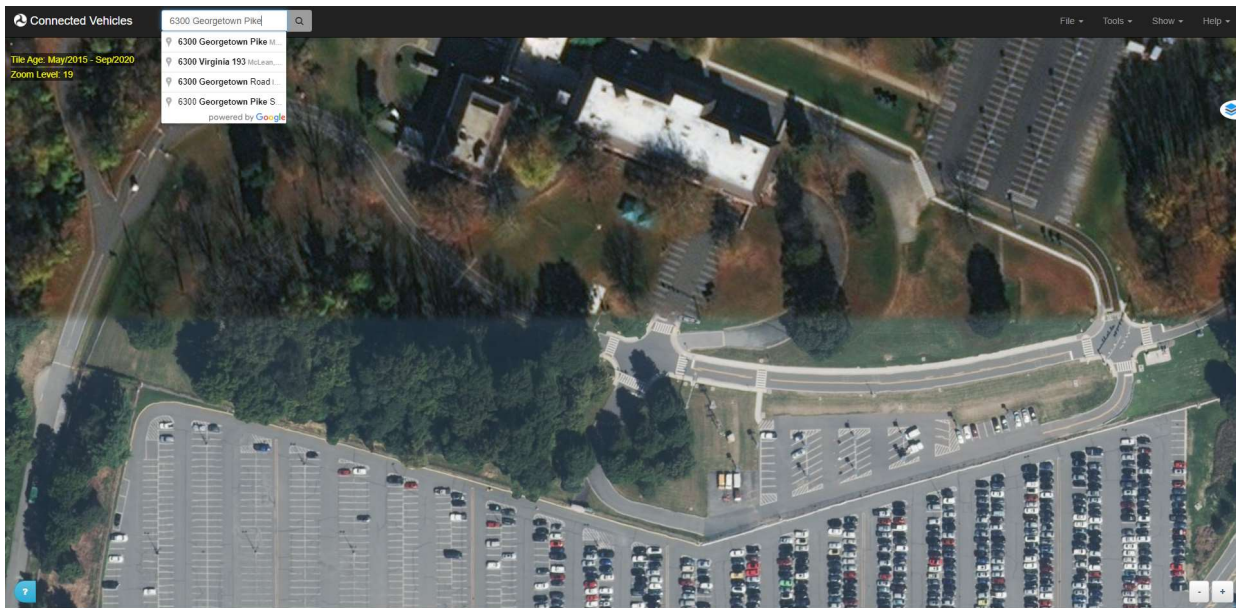


# USDOT's ISD Creation Tool

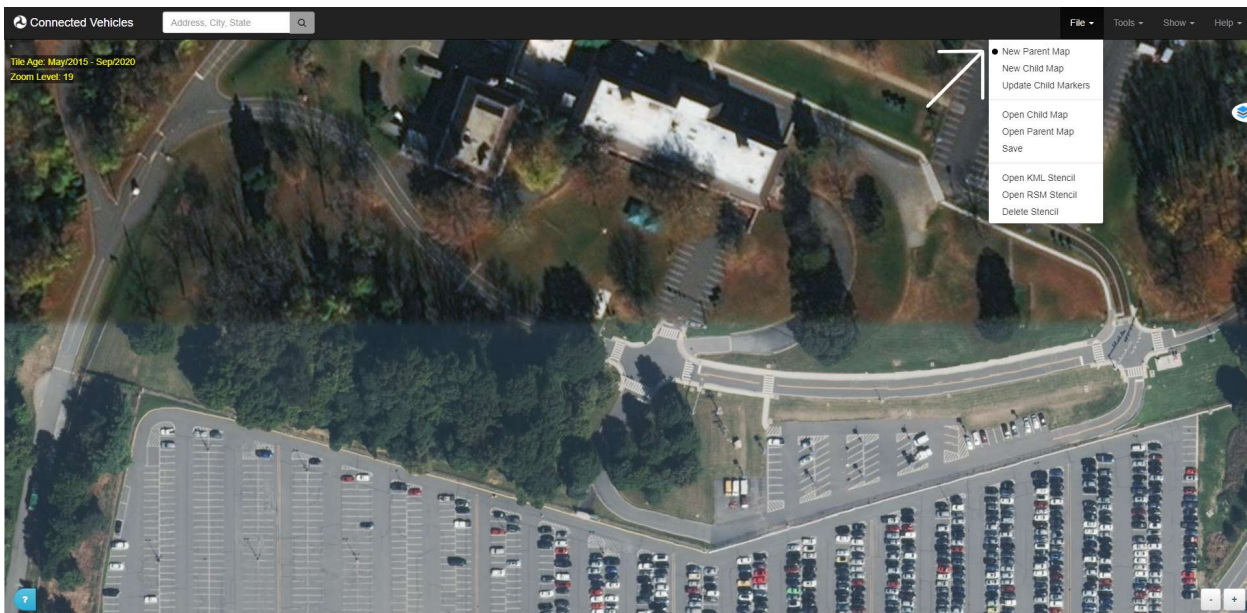
1. Navigate to the address where the ISD message would be created (refer to **Figure 1**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 1. Image. Address Navigation

