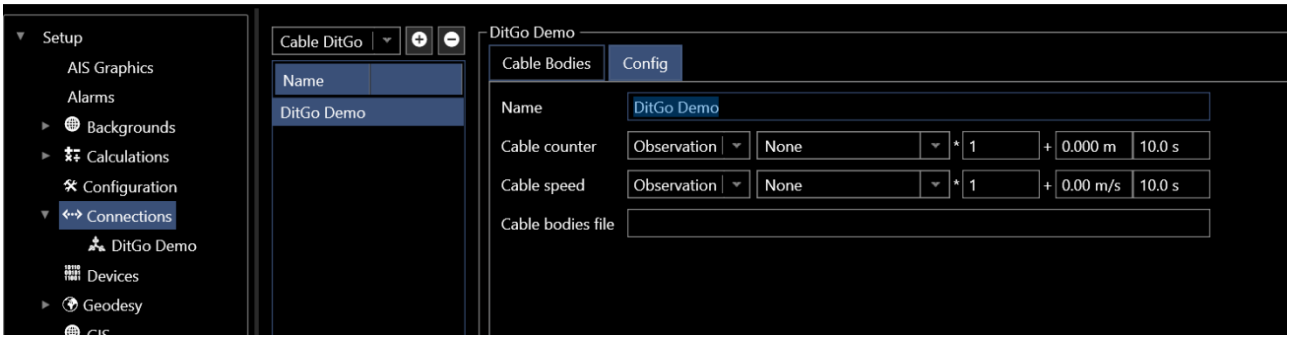


FIGURE 15-23 CONNECTIONS – DITGO - CONFIGURE TAB

I. In the **Name** field enter a name for the DitGo connection

II. When configuring settings of the **Cable counter** and **Cable speed** the user can select between using a **Constant** or an **Observation** as follows:

- In the first dropdown, select **Constant**
- In the second control enter the value to use

or

- In the first dropdown, select Observation
- From the second dropdown, select the data source for the respective Cable counter
- In the third control, enter a scalar if the Observation requires scaling before use
- In the fourth control, enter a C-O if the Observations requires correcting before use
- In the fifth control, enter the maximum age of data in seconds. If there is a loss of data, the calculation will continue using the last data received until it reaches the value set here

III. **Cable body file** displays the imported file name and path

3. When a DitGo connection is created, a Status is added to the View Tab ribbon (see Figure 15-24). Click “Status”, this will open the DitGo connection status window (see Figure 15-25).

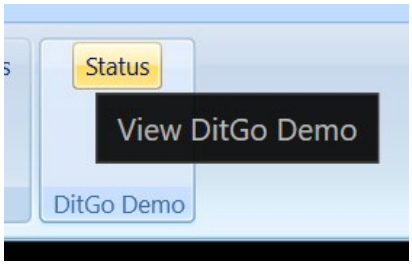


FIGURE 15-24 DITGO VIEW TAB

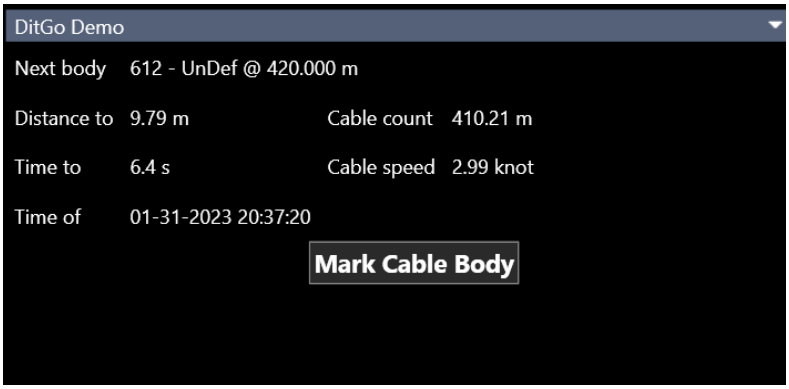
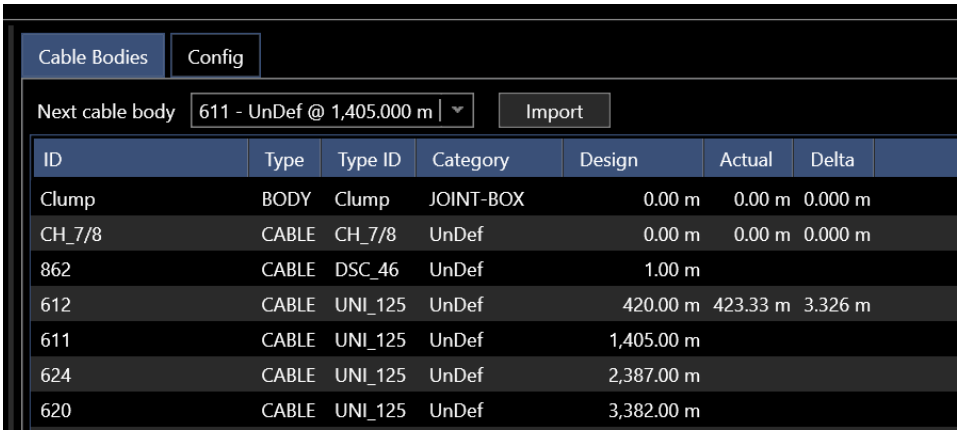


FIGURE 15-25 DITGO STATUS WINDOW

- **Next Body:** Displays the next cable body read from the imported file. This is updated with next body in the imported file when Mark Cable Body button is clicked
- **Distance to:** Distance to next cable body in meters
- **Cable count:** current cable count
- **Time to:** Time remaining to next cable body
- **Cable speed:** Current cable payout speed
- **Time of:** Time (UTC) and date to arrive at next cable body

Note: The **Mark Cable Body** button is only available when the distance to go is <20m or 20% of the leg length between the previous body and next body.