2. From the top navbar, go to **New Parent Map** to enter parent map editing mode (refer to **Figure 2**).

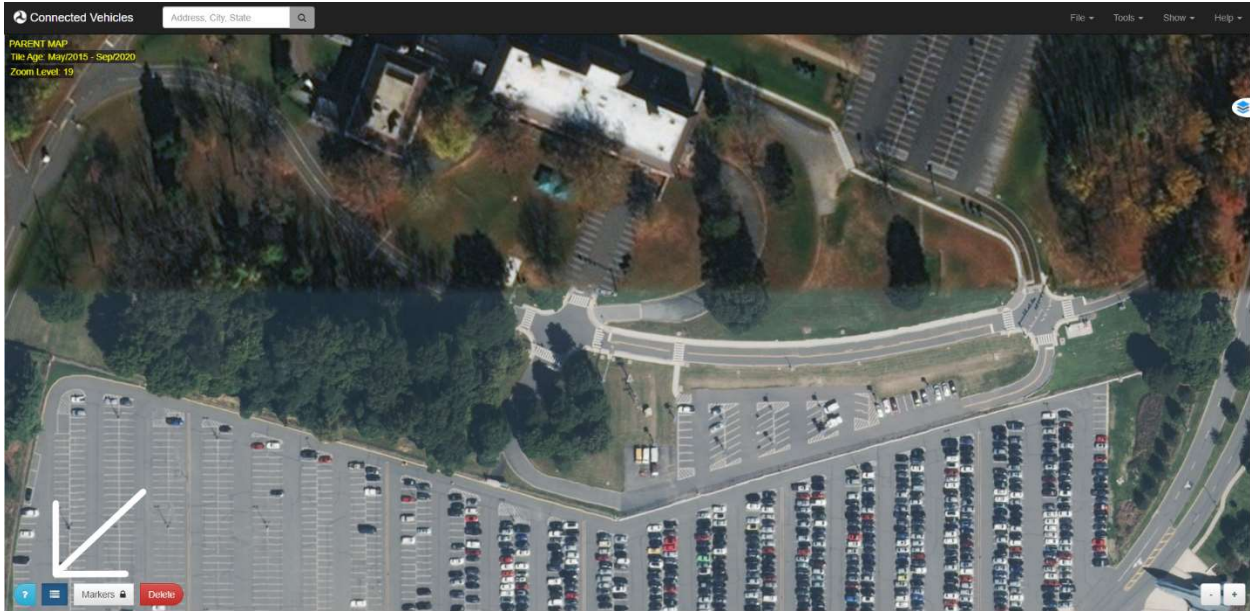


Source: <https://webapp.connectedvcs.com/isd/>

Figure 2. Image. New Parent Map

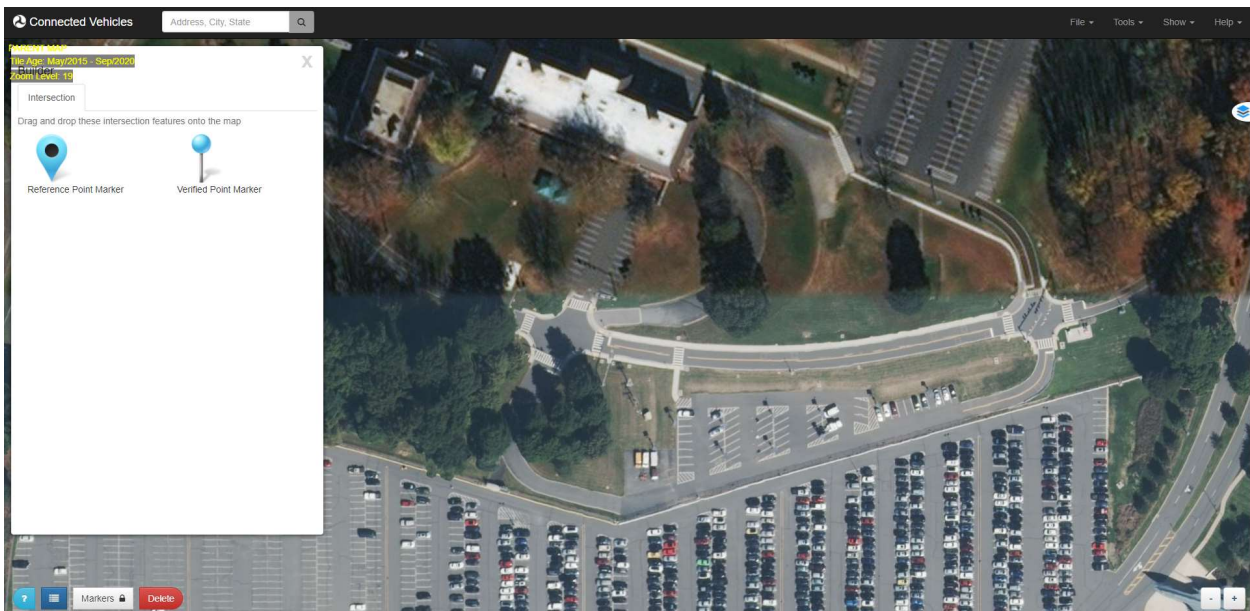
## USDOT's ISD Creation Tool

3. Select the **Builder** icon to bring up the builder menu (refer to **Error! Reference source not found.**). In the **Intersection** tab, you should see the two intersection options, including the **Reference Point Marker** (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 3. Image. Builder Icon



Source: <https://webapp.connectedvcs.com/isd/>

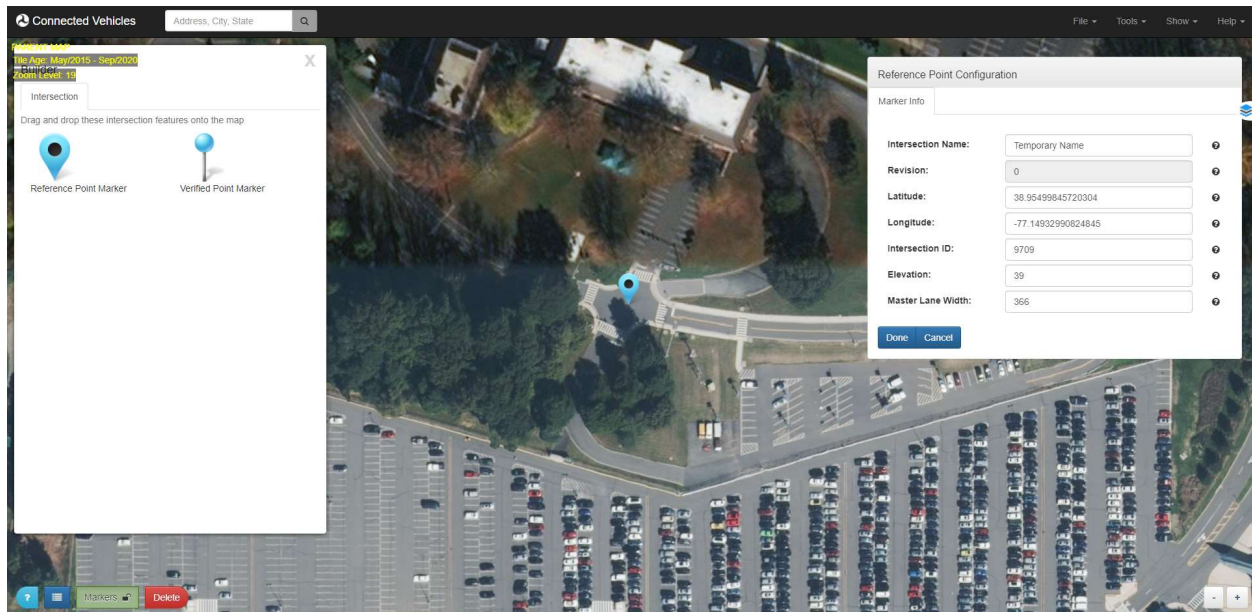
Figure 4. Image. Reference Point Marker

## USDOT's ISD Creation Tool

- Click and drag a reference point marker to the center of your intersection. You can only place one reference point per message.

*Note that the **Markers Control** becomes enabled once the marker is placed (refer to *Source*: <https://webapp.connectedvcs.com/isd/>)*

- Figure 5**).
- You may drag around the marker after being placed to tweak its location.
- Click on the marker to open and close the **Configuration** dialog. From here you can view its Latitude, Longitude, Elevation, and other variables.
- You may toggle the control back off or click **Done** once you are finished tweaking the location of the marker to lock it place.



*Source: <https://webapp.connectedvcs.com/isd/>*

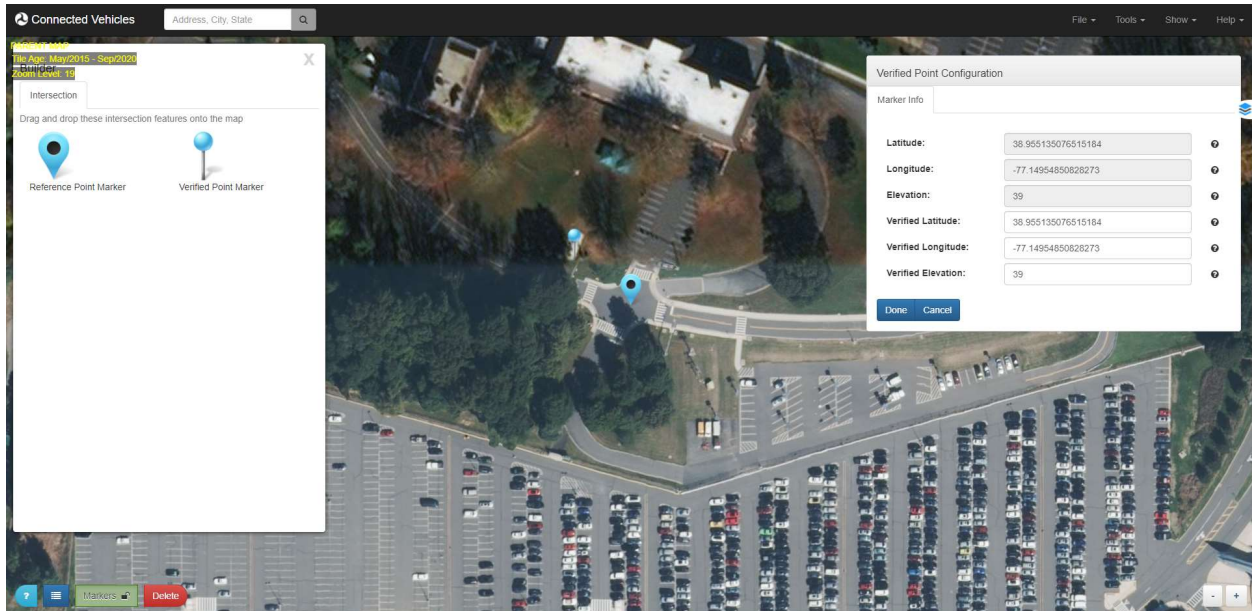
*Figure 5. Image. Marker Configuration Dialog*

- Click and drag the **Verified Point Marker** to a known, surveyed location on the map.

*Click on the marker to open up the **Configuration** dialog (refer to *Source*: <https://webapp.connectedvcs.com/isd/>)*

- Figure** ). You can view the location of the marker on the map, as well as view and modify the verified location of the marker.
- Check the verified marker information and edit as necessary. Click **Done** when finished.