ID	Type	Type ID	Category	Design	Actual	Delta
Clump	BODY	Clump	JOINT-BOX	0.00 m	0.00 m	0.000 m
CH_7/8	CABLE	CH_7/8	UnDef	0.00 m	0.00 m	0.000 m
862	CABLE	DSC_46	UnDef	1.00 m		
612	CABLE	UNI_125	UnDef	420.00 m	423.33 m	3.326 m
611	CABLE	UNI_125	UnDef	1,405.00 m		
624	CABLE	UNI_125	UnDef	2,387.00 m		
620	CABLE	UNI_125	UnDef	3,382.00 m		

FIGURE 15-26 CONNECTIONS – DITGO - CABLE BODIES TAB – ACTUAL

15.4.7 ARTICULATED FRAME CONNECTION

An articulated frame is a body which consists of two or more separate rigid frames connected by a defined joint. For simplicity each joint is assumed to have a single rotation angle about the X, Y, or Z axis. The next joint in the articulated frame is defined by a translation along the rigid frame from the previous joint. An articulated frame is created by defining a series of separately modeled rigid frames.

15.4.7.1 CONFIGURE AN ARTICULATED FRAME

1. Open the Connections dialog, select Articulated Frame from the drop-down list and click the  button.

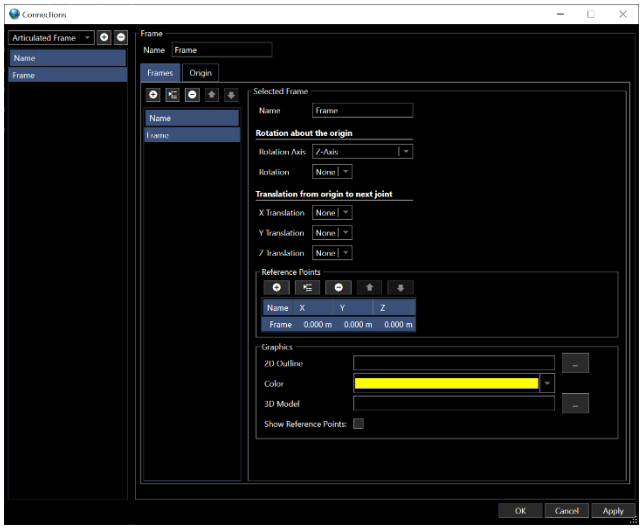


FIGURE 15-27 CONNECTIONS – ARTICULATED FRAME - CONFIGURE ARTICULATED FRAME DIALOG

2. Select the Articulated Frame to be configured in the list in the left panel to display the respective configuration options in the right panel.
3. Configure the selected Articulated Frame Connection options.

a. **Name:** Enter the Name for the Articulated Frame Connection, it is recommended that this be representative of the application

b. **Frames Tab:** Configures the individual rigid frames that make up the articulated frame, see Figure 15-27

- Toolbar 
  -  Click to add an individual frame
  -  Insert a new frame above the selected frame
  -  Click to remove selected frame
  -  Click to move up selected frame
  -  Click to move down selected frame
- **Name:** The display name of the selected rigid frame, the name can be assigned by operator
- **Rotation about the origin:** The coordinate system axis of each rigid frame is defined by a single rotation about the origin. The origin on each rigid frame is defined as the end point of the previous rigid frame, or by the defined reference body in the case of the initial rigid frame. This single rotation rotates the rigid frame from the previous rigid frame. All rotations are counterclockwise positive. The initial axes are defined as follows:
  - **X-Axis:** The lateral axis, positive to starboard
  - **Y-Axis:** The longitudinal axis, positive forward
  - **Z-Axis:** The vertical axis, positive up

4. From the drop-down list select the axis of rotation which the rotation angle is to be applied.

a. **Rotation:** The rotation angle from the previous reference frame to this reference frame. This value can be defined as a constant value or can be read from an Angle data source

I. In the first dropdown, select **Constant**

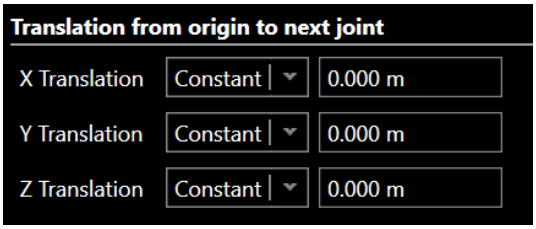
II. In the second control enter the value to use

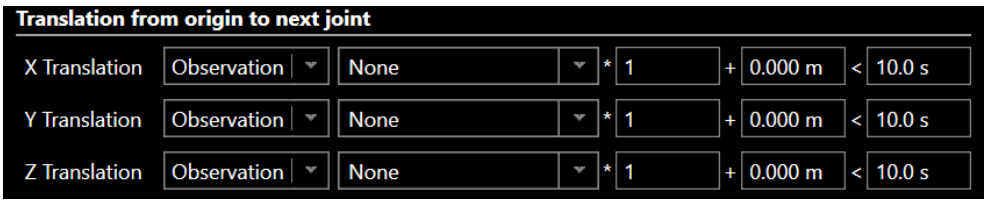
III. In the first dropdown, select Observation
IV. From the second dropdown, select the data source for the respective Observation type
V. In the third control, enter a scalar if the Observation requires scaling before use
VI. In the fourth control, enter a C-O if the Observations requires correcting before use
VII. In the fifth control, enter the maximum age of data in seconds. If there is a loss of data, the towed body calculation will continue using last data received until it reaches the value set here