# USDOT's ISD Creation Tool



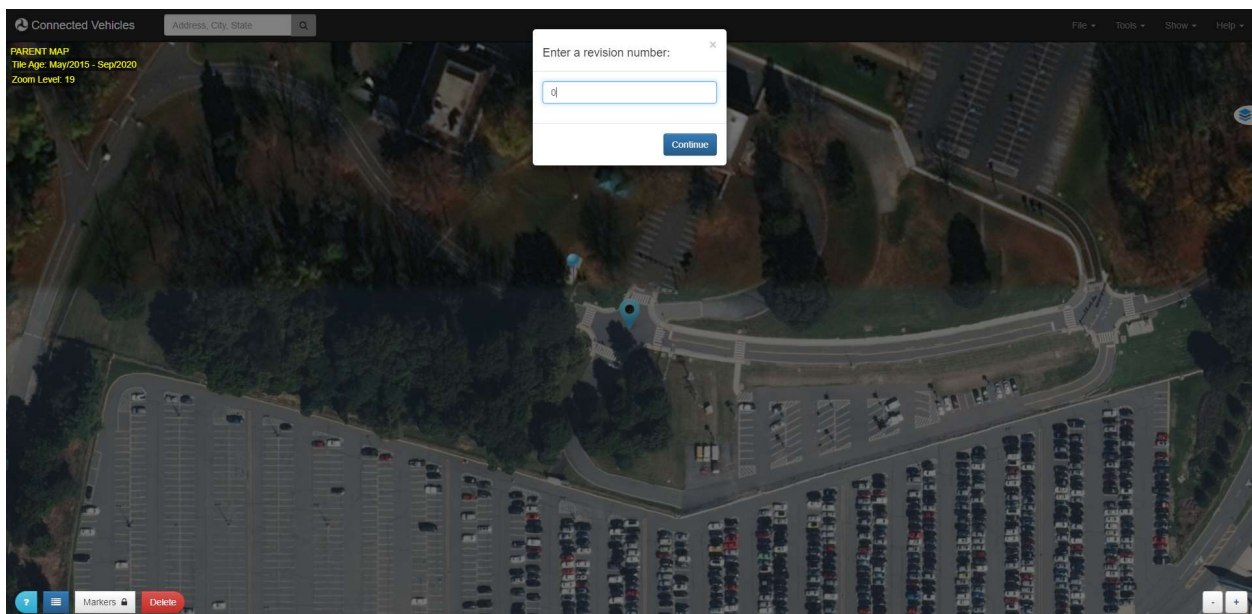
Source: <https://webapp.connectedvcs.com/isd/>

Figure 6. Image. Verified Point Configuration

6. Close the **Builder** once you are finished placing the two markers.

Go to **File** then **Save** and enter your revision number (refer to Source: <https://webapp.connectedvcs.com/isd/>)

7. **Figure** ).



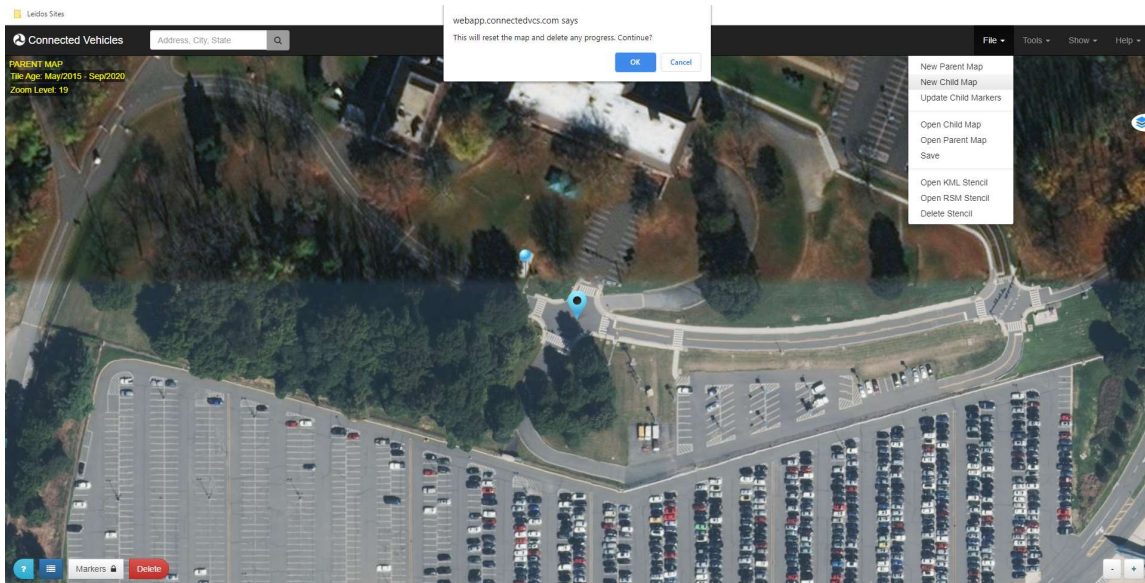
Source: <https://webapp.connectedvcs.com/isd/>

## USDOT's ISD Creation Tool

Figure 7. Image. Setting Revision Number

Save file and continue to creating a **New Child Map** in the file menu. Selecting new child map will bring up a dialog box. Click **OK** if your parent map has been saved (refer to Source: <https://webapp.connectedvcs.com/isd/>)

### 8. Figure 3).



Source: <https://webapp.connectedvcs.com/isd/>

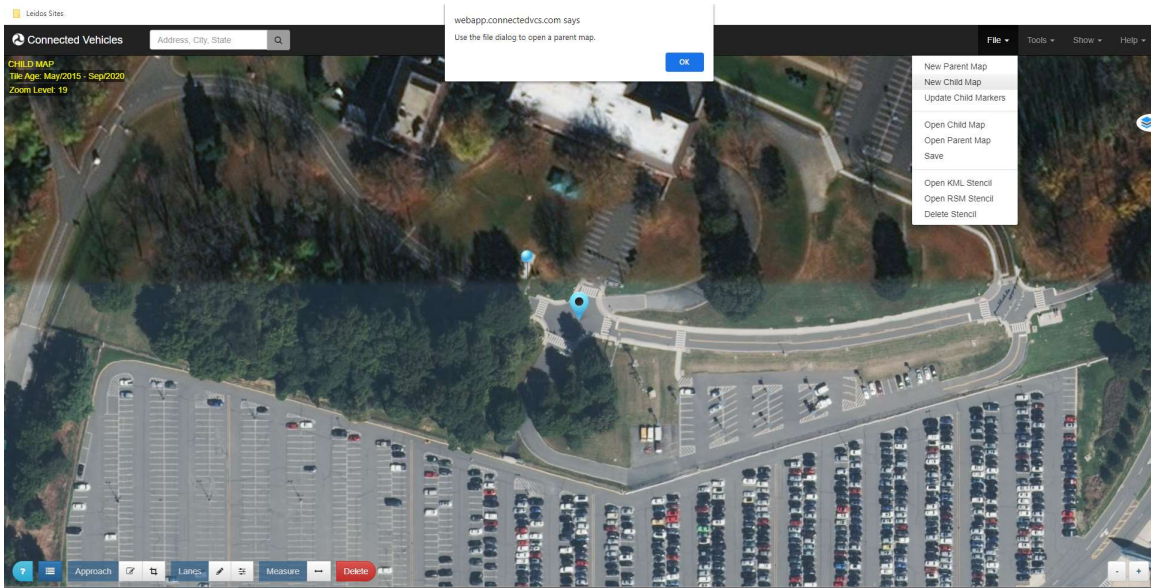
Figure 8. Image. New Child Map

A second dialog box will direct to opening a parent map, which is used to build the child map (refer to Source: <https://webapp.connectedvcs.com/isd/>)

Figure 3). Select the saved parent map and open (refer to Source: <https://webapp.connectedvcs.com/isd/>)

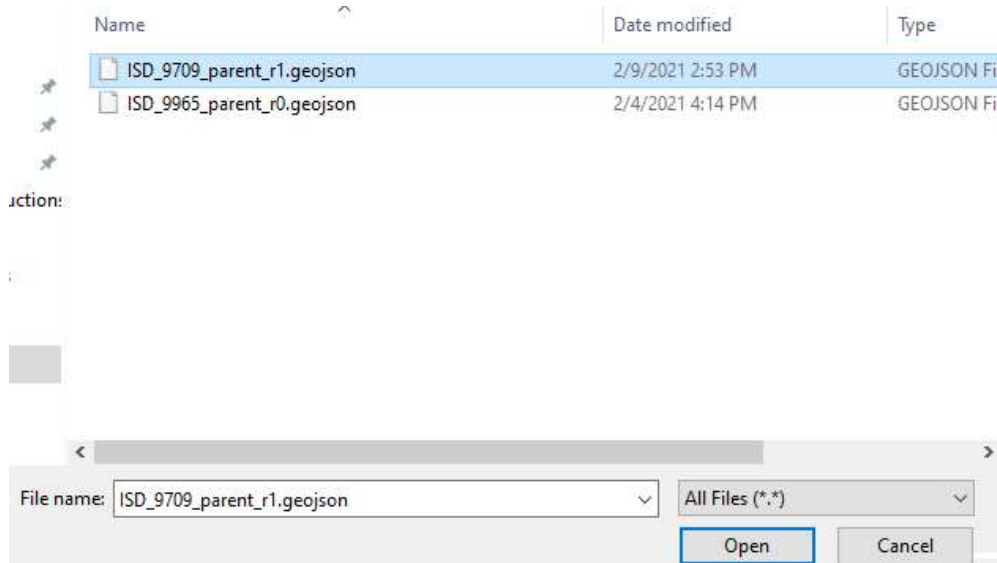
### 9. Figure 3).

# USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

Figure 9. Image. New Child Map



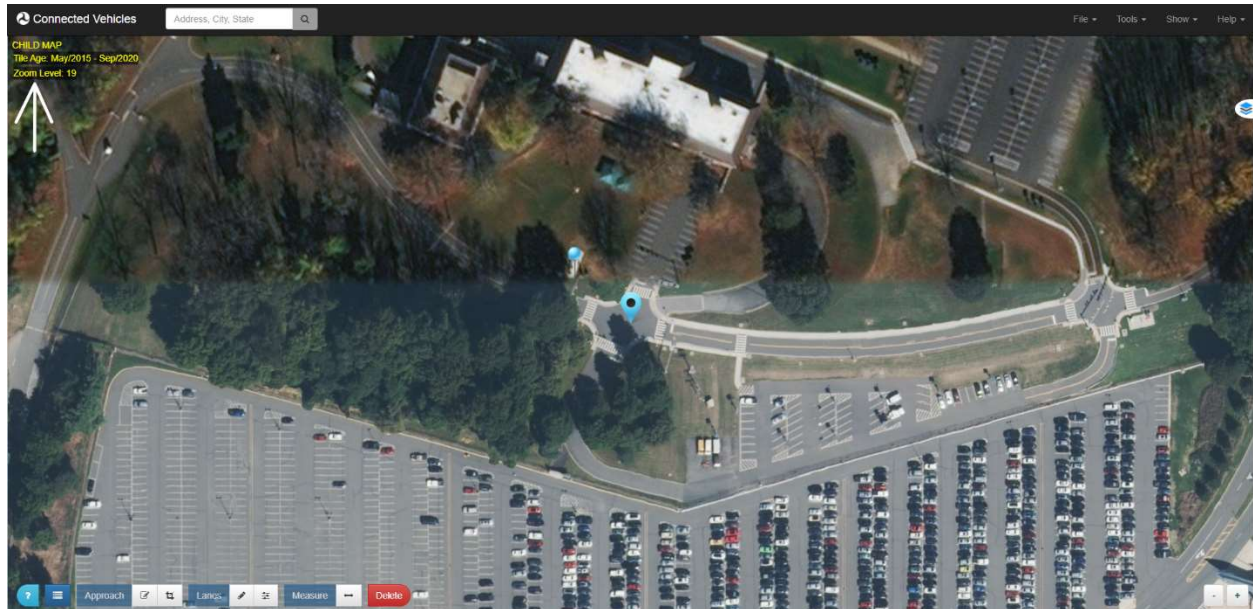
Source: <https://webapp.connectedvcs.com/isd/>

Figure 10. Image. Selecting Parent Map

Once opened, the information from the parent map will be imported to the new child map (refer to Source: <https://webapp.connectedvcs.com/isd/>

10. **Figure 3).**

## USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

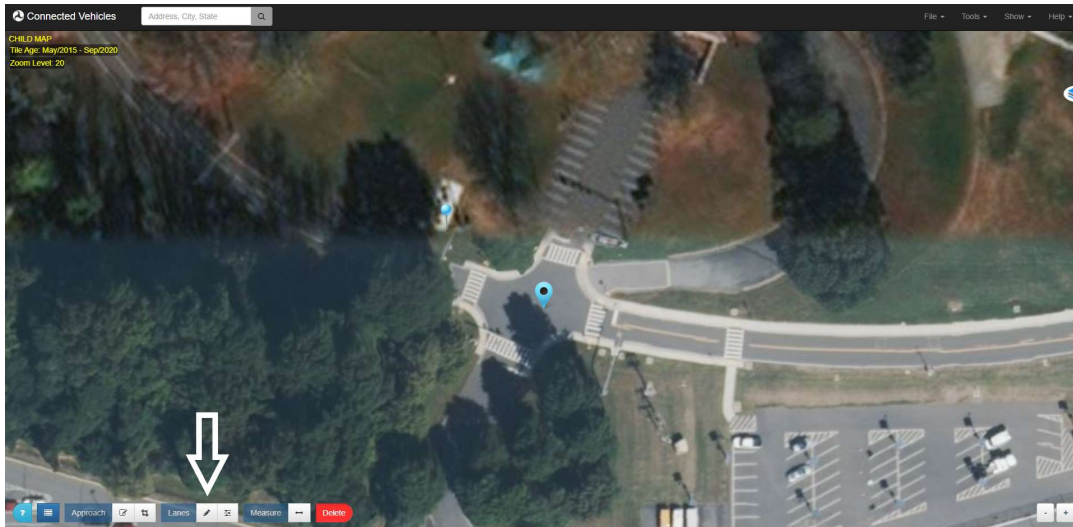
Figure 11. Image. New Child Map

### Defining the Region

Toggle ON the **Draw Lane** control from the bottom Control Panel. A lane region is started from the STOP bar, down the center of the lane, until about 1000 feet away from the intersection. Single click to drop points, double click to stop drawing. (refer to Source: <https://webapp.connectedvcs.com/isd/>)