Note: The order of application of the scaler and C-O are as indicated by their order in the control, i.e. (Distance Observation * scaler) + C-O

Note: If multiple rotations are required to define the new rigid frame coordinate system, then multiple rigid frames can be added sequentially with a zero translation.

b. **Translation from origin to next joint:** The origin of each subsequent rigid frame is defined by a translation from the origin of this rigid frame to the next rigid frame. The translation axes are the axes of this rigid frame after the rotation about the origin has been applied
   - **X-Translation:** The translation along the rigid frame's x-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source
   - **Y-Translation:** The translation along the rigid frame's y-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source
   - **Z-Translation:** The translation along the rigid frame's z-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source





c. **Reference points:** Reference points are used to define any points of interest on the rigid frame. Reference Points are added using the toolbar. Each reference point is defined by:
    - **Name:** The display name for the reference point, the name can be assigned by operator
    - **X:** The distance along the X-Axis from the rigid frame origin to the reference point
    - **Y:** The distance along the Y-Axis from the rigid frame origin to the reference point
    - **Z:** The distance along the Z-Axis from the rigid frame origin to the reference point

The following values are computed for each reference point:

- Geographic 2D coordinates
- Elevation
- Local lever arm (X, Y, Z) from the origin of the articulated frame

d. **Graphics:** The graphics section configures the graphics of the rigid frame
    - **2D Outline:** The drawing file used to render the rigid frame
    - **2D Outline:** The drawing file used to render the rigid frame
    - **Color:** The rendered color of the 2D model
    - **3D Model:** the 3D model used to render the rigid frame
    - **Show Reference Points:** Check the box to display Reference points on map view
e. **Origin Tab:** The Origin tab configures the reference origin and rotation convention used to define the local cartesian coordinate reference system (LC-CRS) of the articulated frame

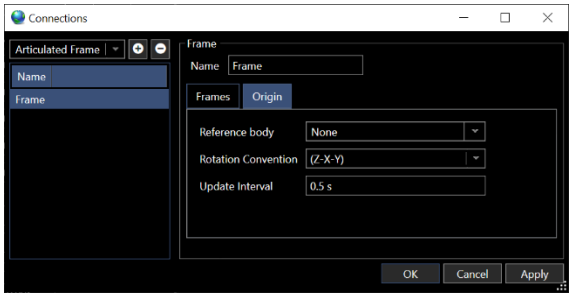


FIGURE 15-28 CONNECTIONS - CONFIGURE ARTICULATED FRAME DIALOG - ORIGIN TAB

- **Reference body:** Defines the reference body state used to define the origin of the LC-CRS. All local lever arm (relative x, y, z) output observations are reference from the LC-CRS. The reference body is normally the origin of the vehicle on which the articulated frame is located. A valid body state including geographic 2D coordinates, elevation, heading, pitch, and roll is required to calculate the state of the articulated frame and all rigid frames

- **Rotation convention:** Defines the rotation convention for applying the three rotation angles of the body state. The two possible choices are:
  - **Yaw-Pitch-Roll (Z-X-Y):** Defines the rotation order of (Rz * Rx * Ry) or (Ry * Rx * Rz)
    Rz is the rotation about the z-axis (heading axis)
    Ry is the rotation about the y-axis (roll axis)
    Rx is the rotation about the x-axis (pitch axis)
  - **Yaw-Roll-Pitch (Z-Y-X):** Defines the rotation order of (Rz*Ry*Rx) or (Rx*Ry*Rz)

15.4.8 CRANE CONNECTION

The Crane connection is used to derive the position of the crane sheave/hook using the host body crane pedestal position (rotation point), slew angle, boom angle and payout.

15.4.8.1 CONFIGURE A CRANE

1. Open the Connections dialog, select Crane from the drop-down list and click the  button.

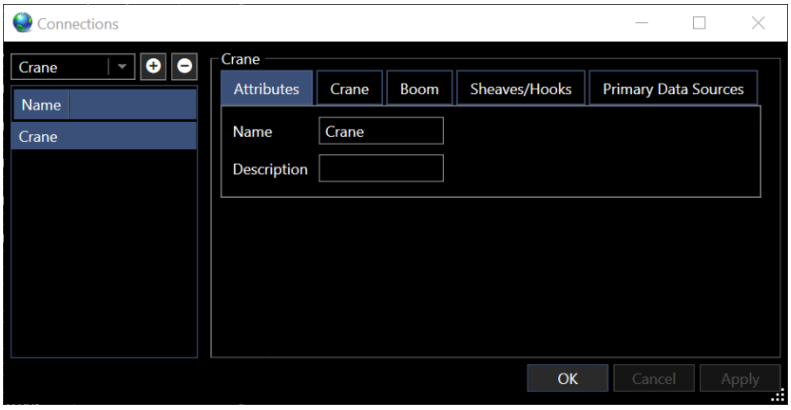


FIGURE 15-29 CONNECTIONS - CONFIGURE CRANE DIALOG

2. Select the Crane to be configured in the list in the left panel to display the respective configuration options in the right panel.
3. Configure the selected Crane Connection options.
   a. **Attributes Tab** (see Figure 15-29)
      - **Name:** Enter the crane name to be displayed
      - **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection

b. **Crane Tab**

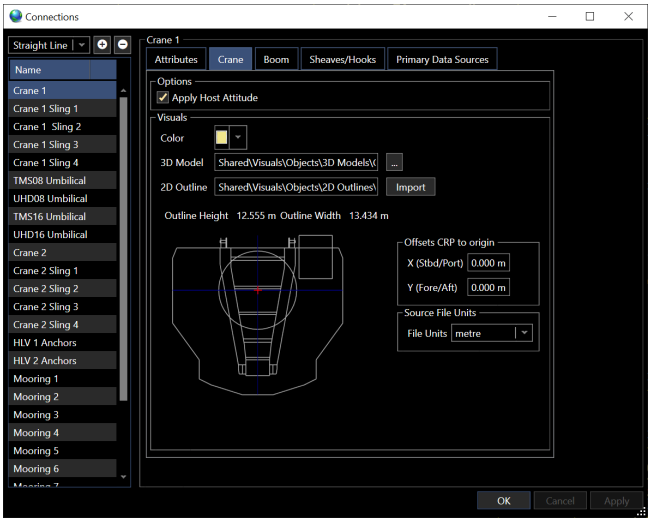


FIGURE 15-30 CONFIGURE CRANE CONNECTION DIALOG - CRANE TAB

- **Options**
  - **Apply Host Attitude:** Check to apply the host vehicle's attitude data to the crane connection
- **Visuals**
  - **Color:** Select the crane color to be displayed
  - **3D Model:** Select a 3D model to represent the crane using the browse button ... for display in 3D Map
  - **2D Outline:** Select a 2D outline to represent the crane using the import button for display in 2D Map
    - **Offsets CRP to origin:** Enter the (X,Y) offsets from the crane rotation point to the drawing origin
    - **Source File Units:** Select the units of the imported outline drawing

c. **Boom Tab**

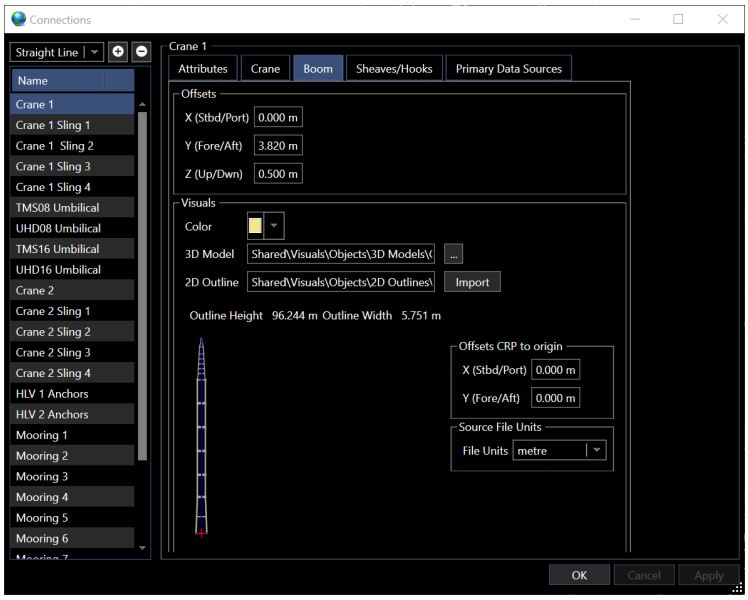


FIGURE 15-31 CONNECTIONS - CONFIGURE CRANE DIALOG - BOOM TAB

- **Offsets**
  - **X (Stbd/Port):** Enter the X offset (+ to starboard, - to port) from the crane's rotation point to boom's CRP
  - **Y (Fore/Aft):** Enter the Y offset (+ to foreward, - to aft) from the crane's rotation point to boom's CRP
  - **Z (Up/Down):** Enter the Z offset (+ Up, - down) from the crane's rotation point to boom's CRP
- **Visuals**
  - **Color:** Select the crane boom color to be displayed
  - **3D Model:** Select a 3D model to represent the boom using the browse button  for display in 3D Map
  - **2D Outline:** Select a 2D outline to represent the boom using the import button for display in 2D Map
  - **Offsets CRP to Origin:** Enter the (X,Y) offsets from the crane rotation point to the drawing origin
  - **Source File Units:** select the units of the imported outline drawing

d. **Sheaves/Hooks Tab**

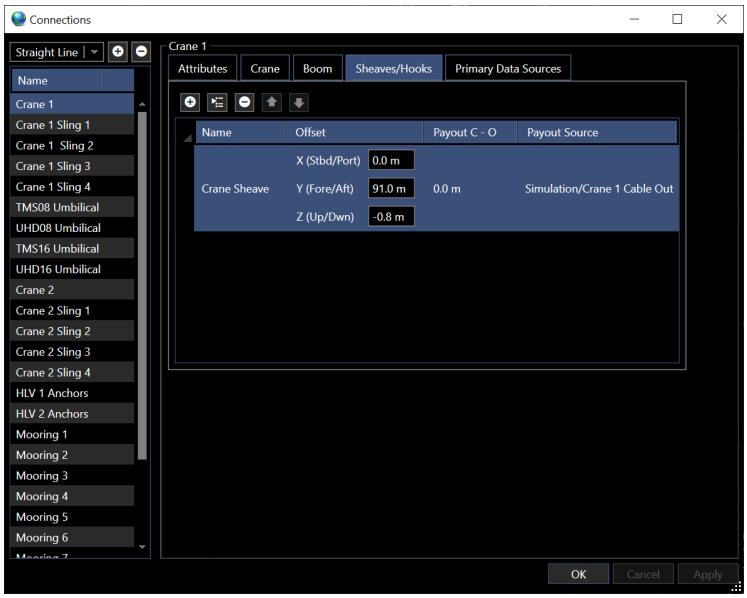
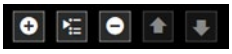