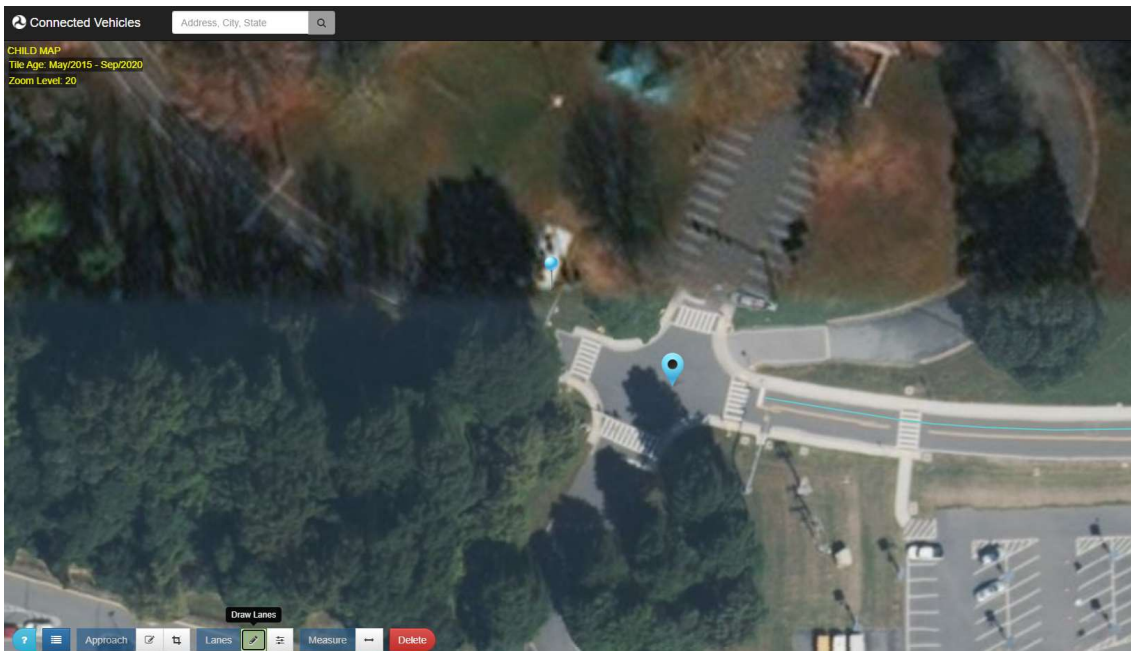
1. **Figure 3).**

## USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

Figure 31. Image. Draw Lane

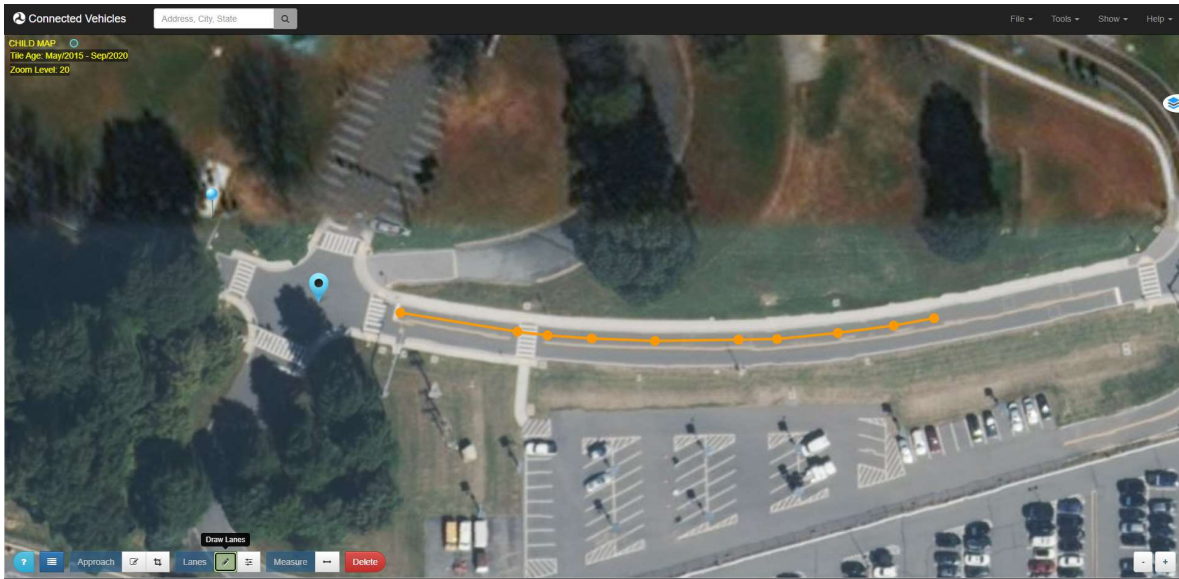


Source: <https://webapp.connectedvcs.com/isd/>

Figure 12. Image. Draw Lane In Progress



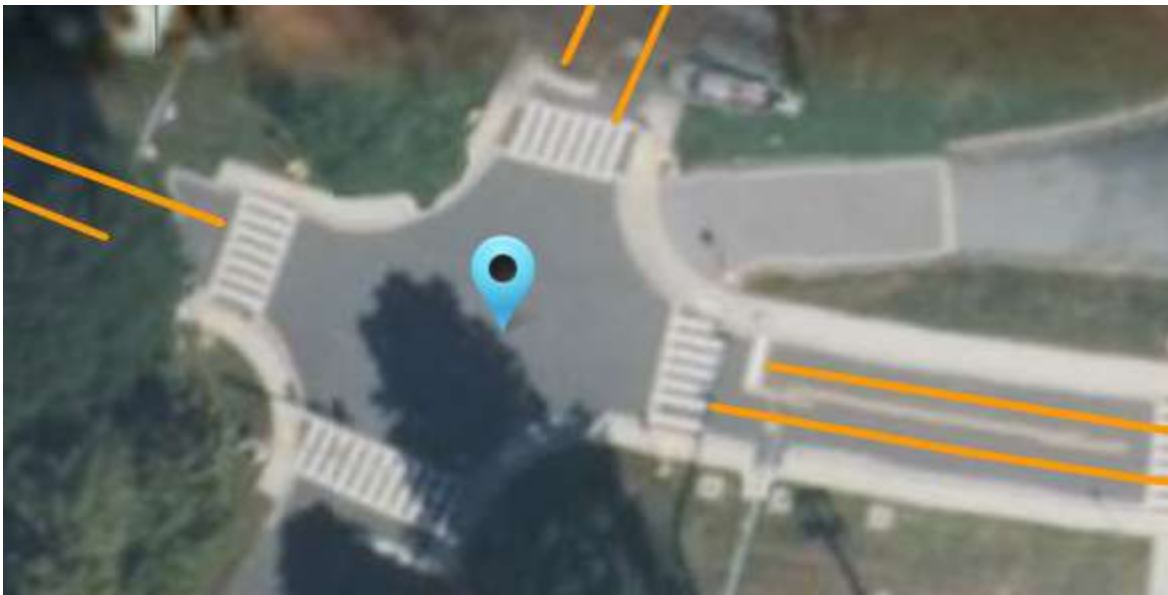
## USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

Figure 13. Image. Completed Lane

2. Ingress lanes are marked from the beginning of the STOP bar and egress lanes are marked from the beginning of the CROSSWALK (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 14. Image. Ingress and Egress Lanes

## USDOT's ISD Creation Tool

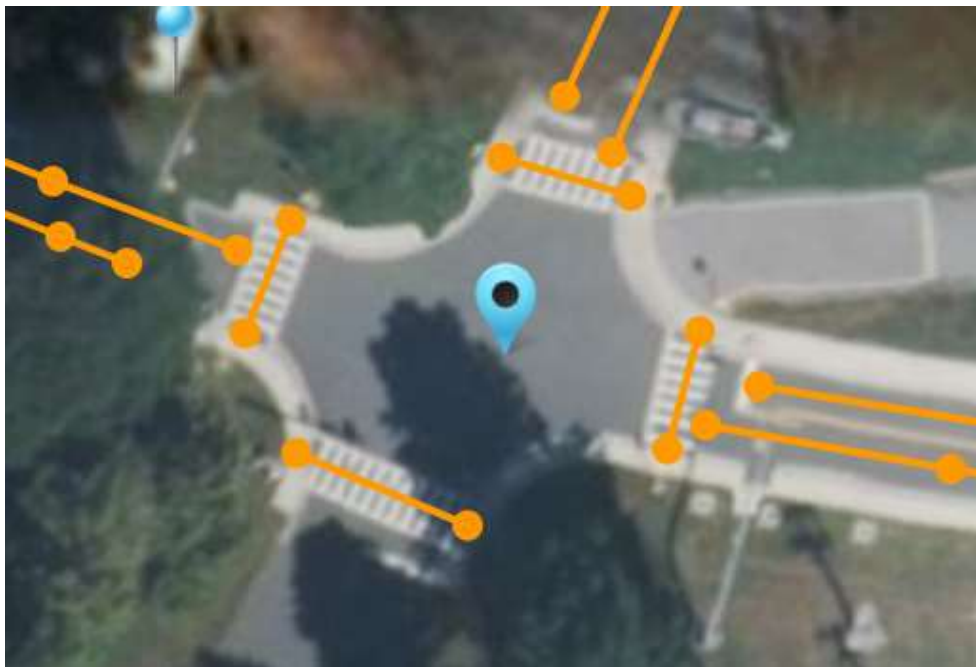
- Lanes can be edited using the **Edit Lanes** button at the bottom of the screen. Selected lane will show markers, which can be moved (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 15. Image. Edit Lanes

- Crosswalks are marked using the same **Draw Lanes** tool (refer to **Error! Reference source not found.**).

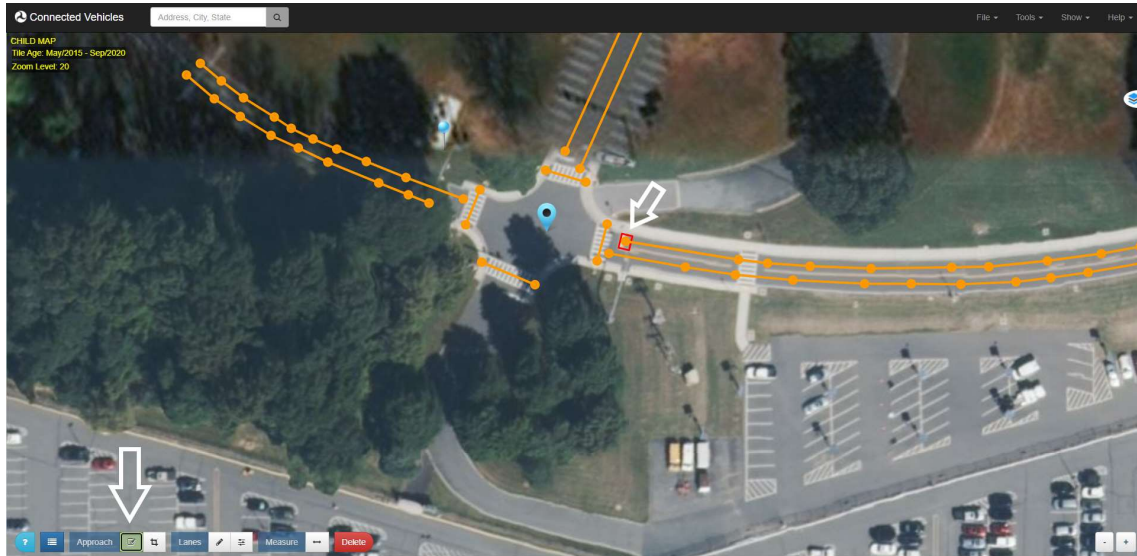


Source: <https://webapp.connectedvcs.com/isd/>

## USDOT's ISD Creation Tool

Figure 16. Image. Drawing Crosswalks

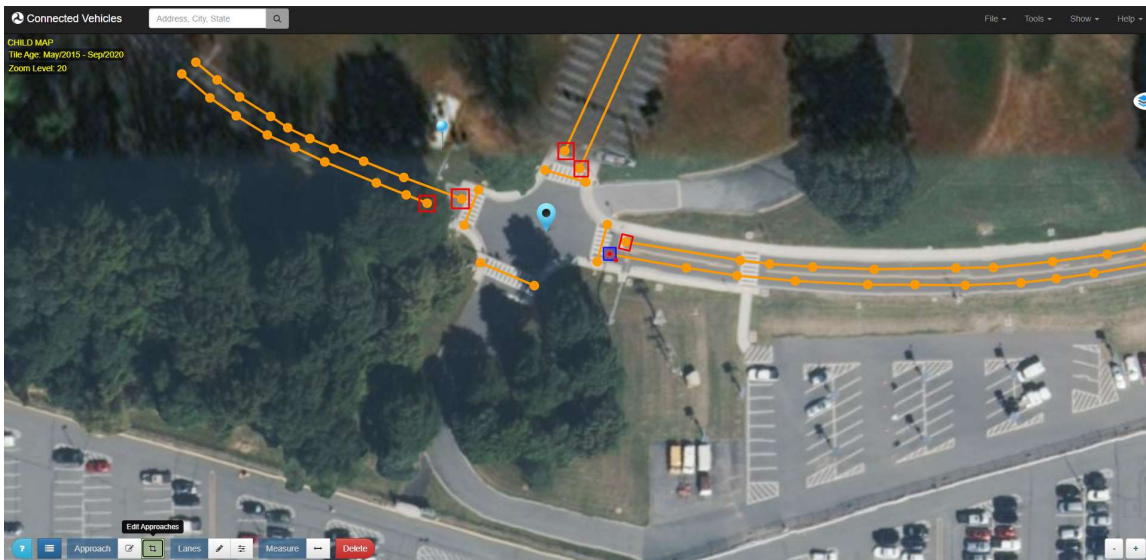
- An approach is drawn by selecting the **Draw Approaches** tool at the bottom of the screen. Click and drag across a region to draw (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 17. Image. Drawing an Approach

- Approaches can be edited by selecting the **Edit Approaches** tool at the bottom of the screen. Clicking on an approach will allow you to move and adjust the approach (refer to **Error! Reference source not found.**).

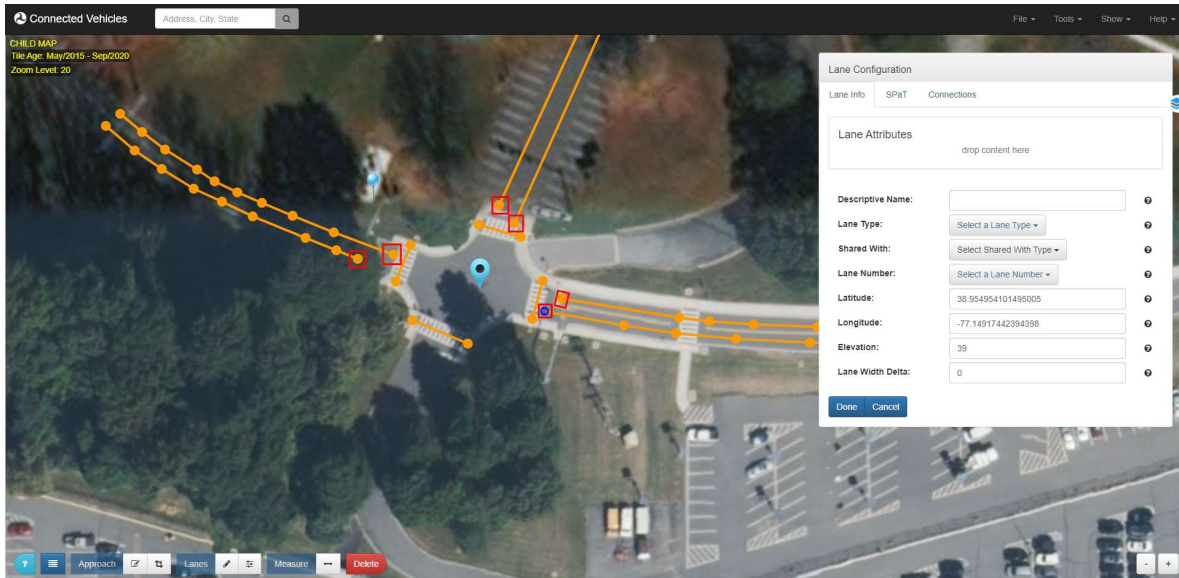


Source: <https://webapp.connectedvcs.com/isd/>

## USDOT's ISD Creation Tool

Figure 18. Image. Editing an Approach

7. Feel free to save the maps at any time. This way, previous revisions can be accessed if desired.
8. Lane configurations can be updated by clicking on the first node drawn at each lane (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 19. Image. Lane Configuration

9. Set the **Lane Type** and **Lane Number** for each node in the intersection (refer to **Error! Reference source not found.**).

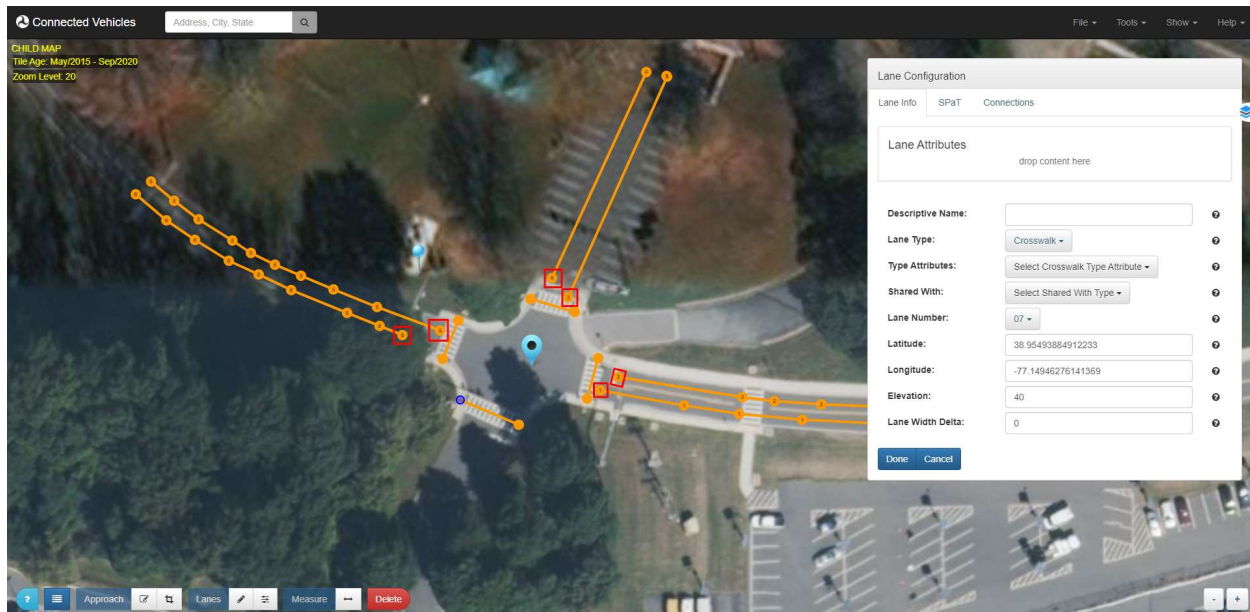
## USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

Figure 20. Image. Lane Configuration

10. Crosswalks can be set and numbered as well (refer to **Error! Reference source not found.**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 21. Image. Crosswalk Configuration

11. **Type Attributes** and **Shared With** can be selected if needed for a specific lane in the lists (refer to **Error! Reference source not found.**).