FIGURE 15-32 CONNECTIONS - CONFIGURE CRANE DIALOG – SHEAVES/HOOKS TAB

- Toolbar 
  -  Click to add an individual sheave/hook
  -  Insert a new sheave/hook above the selected sheave/hook
  -  Click to remove selected sheave/hook
  -  Click to move up selected sheave/hook
  -  Click to move down selected sheave/hook
- **Name:** The display name of the selected sheave/hook, the name can be assigned by operator
- **Offset:** Enter the (X, Y, Z) offset from crane boom CRP to the sheave
- **Payout Source:** Select a payout source from the drop-down list
- **Payout C-O:** Enter C-O to be applied to the payout source

e. **Primary Data Sources Tab**

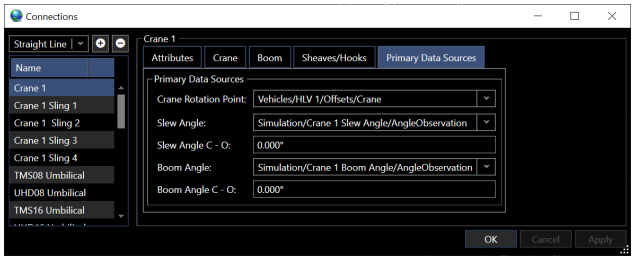


FIGURE 15-33 CONNECTIONS - CONFIGURE CRANE DIALOG - PRIMARY DATA SOURCES TAB

- Primary Data Sources
  - **Crane Rotation Point:** Select from the drop-down list the positioning source for the crane rotation point, e.g. crane static offset assigned to a vessel
  - **Slew Angle:** Select from the drop-down list a crane slew angle source
  - **Slew Angle C-O:** Enter C-O to be applied to the slew angle source
  - **Boom Angle:** Select from the drop-down list a boom angle source
  - **Boom Angle C-O:** Enter C-O to be applied to the boom angle source

15.4.9 LAYBACK CONNECTION

A pipeline Layback connection allows for the tracking of a pipeline with layback applied and a touchdown monitor selected.

15.4.9.1 CONFIGURING A LAYBACK CONNECTION

1. Open the Connections dialog, select the Layback connection from the drop-down menu and click the button.

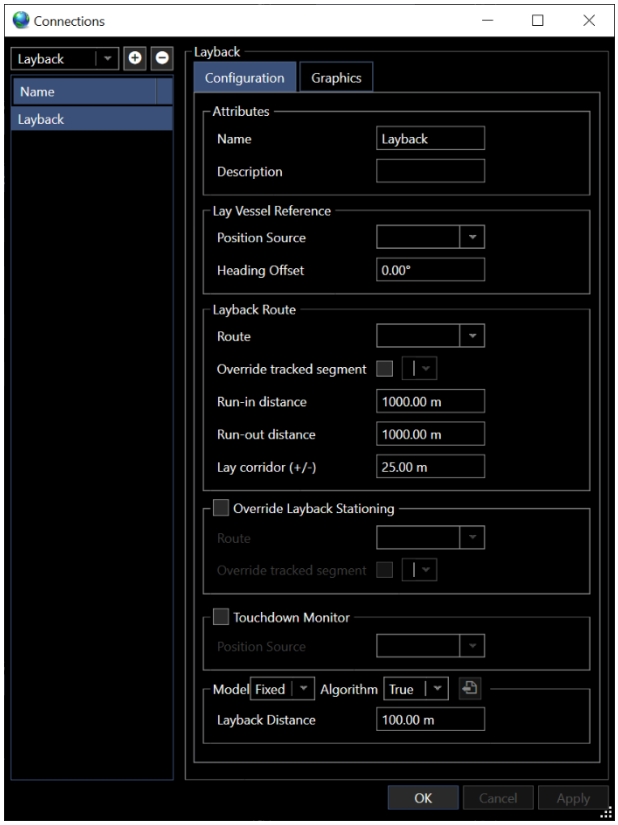


FIGURE 15-34 CONNECTIONS - CONFIGURE LAYBACK DIALOG

2. Configure the Layback options.
   a. **Configuration Tab** allows for editing the various route characteristics for the layback connection (see Figure 15-34)
      - **Attributes**
        - **Name:** Enter the Name of the layback connection, it is recommended that this be representative of the application
        - **Description (Optional):** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection
      - **Lay Vessel Reference**
        - **Position Source:** Choose a position source. Note that sources are listed in a hierarchical fashion. Below each vehicle its offsets are listed, as shown in Figure 15-35.

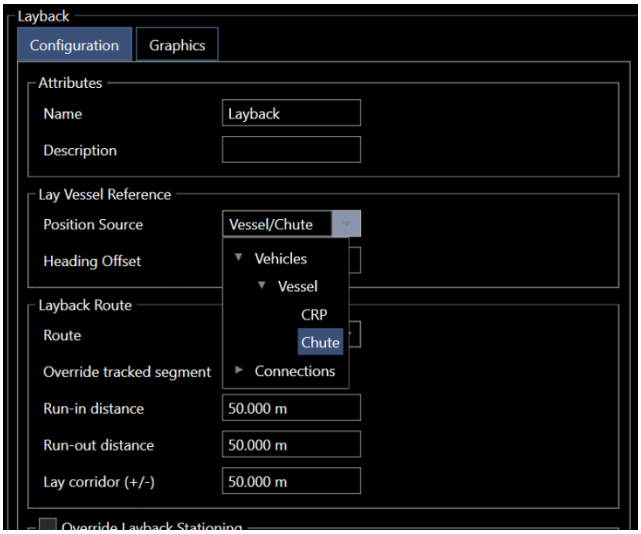


FIGURE 15-35 CONNECTIONS – LAYBACK - LAY VESSEL POSITION SOURCES

        - **Heading Offset:** Specify an offset to apply to the vessel heading when calculating the touchdown position. This allows for accurate tracking of the touchdown point when the vessel is laying at a heading other than directly forwards, such as when in close quarters with other vessels or rigs.
      - **Layback Route**
        - **Route:** Choose a route from the list of routes currently loaded
        - **Override Tracked Segment:** Choose this option to force NavView to track a specific segment on the route for vessel reference
        - **Run-in Distance:** Enter a distance to add to the start of the route
        - **Run-out Distance:** Enter a distance to add to the end of the route

- **Lay Corridor:** Controls the width of the graphical corridor displayed on 2D Map

Note: Corridor is a distance on either side of the pipeline. An entry of 50m will draw a line 50m to the left, and another line 50m to the right of the route.

- **Override Layback Stationing:** Choose this option to force NavView to track a specific segment on the route for touchdown monitoring
  - **Route:** Select the route
  - **Override Tracked Segment:** Select specific segment of the route
- **Touchdown Monitor:** Check the box if a vehicle (i.e. ROV) will be used for touchdown monitoring
  - **Position Source:** Specify the vehicle to use as the touchdown monitor from the drop-down list
- **Layback Model:** Touchdown calculation options are Fixed or Table
  - **Fixed:** Manual entry of layback distance

FIGURE 15-36 CONNECTIONS – LAYBACK - LAYBACK MODEL (TOUCHDOWN) - FIXED

  - **Layback Distance:** Enter the horizontal distance from the lay vessel reference point to the calculated touchdown point
- **Table:** The layback can be looked up from a table which has Station and Layback data and applied to the connection calculation. There are two methods to create a table, Manual Entry or Import file

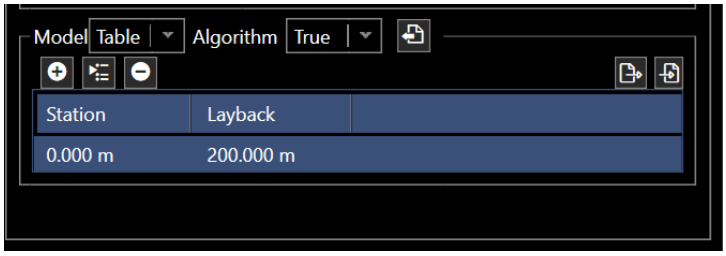


FIGURE 15-37 CONNECTIONS – LAYBACK - LAYBACK MODEL (TOUCHDOWN)) - TABLE

- **Manual Entry Table**
  I. Click the button to add a new row. The Station cell and Layback cell can be edited by double clicking the cell
  II. Click the button to insert a new row above the selected row
  III. Click the button to remove a selected row

IV. Click the  button to export the table as .csv file

- **Import Table**

I. Click the  button to import a lay table from a file. This opens Windows explorer, browse to file, and select. This will open the Import Lay Table dialog

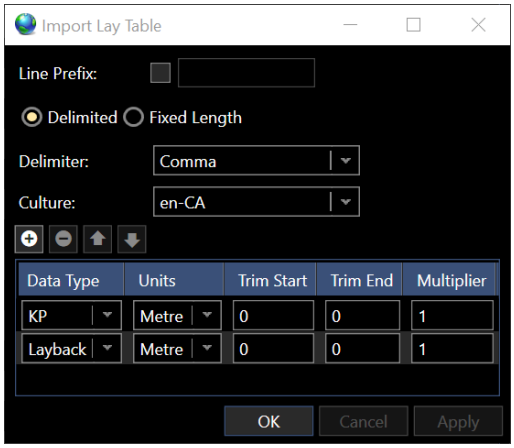


FIGURE 15-38 CONNECTIONS – LAYBACK - IMPORT LAYBACK TABLE DIALOG EXAMPLE

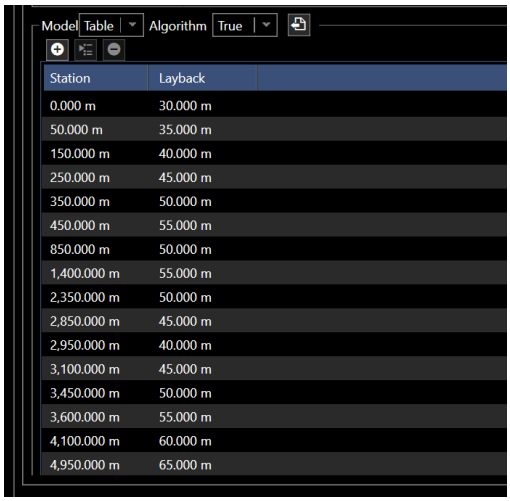


FIGURE 15-39 CONNECTIONS – LAYBACK - EXAMPLE OF IMPORTED LAYBACK TABLE

Note: The Touchdown position is calculated in the direction of reverse vessel heading (positive is aft), with the heading offset applied. For instance, if the vessel heading is 0.00, and the heading offset is 00.0, the touchdown point is calculated at the layback distance, 180.0 degrees from the vessel reference point.