## USDOT's ISD Creation Tool

Lane Configuration

Lane Info | SPaT | Connections

Lane Attributes

drop content here

Descriptive Name:

Lane Type: Vehicle

Type Attributes: Select Vehicle Type Attribute

Shared With:

- (0) Vehicle Revocable Lane
- (1) Vehicle FlyOver Lane
- (2) HOV Lane Use Only
- (3) Restricted To Bus Use
- (4) Restricted To Taxi Use
- (5) Restricted From Public Use
- (6) Has IR Beacon Coverage
- (7) Permission On Request

Lane Number:

Latitude:

Longitude:

Elevation:

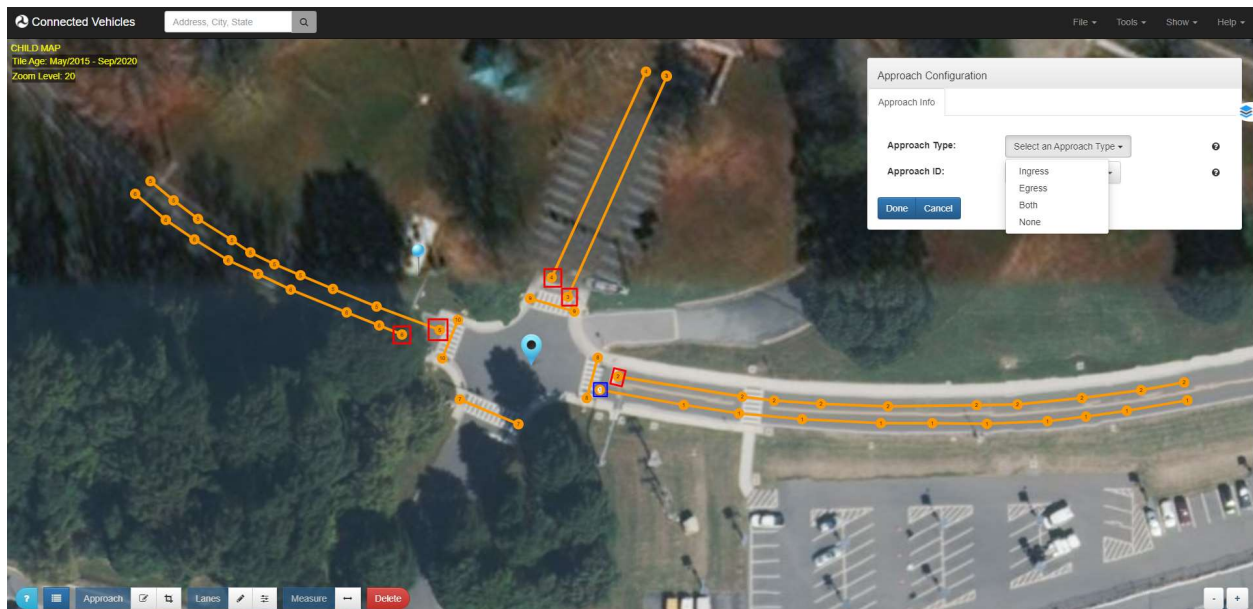
Lane Width Delta: 0

Done Cancel Create Computed Lane

Source: <https://webapp.connectedvcs.com/isd/>

Figure 22. Image. Additional Lane Configurations

12. **Approach Configurations** are added by clicking on each approach border (refer to **Error! Reference source not found.**). This allows the user to set the approach as either an Ingress, Egress, Both, or None.

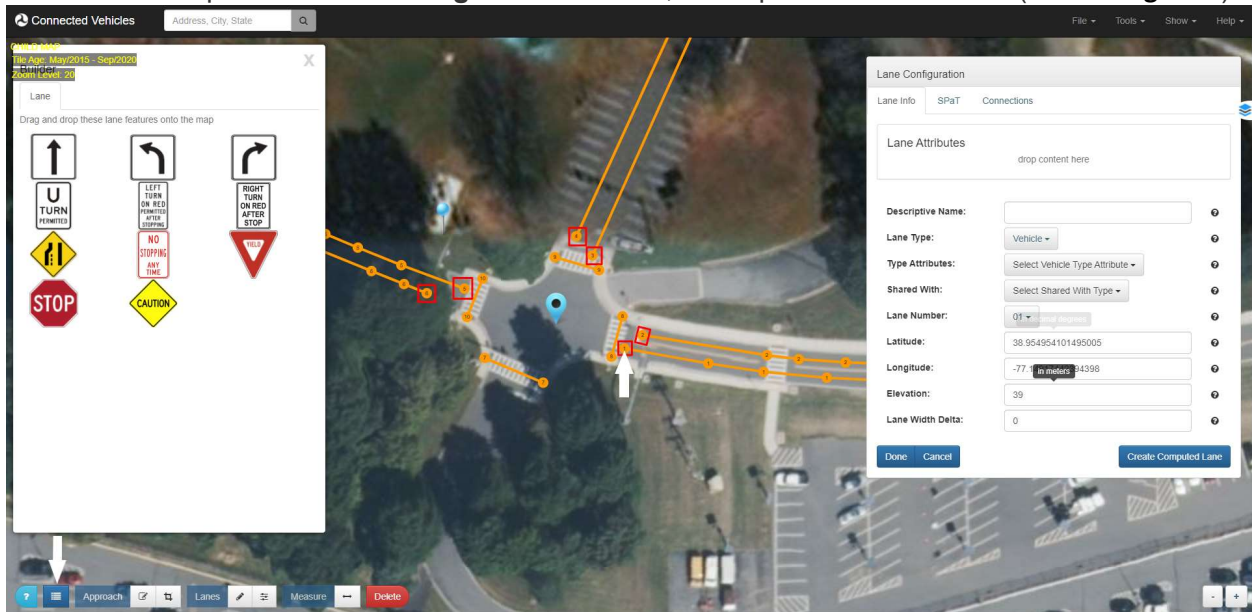


Source: <https://webapp.connectedvcs.com/isd/>

Figure 23. Image. Approach Configurations

## USDOT's ISD Creation Tool

13. In order to define how the lanes and crosswalks interact, the **Lane Attributes** must be edited. Select a lane node to open the **Lane Configuration** window, then open the **Builder** tool (refer to **Figure 4**).



Source: <https://webapp.connectedvcs.com/isd/>

Figure 24. Image. Lane Attributes

14. When both windows are open, a **Lane Feature** can be drag-and-dropped to the **Lane Attributes** section in the Lane Configuration window (refer to **Figure 5**).

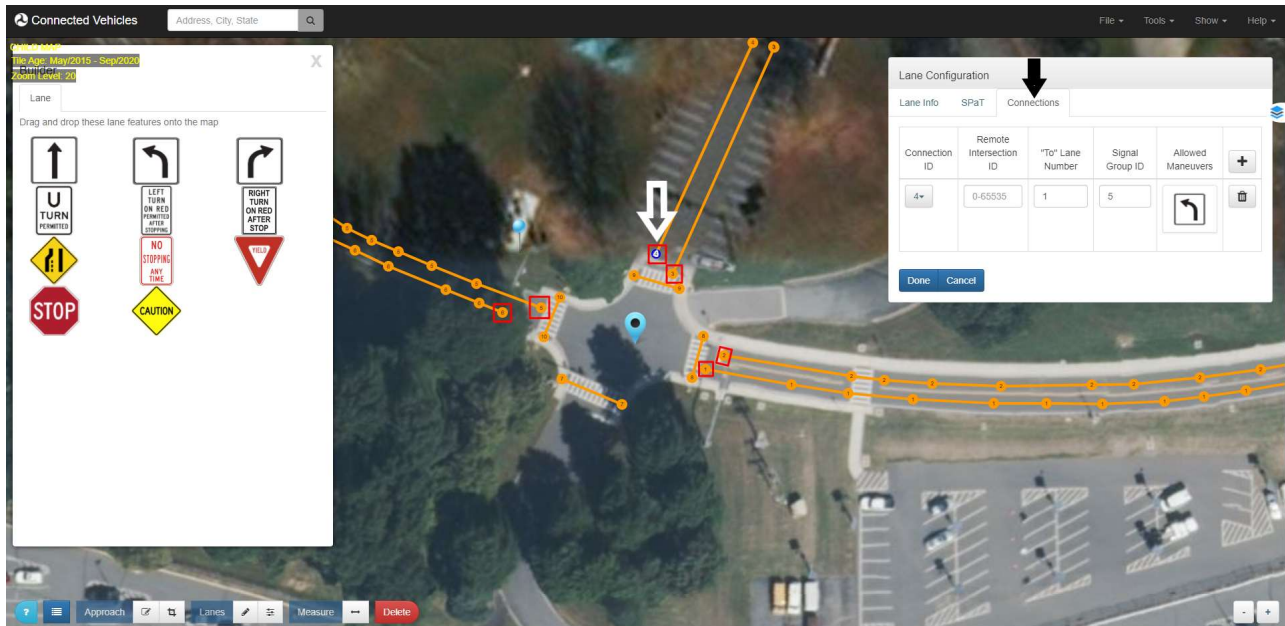


Source: <https://webapp.connectedvcs.com/isd/>

Figure 25. Image. Lane Attributes

## USDOT's ISD Creation Tool

15. Another method for assigning lane attributes can be done using the **Connections** tab. Here, a lane to lane connection through the intersection can be specified. The IDs in this tab are specified by the particular intersection's traffic signal controller configurations. A left turn connection example from Lane 4 to Lane 1 is shown (refer to **Figure 5**).