- **Algorithm:** Method for calculating the Barge Track using the layback values

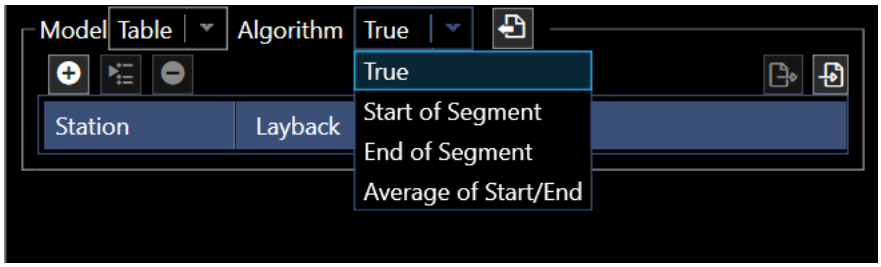


FIGURE 15-40 CONNECTIONS – LAYBACK - BARGE TRACK CALCULATION OPTIONS

  - **True:** Mathematically correct layback route (Barge Track)
  - **Start of Segment:** Option that only projects forward on the start of segments at an alter course. NOT the true layback route
  - **End of Segment:** Option that only projects forward on the end of segments at an alter course. NOT the true layback route
  - **Average of Start/End:** Option that uses the average of the start and end of segment projections at an alter course. NOT the true layback route
- **Export Layback Route**

  I. Click the 

button to export the calculated layback route (Barge Track) to a I/O **Route Export** device, **Survey Line** or **CSV file**.

Note: See ***NavView User Guide, Devices*** on I/O device configuration.

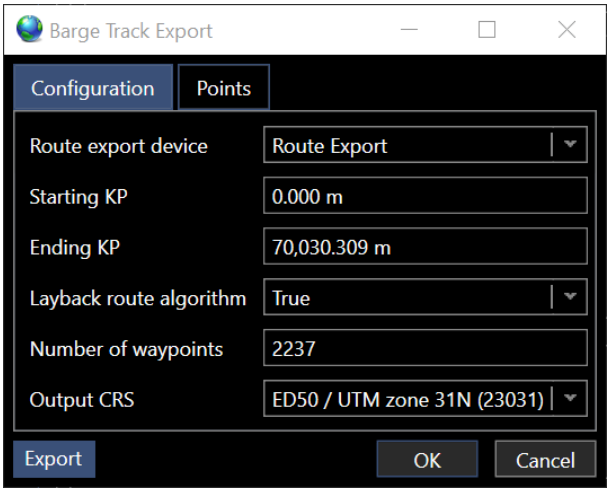


FIGURE 15-41 CONNECTIONS – LAYBACK - BARGE TRACK EXPORT DIALOG

- **Configuration Tab**
  I. **Route Export Device:** Select Route Export device configured in *Devices*
  II. **Starting KP:** Enter along route distance to define the beginning of route to export
  III. **Ending KP:** Enter along route distance to define the end of route to export
  IV. **Layback route algorithm:** The barge track is calculated from layback table or fixed layback applied to route RPL segments. From the drop down select the barge track calculation type
    - **True:** This being the mathematically correct layback route
    - **Start of Segment:** Only projects forward on the start of segments at an alter course. Not the true layback route
    - **End of Segment:** Only projects forward on the end of segments at an alter course. Not the true layback route
  V. **Number of waypoints:** Displays the number of waypoints in the barge track route
  VI. **Output CRS:** Select the required geodetics for the exported barge track
  VII. **Export:** Click this button to export the calculated layback route (Barge Track) to a I/O **Route Export** device, **Survey Line** or **CSV file**. See Figure 15-42

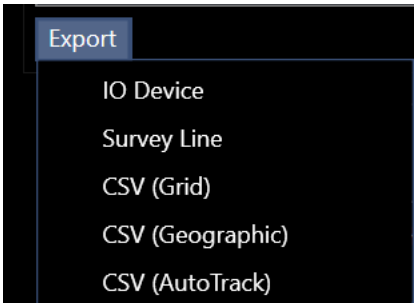


FIGURE 15-42 CONNECTIONS – LAYBACK – BARGE TRACK EXPORT OPTIONS

- **Points Tab:** Listing of waypoints created for the barge track route
  I. **Name:** Waypoint number
  II. **Position:** Waypoint position
  III. **Station:** Waypoint along route distance referenced to lay route, not barge track route

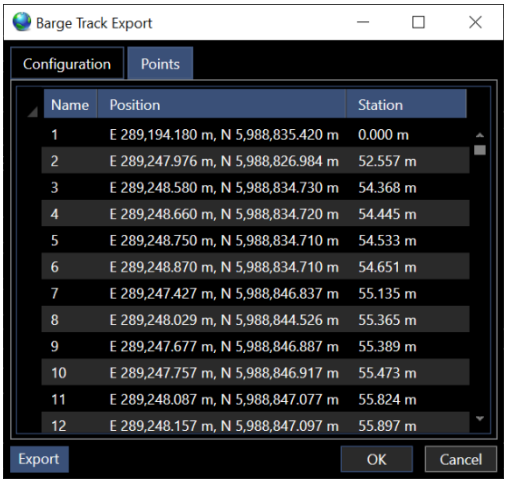


FIGURE 15-43 CONNECTIONS – LAYBACK - BARGE TRACK EXPORT - POINTS TAB

b. **Graphics Tab** allows for editing the various symbols and lines associated with a Layback connection

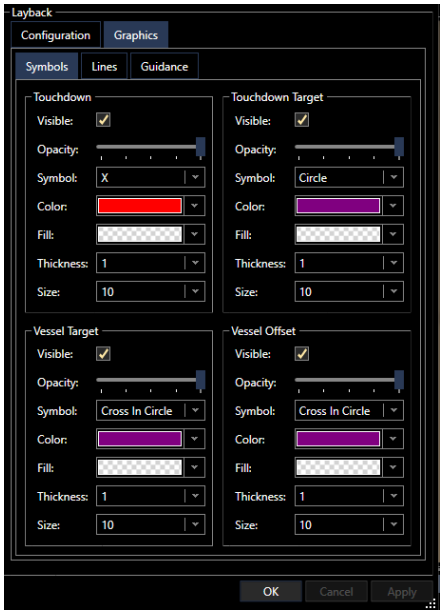


FIGURE 15-44 CONNECTIONS - LAYBACK GRAPHICS TAB - SYMBOLS TAB

- **Symbols Tab**
  - **Touchdown:** This is the calculated touchdown point based on the layback and vessel heading
  - **Touchdown Target:** This is the desired touchdown point, which is at the same station as the calculated touchdown point, with no offline distance from the pipeline
  - **Vessel Target:** This is the vessel position which would be required for the calculated touchdown point to be at the desired touchdown point

- **Vessel Offset:** This is the vessel that is laying at a heading other than directly forwards, such as when in close quarters with other vessels or rigs

- **Lines Tab**

FIGURE 15-45 CONNECTIONS - LAYBACK GRAPHICS TAB - LINES TAB

- **Layback:** This is a line connecting the reference offset of the lay vessel to the calculated touchdown point
- **Layback Route:** Also known as “Barge Track” this is the route which the vessel needs to follow
- **Lay Corridor:** If a lay corridor has been specified, its visible properties can be edited here

- **Guidance Tab**

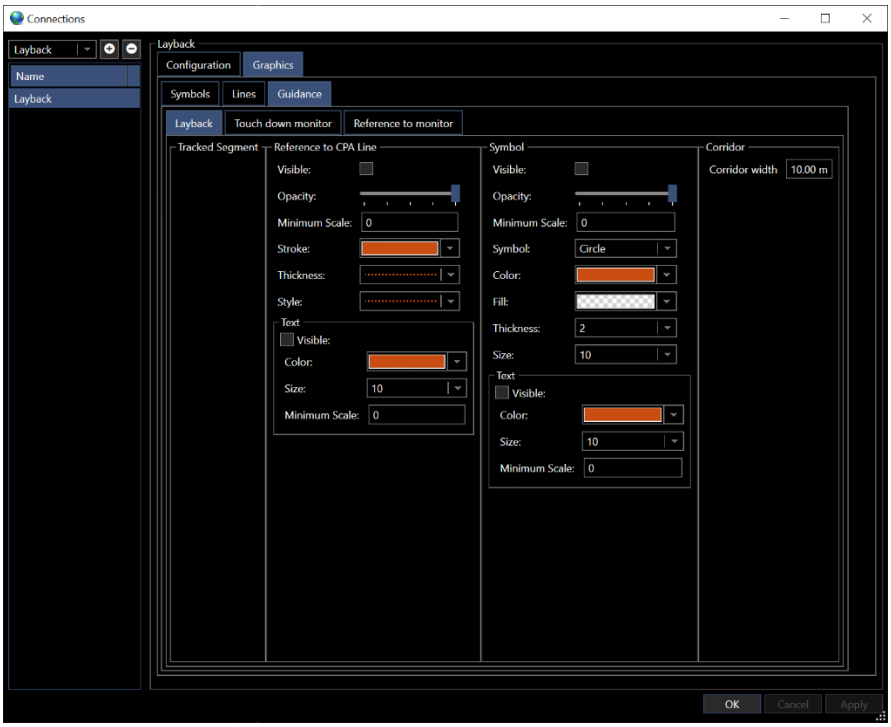


FIGURE 15-46 CONNECTIONS - LAYBACK GRAPHICS TAB - GUIDANCE TAB

- **Layback Tab**
  I. **Tracked Segment:** Route segment tracked by layback reference (touchdown)
  II. **Reference to CPA Line:** Line from layback reference (touchdown) perpendicular to tracked segment. Layback reference to CPA annotation will be displayed when Text box is checked
  III. **Symbol:** Icon for displayed for layback reference (touchdown). Reference annotation can be displayed by checking the Text box
  IV. **Corridor:** A corridor of a specified width can be displayed for the layback
- **Touch down monitor Tab**
  I. **Tracked Segment:** Route segment tracked by vehicle following touchdown such as a ROV
  II. **Reference to CPA Line:** Line from vehicle following touchdown perpendicular to tracked segment. Vehicle to CPA annotation will be displayed when Text box is checked
  III. **Symbol:** Icon displayed for vehicle following touchdown. Reference point annotation can be displayed by checking the Text box
  IV. **Corridor:** A corridor of a specified width can be displayed for the Touch Down Monitor

- **Reference to Monitor Tab**
  I. **Line:** Line drawn from lay vessel reference to vehicle following touchdown. Line can be annotated by checking the text box
  II. **Symbol:** Icon displayed for lay vessel reference point. Reference annotation can be displayed by checking the Text box