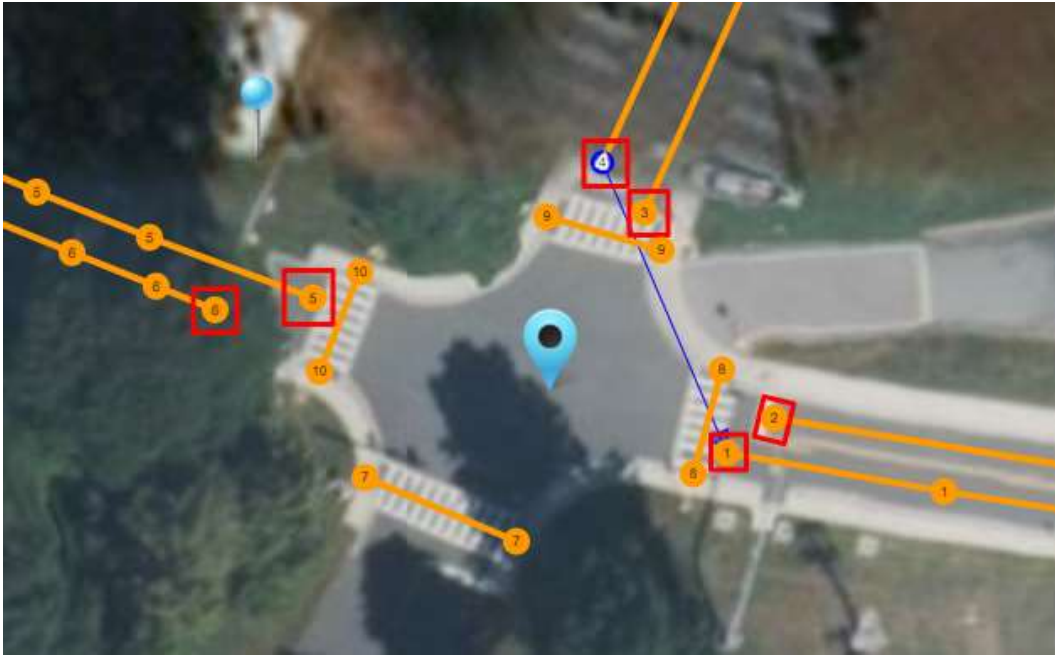
Source: <https://webapp.connectedvcs.com/isd/>

Figure 26. Image. Left Turn Attribute

16. Once the connection is made and **Done** is selected, a connection on the map can be seen when the approach is selected (refer to **Figure 4**).
- All lanes are configured individually.



## USDOT's ISD Creation Tool



Source: <https://webapp.connectedvcs.com/isd/>

Figure 27. Image. Added Left Turn Attribute

17. The final lane configuration is the SPaT tab. Here, you can input all the SPaT information for each lane (refer to **Figure 4**).

Lane Configuration	
Lane Info	SPaT
SPaT Revision:	<input type="text" value="1"/>
Signal Group ID:	<input type="text" value="0 to 255"/>
Signal Phase:	<input type="button" value="Select a Signal Phase"/>
Start Time:	<input type="text" value="0 to 36001"/>
Minimum End Time:	<input type="text" value="0 to 36001"/>
Maximum End Time:	<input type="text" value="0 to 36001"/>
Likely Time:	<input type="text" value="0 to 36001"/>
Confidence:	<input type="button" value="Select a Confidence"/>
Next Time:	<input type="text" value="0-36001"/>
<input type="button" value="Done"/> <input type="button" value="Cancel"/>	

Source: <https://webapp.connectedvcs.com/isd/>

Figure 28. Image. SPaT Configurations

## Finish and Encode or Deposit

Encode your ISD message to the intersection once you are finished building it.

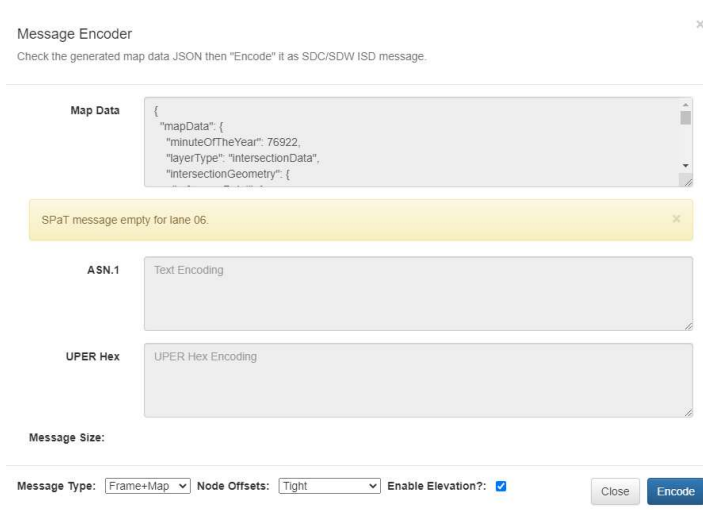
# USDOT's ISD Creation Tool

1. Open Encode/Deposit dialog
  - a. Click on **Tools Encode** to load the deposit window (refer to **Figure 4**). Unless there are errors, a JSON message should already be generated from the map data. Its contents will appear in the **Message** text box (refer to **Figure 5**).
  - b. Verify the contents of the message.



Source: <https://webapp.connectedvcs.com/isd/#>

Figure 4. Image. Open Encode/Deposit Window



Source: <https://webapp.connectedvcs.com/isd/#>

Figure 5. Image. Message Deposit Window

2. Select desired Message Type (refer to **Error! Reference source not found.**)
  - o **ISD** – ISD Safety Message

## USDOT's ISD Creation Tool

- **Map** – Raw map contents
  - **Frame+Map** – SAE J2735 Message Frame message with MAP contents
  - **SPaT** – If SPaT sample data is included in the map message
  - **Frame+SPaT** – SAE J2735 Message Frame message with SPaT contents
  - **SPaTRecord** – SPaT Record portion of ISD message
3. Select desired nodes offsets encoding (in the descending order of the message size)
- **Tight** - uses the absolute minimal SAE J2735 Node-XY-?? offset value encoding for each node (refer to **Figure**)

Message Encoder

Check the generated map data JSON then "Encode" it as SDC/SDW ISD message.

Map Data

```
{
  "mapData": {
    "minuteOfTheYear": 76928,
    "layerType": "IntersectionData",
    "intersectionGeometry": {
```

SPaT message empty for lane 06.

ASN.1

Text Encoding

UPER Hex

UPER Hex Encoding

Message Size:

Message Type:  Node Offsets:  Enable Elevation?:

Close Encode

Source: <https://webapp.connectedvcs.com/isd/#>

Figure 31. Image. Message Type and Node Offsets

4. Encode the MessagePress the **Encode** button to generate the UPER encoding (refer to **Error! Reference source not found.**)
- b. The **Hex** text area box will display the hex encoded message if successful, or an error message if unsuccessful.
  - c. The **ASN.1** text area box will display the ASN.1 encoded message if successful, or an error message if unsuccessful.
  - d. Note that although the cursor in all text areas is the prohibition sign  because the text areas are read-only, you can select the content of any text area and copy it via standard shortcut keys or a context menu available on the right click. The easiest way to copy all content from a text area is to click in the text area and then type Ctrl-A to select all lanes and Ctrl-C to copy to clipboard.

## USDOT's ISD Creation Tool

**Message Encoder** x

Check the generated map data JSON then "Encode" it as SDC/SDW ISD message.

---

**Map Data**

```
{
  "mapData": {
    "minuteOfTheYear": 76976,
    "layerType": "IntersectionData",
    "intersectionGeometry": {
```

SPaT message empty for lane 06. x

**ASN.1**

```
value MessageFrame ::= {
  messageId 18,
  value MapData : {
    msgIssueRevision 3,
```

**UPER Hex**

```
0012814538033000204bda0d4cdc8583d4dc4df118602dc125804280000500040b829d4978ac74c8141
41c74eec3d15e32b2b5f480a0a1716c0b876e40c163fc3a2b08a22c09f60eff9162b058000407581900020
40c01a1000001000022a8acdc5dba3e9e04f601f4830901090000000014b47192ed2de4b027d85602800
0a08b052000208180132000002000245988cca2ddc6f64fdc6d205050b1a1e615afe776050507cb4000fd0
```

**Message Size:** 329 bytes

---

**Message Type:** Frame+Map **Node Offsets:** Tight **Enable Elevation?:**

Close Encode

Source: <https://webapp.connectedvcs.com/isd/#>

*Figure 32. Image. Frame+Map Encoded Message*

- When encoding as Frame+Map or Map, the Hex text area will output the UPER encoded J2735 payload for broadcast. This payload may be copied and provided to the RSU. The provided Frame+Map example is for a Cohda MK5 RSU.